stamens about 200; female flowers: calyx 2 to 3 mm, sepals ovate, glands 3, oblong, nearly the size of the sepals; ovary tomentose or silky; styles short, spreading; capsule dividing into 3 cocci, 5 mm high and 6 mm broad, deeply furrowed; seeds globose, rugose; embryo axile, cotyledons orbicular, twice as long as the radicle.

The *Poola* is a very small, soft-wooded tree, reaching a height of not more than 15 to 18 feet, rarely 20. The trunk is usually branching 6 to 8 feet above the ground with pale, spreading branches, forming rather an unsymmetrical crown.

On East Maui, on the southern slopes of Haleakala, on the lava fields of Auahi, it grows to a small tree at an elevation of 2000 to 2500 feet, in company with Alectryon, Xanthoxylum, Xylosma, Pelea, Tetraplasandra, etc. On Hawaii it is not uncommon on the lava fields of Puuwaawaa, where it is a small tree. The plants from the latter locality differ somewhat from those of other localities, in that their leaves turn to a steel-blue color on drying, and in some other minor points. On Lanai, the *Poola* is most plentiful in the valleys of Kaiholena and Mahana. It is endemic to the Hawaiian Islands. No record remains as to the usefulness of this tree.

The second Hawaiian species, *C. tomentosum* (Hbd.) Heller, is a shrub, and occurs on Kauai only.

ALEURITES Forst.

Monoecious to almost dioecious. Male flowers: calyx irregularly 2 to 3 cleft. Petals longer than the calyx. Stamens inserted on a conical receptacle, in 1 to 4 whorls, the 5 outer ones epipetalous. Alternipetalous disc-glands 5, without rudimentary ovary. Female flowers: corolla the same as in the male flower. Disc much reduced. Ovary 2 to 5-celled. Style divided into two thick, linear branches; stone fruit indehiscent, exocarp thin, endocarp crusty, 2 to 5 celled. Testa thick, woody. Albumen thick, hard, very oily.—Trees with stellate pubescence. Leaves alternate, long petioled, large, 5 to 7 nerved at the base, entire or 3 to 5 to 7-lobed; peduncle at the apex with two glands. Flowers in loose, widely branched cymose corymbs.

A small genus of 3 to 5 species, of which *A. moluccana* (L.) Willd. is the most common and widely distributed species; it occurs in the tropics and subtropics of the old world, in the West Indies and Brazil, Pacific islands, etc.

Aleurites moluccana (L.) Willd.

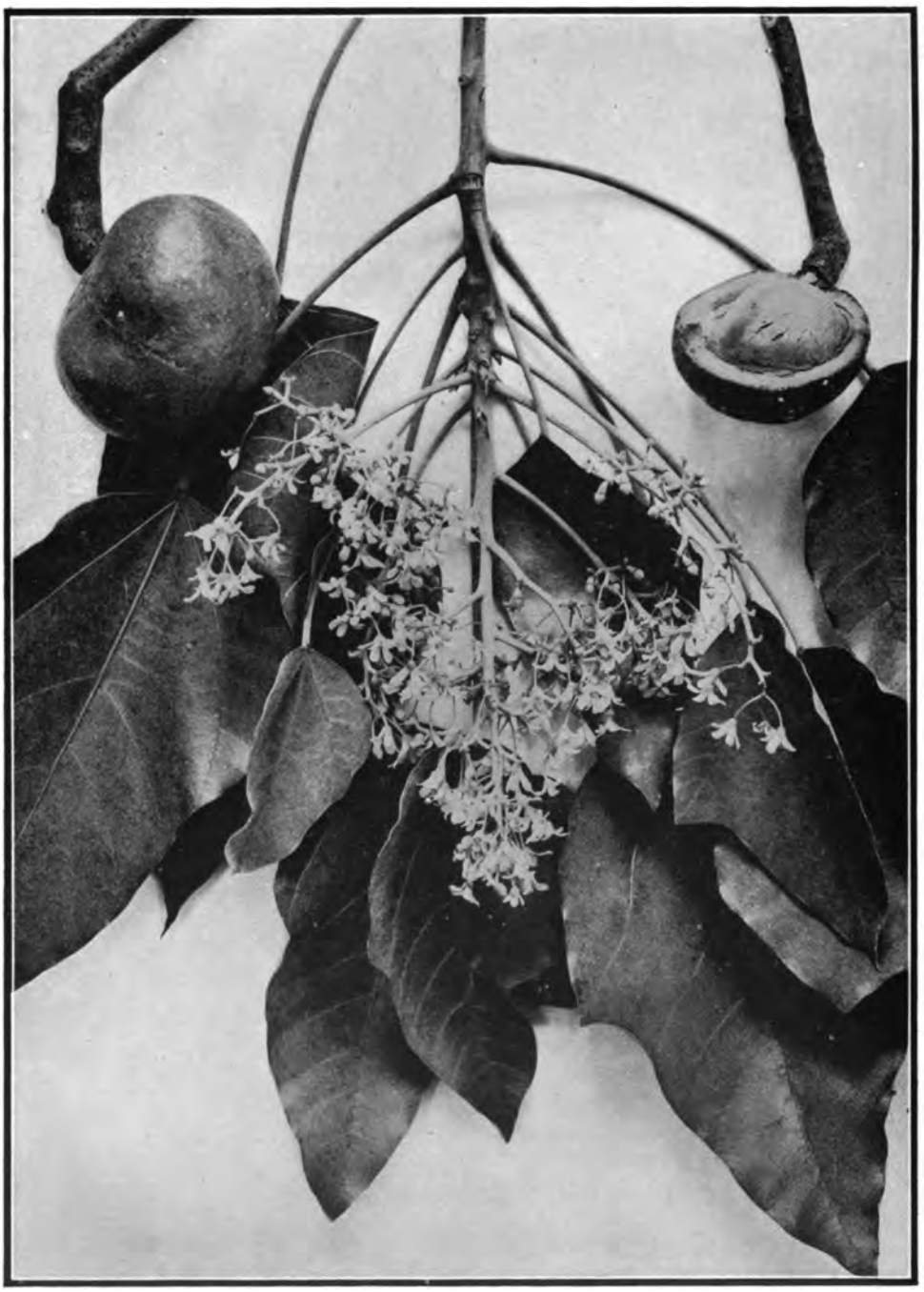
Kukui.

(Plate 99.)

ALEURITES MOLUCCANA (L.) Willd. Sp. Pl. IV. (1805) 590;—Mull. Arg. in DC. Prodr. XV. 2. (1866) 723;—H. Mann Proc. Am. Acad. VII. (1867) 203;—Seem. Fl. Vit. (1867) 223;—Nadeaud Enum. Tahit. Plants (1873) No. 462;—Hbd. Fl. Haw. Isl. (1888) 400;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 289, et Fl. Polyn. Franc. (1893) 183;—Pax in Engl. et Prantl Pflzfam. III. 5. (1896) 73. fig. 44;—Heller Pl. Haw. Isl. (1897) 842.—Brigham Ka Hana Kapa (1911) 138, fig. 84.—**Jatropha moluccana** Linn. Spec Pl. ed. 1. (1753) 1006.—**Aleurites triloba** Forst. Char. Gen. (1776) 112. t. 56., et Prodr. (1786) no. 360, et Incon. (ined. cf. Seem.) t. 262;—Hook. et Arn. Bot. Beech. (1832) 69, et 95;—Endl. Fl. Suds. (1836) no. 1554;—Guill. Zeph. Tait. (1836-37) no. 180;—Jardin Iles Marqu. (1858) 25.—**Telopia perspicua** Soland. Prin. Fl. Ins. Pac. (1858) 332, et in Park. Draw. Tah. Pl. 105, et. 106 (ined. cf. Seem.).—**Camirium moluccanum** O. Ktze. Rev. Gen. Pl. II. (1891) 595.

Leaves of variable shape, ovate or rhombeo-lanceolate, undivided or 3, 5 to 7 lobed, with triangular acuminate lobes, pale, with the rib and nerves tomentose; corymb 10 to

PLATE 99.



ALEURITES MOLUCCANA (L.) Willd.
Kukui.
Flowering and fruiting branch, reduced.

15 cm long. Male flowers: calyx ovoid in the bud petals white to cream colored, oblanceolate; stamens about 18, anthers erect, introrse. Female flowers: calyx 6 mm; ovary hairy, 2-celled; fruit fleshy, coriaceous, globose, about 5 cm or more in diameter, with 4 shallow furrows; seeds 1 or 2, rugose-gibbous.

The *Kukui* is one of the most common of Hawaiian forest trees, growing at elevations of from about sea level to about 2200 feet. It reaches a height of sometimes 80 feet and more, especially in narrow, rocky gorges, such as Mauna Lei on Lanai, and other narrow valleys. The trunks reach large dimensions, and it is not uncommon to find them several feet in diameter. Of all Hawaiian trees the *Kukui* has the lightest colored foliage, it being covered with a silvery-gray powder which makes it very conspicuous in the forest, and can be recognized from far off. The trunks are not always erect, but sometimes are twisted and running on the ground, as are also the huge branches. It is mainly in narrow gorges that the tree has a perfectly straight trunk, branching 40 feet or so above the ground.

It inhabits the lower slopes of the mountains in the dry region as well as on the windward side, where the rainfall is usually heavy. It is common on all the islands from almost sea level up to 2200 feet, but not higher.

The nuts especially were a necessity to the natives, who made their torches from the seeds, strung on coconut or palm-leaf midribs. An oil was expressed from the nuts, which they burnt in stone lamps. Of the acrid juice of the fleshy covering of the nuts they prepared a black dye, used in tattooing. From the bark of the root a similar dye was used in coloring canoes black. The trunk itself was sometimes made into canoes. while the soot of the burning nuts was used as canoe paint. The trunk, when bruised, exudes a gum or resin called *pilali* by the natives, who employed it for various purposes. The gummy substance is said to be chewed by the Tahitians, especially that exuding from the fruits. The nuts contain 50 per cent of oil, which is known as *Kekuna* in India and Ceylon, and *Kukui* in Hawaii. In former times the yearly production of the *Kukui* nut oil in the Hawaiian Islands amounted to 10,000 gallons, and was exported to Europe. The cake, after expression of the oil, is a good food for cattle, and also useful for manuring. Medicinally, the oil is used as a purgative, and also makes an ideal dressing for ulcers.

The nuts are also roasted by the Hawaiians and, when chopped, are mixed with seaweed and served at *luaus* or native feasts as a relish. In Samoa the nuts are strung similarly to the old Hawaiian method and used as house lamps, 50 to 60 nuts being necessary for one night. They are boiled before being strung on the midribs of palm leaves. It is called *lama* and *tuitui* in Samoa, *nibbol* by the Tami Islanders in New Guinea, and *raguar* in the Caroline Islands; it is the *lauci, sikeci* and *tuitui* in the various dialects of Fiji.

The wood of the *Kukui* is of a light color, soft and absolutely not durable. It decays very easily when cut full of sap. Many insects bore into the wood, but especial mention may be made of the big beetle Aegosoma, belonging to the Longicorn family, which is also a great enemy of the *Koa* and other trees.

PLATE 100.

EUPHORBIA LORIFOLIA (Gray) Hbd. var. **GRACILIS** Rock var. nov.
Koko or **Akoko.**
Fruiting branch pinned against trunk of tree; bark is incised, note flow of latex. Growing on the lava fields of Puuwaawaa, North Kona, Hawaii; elevation 3000 feet.

Euphorbiaceae.

EUPHORBIA L.

Cyathium campanulate, 4 to 5 lobed, the lobes entire or slit, often hidden by glands. Glands between the lobes, rarely less, entire or two horned or digitate. Male flowers: numerous without calyx, very rarely with a small scale on the articulation of the stamens. Female flowers: single from the middle of the cyathium, finally stipitate and exserted from the cyathium, naked or with a calyx formed by three small scales. Styles 3, free or united, entire or bifid. Capsule separating into 3 two-valved cocci.—Herbs, shrubs or trees, abounding in milky juice. Leaves entire, opposite, or alternate. Cyathia in terminal cymes or in the axis of two dichotomous branches, or in the axils of the leaves; stem often thick fleshy, cactus-like or even leafless.

The genus consists of more than 600 species, and is distributed especially over the warmer regions; it is absent in the Arctic regions, and only very sparingly represented in the colder parts of the temperate zone.

In the Hawaiian Islands ten species are endemic, of which only three become small trees.

All Hawaiian Euphorbiae are called *Akoko* or *Atoto* by the natives. The name *Atoto* appears also in Tahiti for *Euphorbia atoto*, which is called *Totolu* and *Totoyava* by the Fijians. *Euphorbia atoto* is credited to the Hawaiian Islands by Seeman, who mistook for it the closely allied *Euphorbia cordata* of our seashores.

KEY TO THE SPECIES.

Leaves linear oblong; flowerheads terminal or axillary, single; capsule small. **E. lorifolia**
Leaves obovate oblong; flowerheads in open axillary cymes; capsules large. **E. Rockii**

Euphorbia lorifolia (Gray) Hbd.

Koko or *Akoko.*

(Plate 100.)

EUPHORBIA LORIFOLIA (Gray) Hbd. Flora Haw. Isl. (1888) 395;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VII. (1892) 285.—**E. multiformis** var. **lorifolia** Gray in H. Mann, Proc. Am. Acad. VII. (1867) 202.—**E. multiformis** var. **angustifolia** Boiss. in DC. Prodr. XV. 2 (1866) 11 (ex parte).

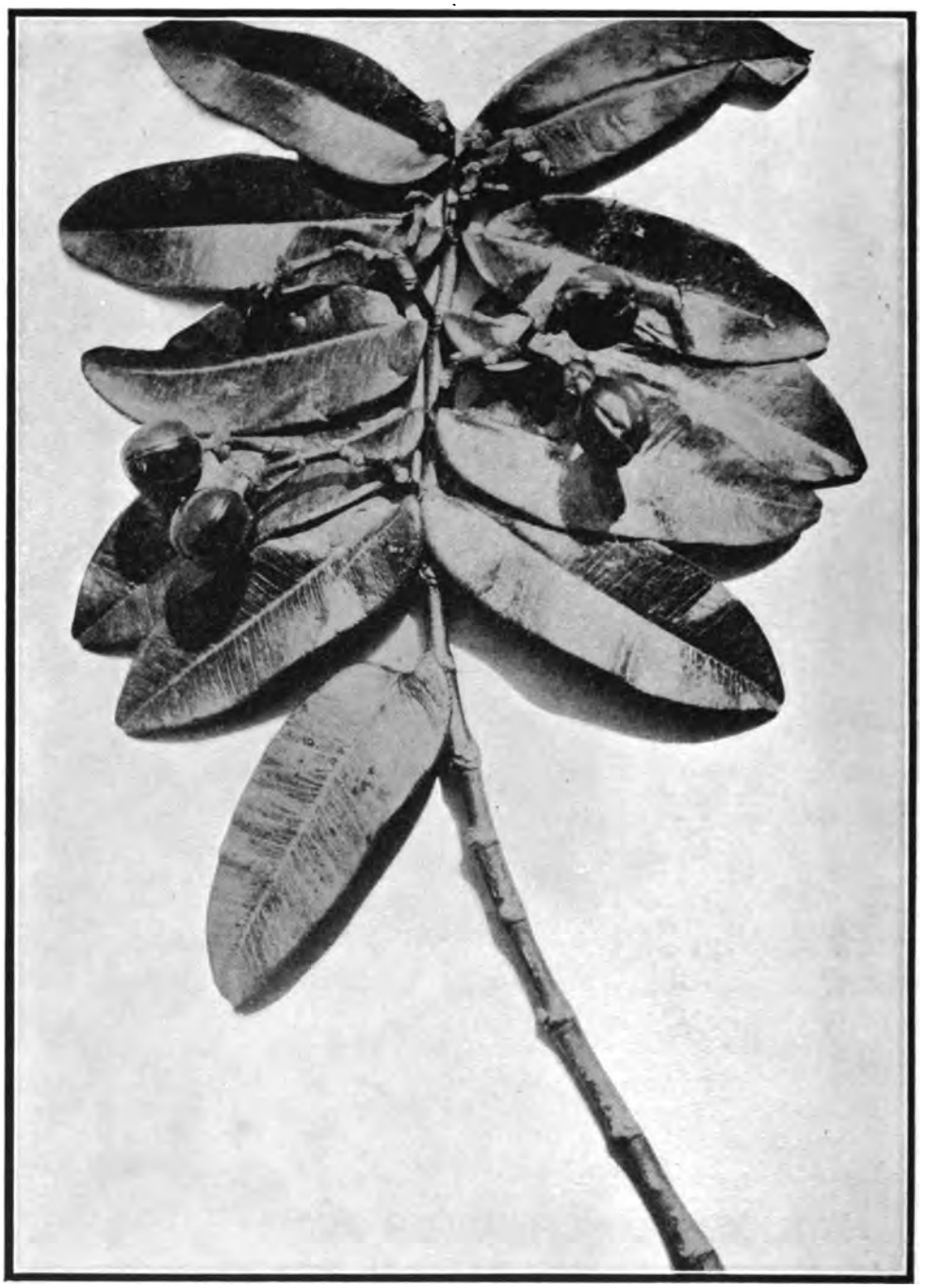
A small tree, with stiff branches which are nodose with short internodes and puberulous; leaves opposite, linear or oblong, somewhat spathulate, 2.5 to 5 cm long, 4 to 10 mm wide, on petioles of 1 mm or almost sessile, obtuse or truncate, often retuse at the apex, entire, slightly contracted and subtruncate or uneven sided at the base, chartaceous or somewhat fleshy; stipules very low, triangular with a broad base; flowerheads terminal and axillary, generally single or (in the Maui specimens) 2 to 3 in the leaf-axils, subsessile, supported by several short bracts; involucre less than 3 mm, pubescent outside, glabrous within, with 4 suborbicular glands; the lobes obovate or quadrate, with ragged margins; bracteoles 3 to 4 fid; styles free to the base, shortly bifid with clavate branches; capsule erect on a short stalk, 3 mm in diameter, puberulous, obtuse at the angles, the cocci broader at the base; seeds rugose, scrobiculate.

Var. gracilis Rock. var. nov.

Branches not erect and stiff, but very slender and drooping; leaves linear oblong, acute at both ends, chartaceous, opposite, on petioles of 2 to 3 mm, midrib and veins very prominent, pubescent underneath, pellucid, capsules smaller, the cocci of equal width. Type no. 3593 in College of Hawaii Herbarium.

This variety is peculiar to Puuwaawaa, North Kona, Hawaii, where it grows on the *aa* lava fields. It reaches a height of 20 to 25 feet and a diameter of

PLATE 101.



EUPHORBIA ROCKII Forbes.
Koko.
Showing fruiting branch and flowers, reduced.

often more than 10 inches. The trunk is vested in a pinkish, rather thin bark which is smooth when young, but often forms thick knobs which are deeply wrinkled in very old trees. It has a tremendous flow of latex, which does not coagulate on the tree, but becomes yellow, especially in old trees.

The species occurs in the gulches back of Makawao, Maui, and also on the slopes of Mauna Kea, Hawaii, near the crater Nau, on the boundary of the Parker and Horner ranches. The writer met with it also on the Island of Lanai in the dry gulches of Mahana.

The new variety, however, occurs only on the slopes of Hualalai between Huehue and Puuwaawaa, Hawaii, at an elevation of 3000 feet, on the rough *aa* lava fields and also in the more humid forest of Waihou. The area with which this tree is practically covered amounts to about 5000 acres. During a recent visit in North Kona, engaged in botanizing in this most interesting locality, the writer was struck by the tremendous flow of latex and the large amount which could be procured from a single tree. Thinking it worth while to take some latex samples for examination, the writer sent a large bottleful to the U. S. Agricultural Experiment Station in Honolulu for analysis.

This Station has since published the results of the analysis in the form of a Press Bulletin No. 37, entitled "*Euphorbia lorifolia*, a Possible Source of Rubber and Chicle," by Wm. McGeorge, Assistant Chemist, and W. A. Anderson, Superintendent Rubber Substation

Euphorbia Rockii Forbes.

Koko.

(Plate 101.)

EUPHORBIA ROCKII Forbes Occas. Pap. Bernice P. Bishop Mus. Vol. IV. 3. (1909) 38, pl. 1.

Leaves opposite, obovate-oblong, obtuse, uneven-sided with a clasping base, nearly sessile, 8 to 12 cm long, 2.5 to 3 cm wide; flowers in open axillary cymes 3 to 3.5 cm long; involucre campanulate, minutely hairy or glabrous on the outside, pubescent on the inside, lobes ovate, minute, glands transversely oblong, not appendiculate; style branches short, nearly free; capsules large 18 to 24 mm. glabrous, pink or dark crimson, on nodding peduncles.

This tree, which was discovered by the writer in August, 1908, when in full fruit is exceedingly handsome. It reaches a height of about 15 to 20 feet, with a trunk of about eight inches in diameter. The bark is smooth and whitish. Like all Euphorbiae, it exudes a sticky, milky sap when bruised. The branches are flat and spreading, giving the trees a broad, flat crown. The flowers are small and inconspicuous and are borne on dichotomous cymes. The three-cornered capsules are bright pink or deep scarlet when mature, of an inch or more in length clothing the whole crown in scarlet, which is beautifully contrasted with the dark-green, glossy, sessile foliage.

The *Euphorbia Rockii* is peculiar to the Island of Oahu, and is only found on the windward side, in the mountains of Punaluu above Kaliuwaa valley, at an elevation of 2000 feet or more. On the summit ridge it grows to a shrub.

while in the shaded ravines it becomes a tree 15 to 18 feet in height. It associates with *Pittosporum glomeratum, Straussia* sp., *Psychortia hexandra, Pterotropia gymnocarpa,* Cyrtandra, many Lobelias and other plants peculiar to the rain forest, of which this tree is also typical.

ANACARDIACEAE.

This family, which consists of 58 genera with over 420 species, reaches its best development in the tropical regions of the old and new world, but mainly in the Malayan Archipelago. Only a few genera occur in the extra tropical regions of the northern and southern hemispheres, as in the Mediterranean, and Manchurian-Japanese regions, in the forests of North America, and in the Andes region of South America.

Among the most useful members of this family are the Mango (*Mangifera indica*), *Wi* (*Spondias dulcis*), *Cacheu-nut* (*Anacardium occidentale*) and many others.

RHUS L.

Flowers polygamous, calyx 5-lobed. Petals longer than the calyx, both imbricate. Stamens inserted below a broad discus, with subulate filaments, and ovate anthers, in the female flowers often small. Ovary ovate or subglobose, with a single ovule suspended from an erect funis; styles terminal 3, free or somewhat united, with truncate or capitate stigmas. Drupe globose or compressed, with thin glabrous or tomentose exocarp. Seeds ovate or reniform with thin testa.—Shrubs or trees with alternate, simple, trifoliate or pinnate leaves, and usually small flowers arranged in compound panicles.

The genus Rhus has the largest number of species of any genus of the above family. It consists of over 120 species and subspecies, and is distributed over the tropics, subtropics and temperate zones, but chiefly in South Africa. Several species are found in the Viti (Fiji) and Society Islands.

The Hawaiian variety of *R. semialata* differs from the species in having the rhachis of the leaf not winged.

R. semialata extends from the Himalaya Mts. through China to Japan.

The Japanese Sumach (*R. vernix*) has been introduced into the islands here.

Some species of Rhus are poisonous to the touch, others are employed for tanning and dyeing purposes.

The Tahitian name of *R. Taitensis,* peculiar to the South Sea Islands (Samoa, Viti, and Tongan Islands) is "*Waiwai,*" in Samoa "*Tavai.*"

Rhus semialata Murr. var. **sandwicensis** Engl.

Neneleau or *Neleau.*

RHUS SEMIALATA Murr. var. **SANDWICENSIS** Engl. in DC. Monogr. IV. (1883) 380;—Hbd. Fl. Haw. Isl. (1888) 89;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 145;—Engler in Engl. et Prantl Pflzfam. III. 5 (1896) 168.—**R. semialata** Murr., Mann Proc. Am. Acad. VII. (1867) 162, et Fl. Haw. Isl. (1867) 177.—**Rhus sandwicensis** Gray Bot. U. S. E. E. (1854) 369.—**Toxicodendron semialatum** (Murr.) O. Ktze Rev. Gen. Pl. I. (1891) 154.

Branches feruginous at the ends; leaves impari-pinnate, with 2 to 6 pairs of leaflets, the rachis 10 to 30 cm long, terete, not margined, petiolate in the lower third or fourth; leaflets oval or oblong, more or less acute or acuminate, 5 to 15 cm long and 2.5 to 8 cm wide, almost sessile, feather veined, downy underneath, subglabrous above; panicle terminal, very large and compound, very dense, 30 cm long, many flowered, flowers small yellowish, calyx 1 mm, deeply 5-cleft, tomentose; petals 5, 2 mm, obovate, glabrous or ciliate; anthers 5, ovoid, obtuse, on very short filaments, styles 2 to 3, short, with capitate stigmas; fruit 3 to 4 mm, ovoid, somewhat flattened, tomentose.

The *Neneleau,* or Hawaiian Sumach, is a small tree of 15 to 25 feet in height. It sometimes sends up numerous shoots from the roots and thus forms dense clumps of great extent. The trunk is seldom a foot in diameter and is vested in a smooth bark; the leaves are pinnate, of a bright green with red veins and petioles, and when it is in flower is quite an attractive looking tree. The flowering panicle is terminal rusty tomentose, and very dense. The flowers are very small and pale yellow. The *Neneleau* is strictly of the lowland and lower forest zone between 600 to 2000 feet elevation, and may be found in more or less isolated clusters. On Kauai it grows above Makaweli together with the *Kukui* (*Aleurites moluccana*), *Sapindus oahuensis*, Pisonia, etc., while on Hawaii it is most common all along the road back of Hilo. It is also found in Kona and back of the Waimea village. On Maui it grows on the windward (Kailua) and leeward slopes of Haleakala (at Auahi), together with the *Puhala* (*Pandanus odoratissimus*), and it is not uncommon in Nuuanu Valley, on Oahu.

The wood of the *Neneleau* is soft and very light, of a yellowish gray color, and has a rather coarse grain with darker streaks. It, however, is tough and is largely used for ox plows by the ranchers.

In North Kona above Kailua, Hawaii, there is a large grove of *Neneleau,* though now almost dead, due to a fungus pest which has also made its appearance in Hilo.

The species of which this Hawaiian tree is a variety is a small tree whose habitat is in the outer Himalaya Mts., from the Indus to Assam, growing at an elevation of 6000 feet, and on the Khasia Mts. at altitudes between 3000 and 5000 feet. The fruit is used by the hill tribes of the Himalaya as a remedy for colic. From the pulp which surrounds the drupes, the *omlu,* a vegetable wax, is prepared by the Nepalese, which is similar to the Japanese wax of commerce. The *Neneleau,* however, is peculiar to Hawaii.

AQUIFOLIACEAE.

Of the family Aquifoliaceae only about 176 species are known, of which more than 170 belong to the genus Ilex. The remaining species belong to 3 genera. The center of distribution of Ilex is in the central and southern part of America, with nearly half as many species in Asia and a few in the Pacific Isles. One genus (Nemopanthes) is North American, while the genus Phelline and others belong to the Australian floral region.

PLATE 102.

ILEX SANDWICENSIS (Endl.) Loes.
Kawau or **Aiea** on Kauai.
Fruiting branch about one-half natural size. Typical Oahu specimen.

ILEX L.

Flowers through abortion dioecious. 4 to many lobed, usually isomerous, calyx rarely oligomerous, and ovary pleiomerous.

Subgenus **BYRONIA** (Endl.) Loes.

Inflorescence single or in the leaf axils or single lateral at the base of young shoots, usually long peduncled, one or several times dichotomous or trichotomous, cymose or irregularly forked, rarely umbellately contracted. Flowers isomerous, or oftener at least the female flowers heteromerous. Petals occasionally shorter than the ovary. Staminodia of the female flower often without anthers, resembling entirely the petals. Ovary 5, or more often 6, to many celled, occasionally 22 celled. Ovules single in each cell. Trees with chartaceous or mostly thick coriaceous, entire, or rarely serrulate leaves.

The genus Byronia, established by Endlicher, was reduced by Loesener to a subgenus under the genus Ilex, which was again divided into two classes, A. *Eubyronia,* into which falls the Hawaiian representative, now *Ilex sandwicensis* (Endl.) Loes., and B. *Micrococca* Loes. with a single species found in Japan.

Ilex sandwicensis (Endl.) Loes.

Kawau, or *Aiea* on Kauai.

(Plate 102.)

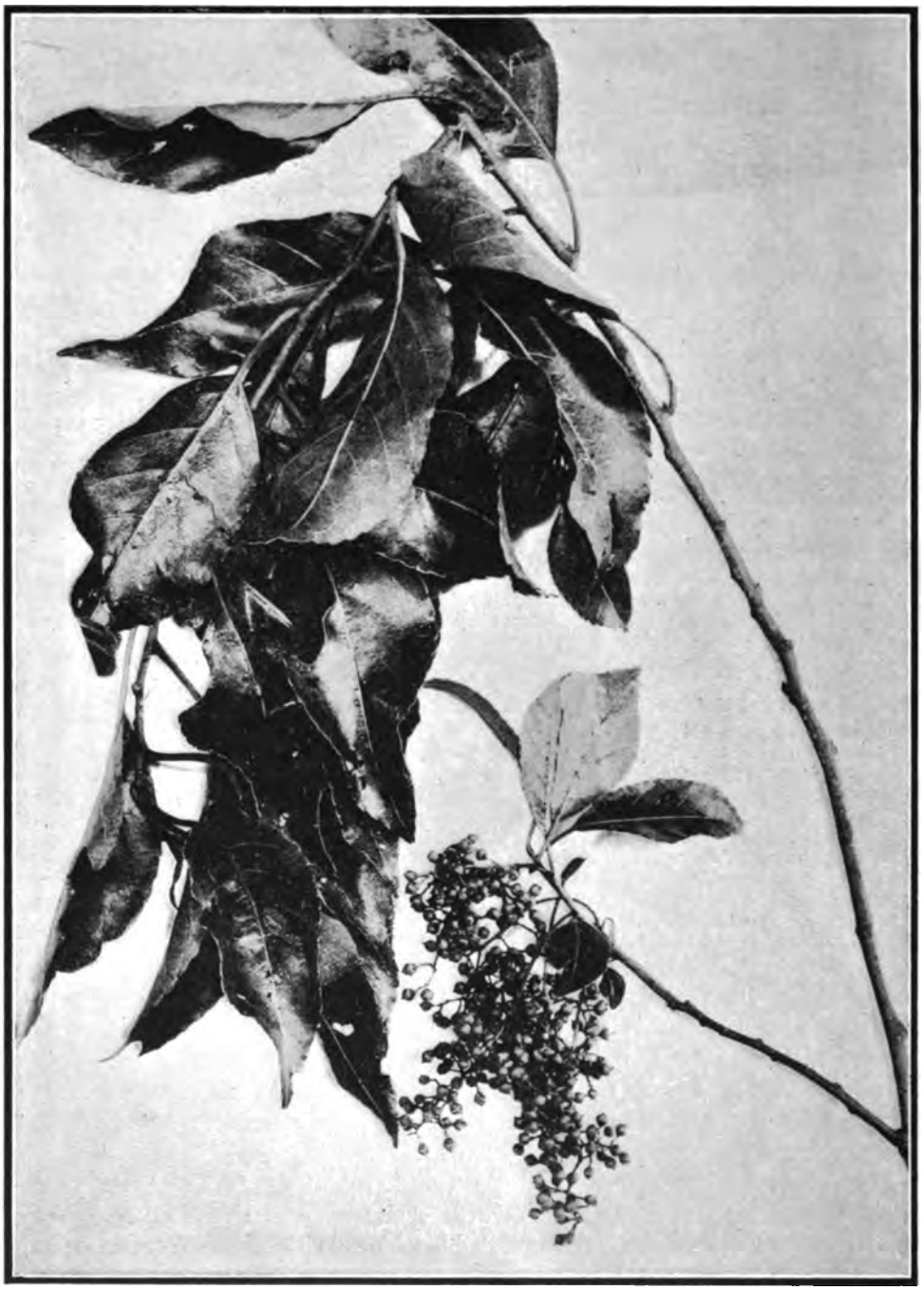
ILEX SANDWICENSIS (Endl.) Loes. in Engler et Prantl Pflzfam. Nachtr. I. γ 218.—**Ilex ? anomala** Hook et Arn. Bot. Beech. (1832) 111 t. 25.—**Byronia sandwicensis** Endl. in Ann. Wien. Mus. I. (1836) 184,—et Fl. Suds. (1836) no. 1577;—A. Gray Bot. U. S. E. E. (1854) 296. pl. 26;—H. Mann Proc. Am. Acad. VII. (1867) 161, et Fl. Haw. Isl. Essex Inst. V. (1867) 171;—Wawra in Flora (1873) 170;—Hbd. Fl. Haw. Isl. (1888) 78;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 138;—Brigham Ka Hana Kapa (1911) 178, fig 105.—**Byronia anomala** Heller Pl. Haw. Isl. (1897) 847, et **B. sandwicensis** Endl. Heller l. c. p. 848.

Leaves elliptico-oblong or obovate to ovate, 5 to 12 cm long, 2 to 6 cm wide, on petioles of 5 to 25 mm, obtuse, narrowing toward the base, entire or rarely serrulate, coriaceous, dark green above, lighter underneath, glossy above, with impressed nerves; flowers numerous in cymose panicles of 5 to 10 cm in length, the naked compressed two-edged peduncle 2.5 to 5 cm, pedicels 6 mm, bibracteolate below the middle, the bractlets 2 to 3 mm; calyx 4-lobed, the lobes rounded, corolla rotate white, deeply 6 to 10 cleft, female flowers with staminodia often without anthers, as many as the lobes of the corolla and alternate with them; ovary closely sessile in the calyx, globular, 12 to 18 celled; in sterile flowers smaller and imperfect; stigma sessile, broad, radiate with 12 to 18 lines, persistent, ovules single in each cell, stamens half the length of the corolla, filaments flattened, anthers didymous, drupe spherical, smooth, 12 to 18 grooved when mature or dry, black, dull, with purplish fruit flesh, containing 2 to 18 separable pyrenae.

The writer has abundant material of this species from various localities all over the group, and after comparing the many specimens he comes to the conclusion that, as so many of our Hawaiian trees are polymorphous or variable, the *Kawau* or *Aiea* proves to be no exception. Hillebrand in his Flora of the Hawaiian Islands fails to mention that the flowers are often sterile and that the anthers are often wanting in fertile flowers.

It is a handsome tree reaching a height of 20 to 40 feet, with a trunk of often one foot in diameter. It is, however, occasionally a shrub with stiff ascending branches and leaves crowded at the ends of the latter. Such shrubs can be found near Kilauea Volcano on Hawaii, elevation 4000 feet, among the sub-xerophytic vegetation, or in open swampy country. It is one of the most common forest trees on all the islands and is more or less confined to the rain forests, though occa-

PLATE 103.



PERROTTETIA SANDWICENSIS A. Gray.
Olomea or **Waimea** on Maui.
Fruiting branch, about one-half natural size.

sionally met with in the drier districts. It can be found usually in company with *Perrottetia sandwicensis* (*Olomea*), *Cheirodendron Gaudichaudii* (*Olapa*), Straussia, Bobea, *Elaeocarpus bifidus* (*Kalia*), and others peculiar to that zone. The tree is seldom tarnished by insects or blight, and the dark glossy leaves make the tree a conspicuous object in the forest, and more so when it is in full bloom, exhibiting its cymes of white flowers in the upper axils, and abundant small black fruits below the leaves, along the stem.

The leaves vary tremendously in size, shape and texture, and so does the inflorescence, which is sometimes very shortly peduncled and appears to be terminal. A form with very small leaves is not uncommon on Kauai, while the biggest fruited specimens the writer collected on the slopes of Mt. Hualalai, in North Kona, Hawaii.

The wood of the tree is whitish and rather soft. It has been employed for saddle-trees by the Hawaiians of today.

CELASTRACEAE.

With the exception of the Arctic Zone, the Celastraceae are to be found in all floral regions, but especially in southern and tropical Africa, including Madagascar; also in tropical and subtropical Asia, in China, and Japan.

The genus Perrottetia, which occurs in the Indo-Malayan region, is also to be found in tropical America, with one species in the Hawaiian Islands. The family consists of 38 genera with numerous species.

PERROTTETIA H. B. K.

Flowers hermaphrodite or unisexual; calyx broad, flat cupshaped to obconical; lobes triangular 5, short, erect, open or imbricate in the bud. Petals 5, erect, similar to the sepals, occasionally ciliate, valvate in the bud. Disc flat, cup or ring-shaped, entire, or minutely wavy, or undulate. Stamens 5, inserted in the margin of the disc; in the male flowers longer than the petals, in the female flowers very short, sterile, filaments filiform or subulate, anthers broad round or oval, versatile; ovary ovate, or lageniform, free from the disc, mostly 2 celled or oftener apparently 4-celled at the base. Ovules 2 in each cell. Style short, stigma 2 or 3 to 4 parted, 1 to 2 erect ovules in each cell. Fruit a thick fleshy globose berry with persistent calyx, corolla, disc and stamens, 2 to 4 celled, cells 1 to 2 seeded. Seeds round with thin fleshy albumen.—Unarmed trees or shrubs with alternate, thin coriaceous serrate leaves; stipules triangular, small and deciduous. Inflorescence single in the leaf-axils, paniculate or cymosely branched. Flowers small.

Perrottetia sandwicensis A. Gray.

Olomea, or *Waimea* on Maui.

(Plate 103.)

PERROTTETIA SANDWICENSIS A. Gray Bot. U. S. E. E. (1854) 291, pl. 24;—Mann, Proc. Am. Ac. VII (1867) 161, et Fl. Haw. Isl. (1867) 172;—Wawra in Flora (1873) 141;—Hbd. Fl. Haw. Isl. (1888) 79;—Del Cast Ill. Fl. Ins. Mar. Pac. VI. (1890) 139;—Loes. in Engl. et Prantl Pflzfam. III. 5. (1896) 220, et Nachtr. I. (1897) 224,—Heller Pl. Haw. Isl. (1897) 848.

Leaves alternate, ovate oblong, somewhat acuminate, either obtuse or acute at the base, serrate, rather chartaceous, pinnately veined, shining above, pale underneath, veins and nerves as well as petioles red, the latter 12 to 25 mm in length; stipules minute,

PLATE 104

SAPINDUS SAPONARIA Linn.
Ae and Manele.
Showing a fruiting branch and seeds at the base.

caducous; flowers small, polygamo-dioecious, greenish, pedicellate, numerous in compound panicles from the axils of the leaves, peduncle puberulent or tomentose, branching divaricately; sepals 5, ovate lanceolate; petals 5, triangular ovate, acute; stamens 5, alternate with the petals; anthers 2-celled; ovary ovoid, in the male flowers abortive and sterile; ovules 2 in each cell; fruit bright red, globose, slightly depressed, about 6 mm when mature; seeds marked with minute transverse wavy lines.

A tall shrub or tree 10 to 18 feet or more in height, nearly glabrous. The branches are short and stiff, but when growing at higher elevation become long and more or less drooping.

During the month of October and November, when the tree is in full fruit, it is not unattractive. The bright red berries gracefully droop on densely clustered panicles from every branch. The *Olomea* inhabits both the dry and the wet forests on all the islands, ranging from 1000 feet to 6000 feet elevation.

It is most common on Maui, in Koolau, the northern gap or outlet of Haleakala crater, where the tree forms a forest to the exclusion of nearly everything else at an elevation of 6000 feet. The undergrowth in this *Olomea* jungle consists of the native Begonia, *Akaakaawa*, which stands 10 feet high. It is not uncommon near Kilauea Volcano, Hawaii, in the dry forest 4000 feet above sea level, while it is a common feature especially in the rain forests on all the islands.

The wood of the *Olomea* is of medium strength, of a golden brown color with reddish tint, and was used by the natives for producing fire by friction. Two sticks called *Aunaki* were used, the upper of *Olomea* wood and the lower of the much softer *Hau*. In the Hawaiian mythology their origin is explained thus: During the first appearance of the sun which caused the separation of the heavens, Lailai (goddess) is taken up to him ornamented with the dress of the dawn, while he encloses the fire on earth in the rubbing sticks called *Aunaki*.

SAPINDACEAE.

The family Sapindaceae, which is almost purely tropical, consists of not less than 118 genera with over one thousand species, nearly one-third of which (belonging to five genera of the tribe Paullinieae) are climbing or twining plants peculiar to America. The only exception is Cardiospermum, which is found in all tropical countries, besides one other climbing species, *Paullinia pinnata*, occurring in Africa. The remaining genera, consisting either of shrubs or trees, are distributed over Asia, Africa, Australia, and Oceanea.

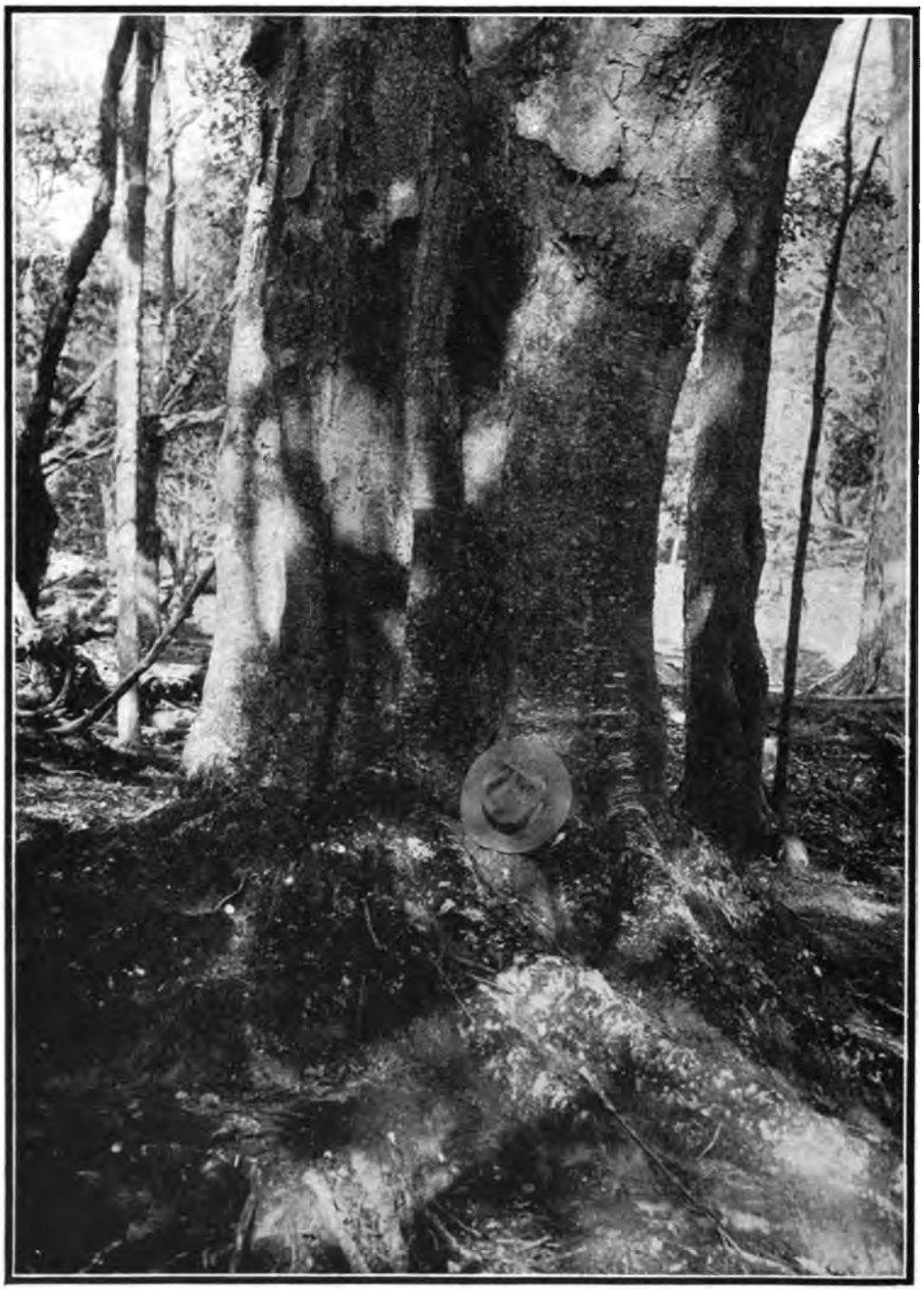
In the Hawaiian Islands only four genera are represented, three of which have arborescent species.

KEY TO THE GENERA.

Petals present:
- Sepals and petals 5; fruit 1-3 cocci, leaves simple or abruptly pinnate.... **Sapindus**

Petals wanting:
- Sepals 5; fruit of one or two cocci..... **Alectryon**
- Sepals 2-5; fruit a winged capsule..... **Dodonaea**

PLATE 105.



SAPINDUS SAPONARIA L.
A'e or **Manele.**
Buttressed trunk of a very large A'e tree. Growing at the Kipuka Puaulu, near the Volcano Kilauea, Hawaii; elevation 4000 feet.

Sapindaceae.

SAPINDUS L.

Sepals 5, round or ovate, concave, either small, glabrous and petaloid, or larger, and densely villous outside, the two outer smaller. Petals usually 5 densely tomentose outside, each with a scale at the base. Disc annular, rarely incomplete; stamens 8 (10) free, generally hairy. Fruit of 3 to 1 cocci, indehiscent, with coriaceous exocarp, mesocarp fleshy containing saponine, putamen chartaceous. Seeds globose or elliptical, with a hard bony testa. Embryo oily. Large or medium sized trees with numerous leaflets and occasionally winged rhachis, one Hawaiian species only with simple leaves. Flowers in terminal and axillary panicles.

A genus of eleven species, mainly medium-sized or large trees, occuring in tropical and sub-tropical countries, with the exception of Africa and New Holland. All species of Sapindus have leaves consisting of many leaflets, with the exception of one species occurring in these islands, which has simple and entire leaves.

Sapindus Saponaria, described by Linnaeus, is found in America in many forms, which have been mistaken for different species.

The genus is represented in these islands by two species, while one other occurs in the Viti (Fiji) Islands. The species of Sapindus found in Tahiti, the Marquesas, and Easter Island, is identified by some botanists with the already mentioned *S. Saponaria* L.

KEY TO THE SPECIES.

Leaves abruptly pinnate	**S. Saponaria**
Leaves simple, entire	**S. Oahuensis**

Sapindus saponaria L.

A'e and *Manele.*

(Plates 104, 105, 106.)

SAPINDUS SAPONARIA L. Spec. pl. ed. 1 (1753) 367;—Forst. Prodr. (1786) 178;—DC. Prodr. I. (1824) 607;—Endl. Fl. Suds. (1836) No. 1534;—Seem. Fl. Vit. (1866) 47;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VI. (1890) 143, et Fl. Polyn. Franc. (1893) 35;—Radlk. in Engl. et Prantl Pflzfam. III. 5. (1896) 315, fig. 164.—**S. microcarpa** Jardin Hist. Nat. Iles Marquises (1858) 25.—**S. Thurstonii** Rock Bull. Hawaii Board Agric. and For. I. (1911) 6, fig. 2, pl. 3.

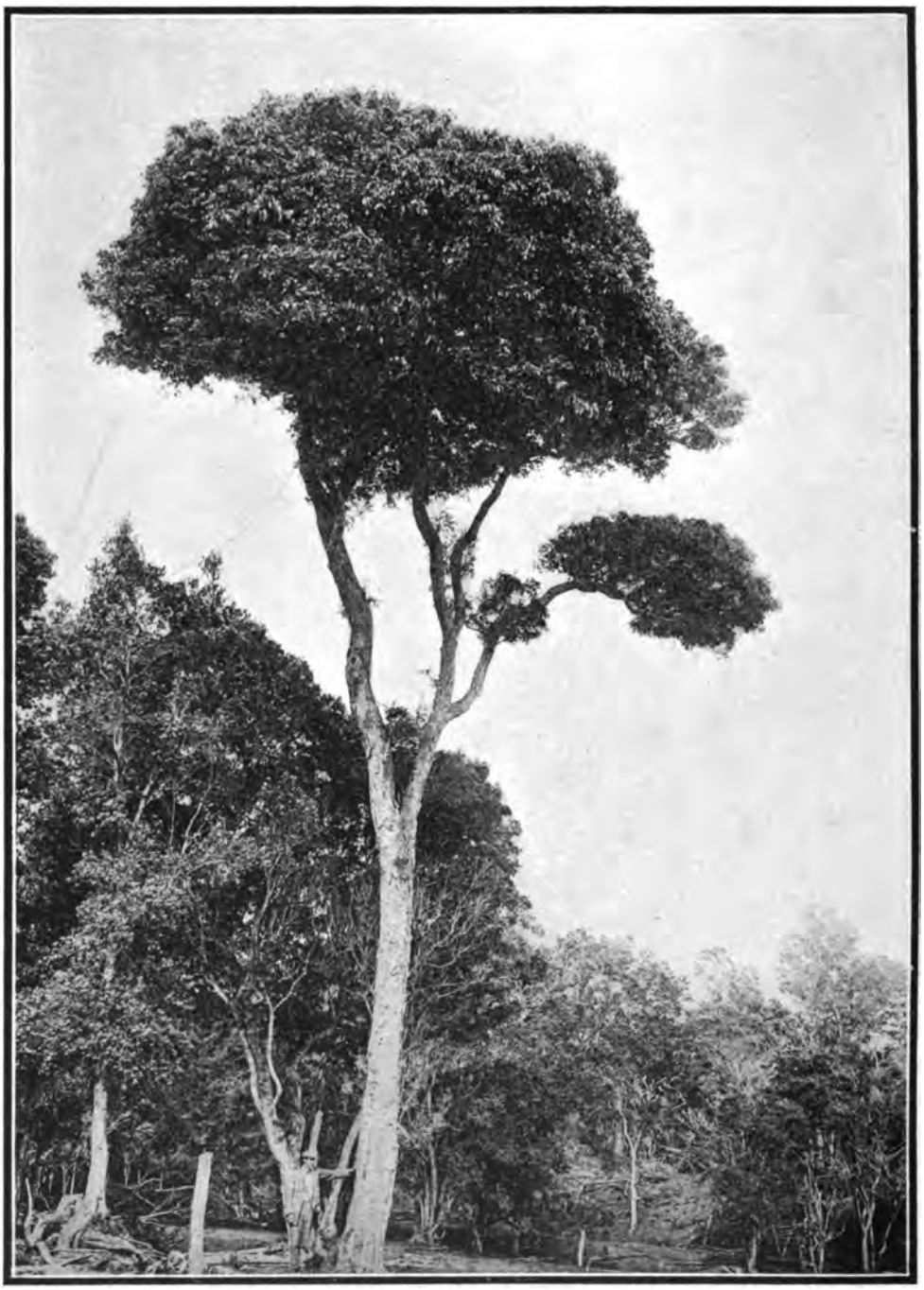
A deciduous tree; leaves alternate; leaflets opposite or slightly alternate, the rhachis slightly marginate or winged in young leaves; leaflets subsessile in 4 to 6 pairs, chartaceous, elliptical-oblong, slightly falcate, 6 to 12 cm long, 2 to 3.5 cm wide, acuminate, rounded at the base, glabrous above, tomentose underneath; the pubescent panicles terminal, about 12 cm long; flower-buds green, strongly pubescent; fruits consisting of 1 to 2 globose cocci, 17 to 20 mm in diam. which are connate, or when single bear the rudiments of two abortive ones; pericarp coriaceous, endocarp pergameneous, pale, seeds globose, dark reddish brown or black, 10 to 12 mm in diam. with a long testa bearing no tufts of hair at the base (in the Hawaiian specimens).

The *A'e* or *Manele* is a very beautiful tree, attaining a height of about 80 feet, when growing in the middle forest zone at an elevation of 4000 feet.

The bark on young trees is of a light-brown color and smooth, and falls off in large scales from mature trees, exposing the smooth inner layers.

The leaves are abruptly pinnate, light-green, and have a winged rhachis when young. The small flowers are on terminal panicles and of a yellowish color. The berries are round, and two or three may be found attached to each

PLATE 106.



SAPINDUS SAPONARIA L.
A'e or **Manele.**
Tree growing in the Kipuka Puaulu, Hawaii; elevation 4000 feet.

other with a parchment-like covering, but are usually single with two abortive ones at the base; the seed is round, brownish-black, and hard. The tree loses its leaves in the winter months; but as the young leaves come out before all the old ones drop, it is hardly bare for any length of time. Owing to the ravages of a caterpillar which feeds on the flowers, making the whole inflorescence wilt before expansion, very few trees, indeed, bear fruits.

S. Saponaria L. is the second species of the genus Sapindus found in these islands. It is called *A'e* on Mauna Loa, while on Hualalai it is known as *Manele*. The wood is whitish and is of medium strength.

After reexamination of extensive material of this plant, the writer came to the mature conclusion that the Hawaiian *A'e* or *Manele* is identical with the American *Sapindus saponaria* L. The tree was first found by the writer on the Island of Hawaii on the lava fields of Puuwaawaa, in North Kona, in the year 1909. Mr. L. A. Thurston called the writer's attention to some very large trees near the Kilauea Volcano, in the Kipuka Puaulu, and on visiting this most interesting district the writer found the trees identical with those from Puuwaawaa, the only difference being in the size of trunk (5 to 6 feet) and height of tree (80 feet), while in the latter locality the tree is rather small. After examining the material and comparing it with specimens of the introduced *Sapindus saponaria* L., growing about town, the writer came to the conclusion that the Hawaii plant was new to science. It certainly differed materially from the trees growing at Honolulu.

The writer after careful examination (unfortunately after the publication of the name *Sapindus Thurstonii*) came to the conclusion that these differences were not specific and that the tree is identical with the American *Sapindus saponaria* L., and as such it is here published. The tree had, however, never been recorded growing in its native state on Hawaii, save by J. Remy (No. 566 bis), who collected on these islands in the early days, and is only cited in the publication by Drake del Castillo.

It is desired to state that the trees of *Sapindus saponaria* L. from Hawaii forests reach a larger size than was ever recorded of that species in other parts of the world. The diameter of some of the trees measures six feet and is also buttressed, as can be seen in the accompanying illustration. The bark of old trees comes off in huge thick scales, exposing the smooth inner layers. The Hawaiian trees are also deciduous.

Sapindus Oahuensis Hbd.

Aulu and *Kaulu* on Oahu, *Lonomea* on Kauai.

SAPINDUS OAHUENSIS Hbd. in Radlkofer, Berichte d. K. Bayer. Acad. (1878) 401,—et Fl. Haw. Isl. (1888) 85;—Radlk. in Engl. et Prantl Pflzfam. III. 5. (1896) 316.—**Celastrina?** Wawra in Flora (1873) 141.

A glabrous tree, with whitish bark covered with lenticels, the wood pale; leaves ovate, 10 to 20 cm long, 5 to 12 cm wide, on petioles of 2.5 to 7 cm, acuminate, rounded or truncate at the base, but slightly decurrent, quite entire, thick chartaceous, pale glabrous;

PLATE 107.

ALECTRYON MACROCOCCUS Radlk.
Mahoe.
Showing fruiting branch, with young and mature fruits; less than one-half natural size.

panicles tomentose with a fulvous pubescence, either several in the axils of the uppermost leaves and then 5 to 10 cm long, or single, terminal and 10 to 12 cm long, with the lowest bracts foliaceous, the branches alternate and patent, the pedicels 2 mm, minutely bracteolate about the middle; sepals unequal, orbicular, 3 mm; tomentose, slightly connate at the base; petals 5, little longer, equal, pubescent and ciliate; stamens 8, inserted on the thick margin of a pentagonal glabrous disc 2 mm; ovary glabrous, 3 to 2 lobed; stigma subsessile, lobes broad, rounded; cocci either 2, connate, or oftener a single one with the rudiments of 1 or 2 abortive ones at the base; the single coccus obovoid, 30 to 20 mm; pericarp leathery, shining; endocarp pergameneous, pale, villous in the immature state; seed obovoid, 20 to 12 mm; testa black, osseous, rugose, with a broad truncate, rather carunculate base; embryo curved, cotyledons accumbent to the short tapering radicle. Hillebrand's var. β differs from the species in its leaves, which are narrowing at the base, and are shorter petioled; the flowering panicle is also denser and not open as in the species.

This tree, which reaches a height of 20 to 30 feet, is endemic to the Hawaiian Islands, and is found on Oahu and Kauai. It develops a rather short trunk of about eight inches in diameter, and is vested in a whitish bark which is covered with lenticels. While all other known species of Sapindus have pinnate leaves, the *Aulu* or *Lonomea* is a remarkable exception, in having single, oblong, entire leaves, which never show any indication of division.

The small, yellow flowers are arranged in long, terminal panicles, which are covered with a rusty-brown down.

It is distinctly a tree of the lower forest zone, and inhabits the leeward sides of the Islands of Oahu and Kauai. On the former island it is found in the valleys of Makaha and Makaleha of the Kaala range, while a variety of it grows in the valley of Niu. On the latter island it is scattered on the lower levels at an elevation of 1000 feet back of Makaweli and Waimea, together with the *Aleurites moluccana (Kukui), Ochrosia sandwicensis*, Straussia, etc.

The wood of the *Aulu* is whitish and of no value. On Kauai the seeds were used as a cathartic by the natives. A dose consisted of 7 to 8 seeds.

The variety occurs in Nui Valley, on Oahu, but all the trees found in Nui by the writer were attacked very badly by a moth (Rhyiocoppha sp.?), which gave the trees an ungainly appearance; in fact, most of them were devoid of leaves.

ALECTRYON Gartn.

(*Mahoe* Hillebr.)

Flowers regular, calyx short, cup-shaped, 4 to 5 toothed, valvate or somewhat imbricate. Petals 4 to 5, with 2 scales, or wanting. Discus complete. Stamens 8 to 10. Ovary 2 to 3 celled, and usually of 2 to 3 cocci, style with a short 2 to 3 lobed stigma, rarely undivided; cell one ovuled. Fruit of 2 or 3 or, through abortion, of one coccus. Cocci large globose or ovate, often of the size of a pea, occasionally keeled, coriaceous or cortico-crustaceous, opening in an irregular fissure. Seeds nearly globose or compressed, with shining brown, smooth testa, arilate. Trees with abruptly pinnate leaves consisting of 1 to 5 pairs of leaflets, entire, or serrate, papillose on the underside in a few species. Flowers small, in thyrses or less branched panicles.

The genus Alectryon consists of 16 species, which are all arborescent and are distributed over the Malayan, Papuan and Pacific islands, represented by the species of Nephelium in the two latter groups.

The type of the genus is the Titaki of New Zealand, *A. excelsus*, which, like our Hawaiian species, the *Mahoe* tree, has edible fruits.

PLATE 108.

ALECTRYON MACROCOCCUS Radlk.
Mahoe tree.
Growing on the lava fields of Auahi land of Kahikinui, southern slopes of Mt. Haleakala, Maui; elevation 2600 feet.

Sapindaceae.

Alectryon macrococcus Radlk.

Mahoe.

(Plates 107 and 108.)

ALECTRYON MACROCOCCUS Radlk. in Sitzber. k. Bayer. Acad. XX (1890) 255, et in Engl. et Prantl Pflzfam. III. 5. (1895) 333, et in Bull. Hawaii Bd. Agric. and Forest. I. (1911) 1;—Rock Rep. Hawaii Board Agric. and For. (1910) 81. pl. 19. et Bull. Bd. Agric. and For. I (1911) 2. pl. 1. in part.—**Mahoe** gen. nov.? Hbd. Fl. Haw. Isl. (1888) 86.—**Dodonaea** sp. Del Castill. Ill. Fl. Ins. Mar. Pac. VI. (1890) 144 in obs. ad. Dod. visc.—Vulgo **Mahoe** in Molokai et Maui (quo nomine in Nuov-Zealandia Melicytus ramiflorus Forst. salutatur t. Kirk. in Forest Fl. N.-Zeal. 1889. 3.).

Medium sized tree; branches terete, glabrous, young branches striate, with new leaves covered with an appressed yellowish silky tomentum; leaves with 2 to 5 pair of leaflets; the latter large, opposite, elliptical or subovate, obtuse at both ends, or with an acuminate apex, petioled, entire undulate, coriaceous to chartaceous, 10 to 18 cm long, 4 to 10 cm wide, the lateral nerves oblique; shining above, densely tomentose underneath with a yellowish brown tomentum; panicles axillary; female flowers small, on pedicels of 2 mm, calyx 5-lobed, the lobes 2 mm, subacute, persistent with the young fruits; petals none, rudimentary; stamens 6-8, in sinuses within the pubescent discus-margin, filaments very short, hirsute; anthers red, 1 mm long, subdidymous at the base; ovary compressed, densely hirsute, 1 to 2 celled; style short, almost arched, with a bifid stigma; male flowers unknown; fruits of 1 to 2 cocci; young fruits covered densely with yellowish-golden setulose hair, crowned by the remnants of the style, mature fruits glabrous, dark brown corticose-coriaceous, globose 3 to 6 cm in diameter; or of one coccus with 1 to 2 abortive ones, largest for the genus; arillus scarlet, seeds with a crustaceous testa, brown, shining, (In the Herbarium of the College of Hawaii No. 8642).

The *Mahoe*, which is the single representative of the genus Alectryon in the Hawaiian Islands, is a medium-sized tree 20 to 25 feet tall, with a trunk of perhaps 6 to 8 inches in diameter. The bark is brown, somewhat rough; the wood is hard, dark yellowish-brown, and very tough.

It is an ungainly tree. The branchlets and inflorescence, as well as young fruits, are covered with a dense coat of silky-brown hair; the leaves are large, having from 2 to 4 leaflets, which are glabrous above and tomentose underneath.

The fruits of the *Mahoe*, which are of very large size, have the color of a potato and are perfectly smooth. They hang in clusters from the branches and become ruptured when mature, the fissure being irregular, exposing a bright scarlet aril and the glossy surface of the chestnut-brown orbicular seed, giving a not altogether unpleasing contrast. Flowering and fruiting trees were observed by the writer during the month of November, who would judge, however, that the flowering period would fall during the late summer months, as most of the trees bore young fruits and old ones from the previous year.

The *Mahoe* inhabits the dry regions on the leeward side of the islands. It is very scarce on Oahu, where it grows in Makaha valley of the Kaala range, and practically extinct on Molokai; on Kauai it was found by Mr. Francis Gay back of Makaweli, while the writer discovered a new locality from which it had not been reported previously. About seven miles from Ulupalakua, on the Island of Maui, is a small area of forest on the lava fields of Auahi. Unpromising as it looks from the road, this forest is botanically, nevertheless, one of the richest in the Territory. It is there that the *Mahoe* is not uncommon, and still

thrives in company with many other rare trees peculiar to that small area, such as Pelea, Xanthoxylum, Bobea, Pittosporum, Pterotropia, Tetraplasandra, etc. Owing to its scarcity, it is unknown to most of the old natives, who have heard of it only in rare instances from their ancestors.

The wood, which is very hard and tough, has not been made use of by the natives, as far as can be ascertained. The bright scarlet fruit flesh is eaten by the natives, as well as the kernel of the seed, and are not altogether unpleasant to the taste.

The *Mahoe* is endemic to the Hawaiian Islands, and is remarkable for its fruits, which are the largest in the genus.

The name *Mahoe*, meaning "twins," undoubtedly refers to the double fruits, which are not uncommon in our Alectryon.

DODONAEA.

Flowers dioecious, regular (often appearing as if hermaphrodite). Sepals 3 to 7 imbricate or valvate; petals none. Disc developed or in the fem. flowers forming a short carpophore. Stamens 8 or less, rarely more, with short filaments and elongate anthers. Ovary usually orbicular or obcordate, mostly 3- also 2- or 4, rarely 5-6 ridged with as many cells as ridges and with 2 ovules in each cell, the upper ascending and apotropous, the lower pendulous and epitropous, styles short, with 3 to 6 short stigmating lobes. Capsule papery or coriaceous, 3-2-6 celled, winged, rarely without wings. Seeds single or 2 in each cell, globose or lentiform. Embryo spirally twisted, containing aleuron as well as saponine.—Trees or shrubs often only bushes with a viscous surface; leaves simple, or pinnate (not in the Hawaiian species), often covered with resinal glands. Flowers pediceled, axillary or terminal, single, or in racemes or panicles.

The genus Dodonaea consists of 46 species, 44 of which are endemic in Australia, including the cosmopolitan *D. viscosa* L., which can be found in all tropical countries.

In Hawaii three species occur; the above-mentioned *D. viscosa* L., besides *D. eriocarpa* Smith, and *D. stenoptera* Hbd., the latter a shrub 2 to 4 feet high and peculiar to Molokai. Outside of the Australian and Hawaiian species, there is only one other species, *D. madagascariensis* Rdlk., which is peculiar to Madagascar. They are trees or shrubs, or also bushes.

The leaves in the Hawaiian Dodonaea or *Aalii*, as they are called by the natives, are simple, usually covered with glands which secrete a resin.

KEY TO THE SPECIES.

Capsule broadly winged, with wings projecting above:
- Capsule glabrous, flat, 2-winged..... **D. viscosa**
- Capsule pubescent, 3-4 winged..... **D. eriocarpa**

Dodonaea viscosa L.

Aalii or *Aalii kumakua.*

DODONAEA VISCOSA L., Mant. II. (1771) 238;—Forst. Prodr. (1786) no. 164;—DC. Prodr. I. (1824) 616;—Hook. et Arn. Bot. Beech. (1832) 61;—Endl. Fl. Suds. (1836) no. 1539;—Guill. Zeph. Tait. (1836-1837) no. 335;—A. Gray Bot. U. S. E. E. (1854) 260;—Pancher in Cuz. (1860) l. c.;—Seem. Fl. Vit. (1866) 49;—Mann. Proc. Am. Acad. VII. (1867) 175;—Nadeaud Enum. Tahit. Pl. (1873)

447;—Sinclair Indig. Fl. Haw. Isl. (1885) pl. 39;—Hbd. Fl. Haw. Isl. (1888) 87;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 144, et Fl. Polyn. Franc. (1893) 36;—Radlk. in Engl. et Prantl Pflzfam. III. 5. (1895) 357;—Heller Pl. Haw. Isl. (1897) 849.

Branches angular, stiff, glabrous, glutinous at the ends; leaves lanceolate, oblanceolate or obovate, acuminate, or obtuse, entire, chartaceous panicles terminal and axillary 2.5 to 5 cm long; male flowers: sepals 4, glabrous, 2 mm; stamens 7 to 9; ovary rudimentary; female flowers: sepals 4, stamens wanting; ovary shortly stipitate, viscid, glabrous, 2 to 3 celled, each cell with 2 ovules; style several times as long as the ovary with two linear lobes glued together; capsule bright yellow, red or brown, membraneous, flat, orbicular, faintly ridged along the middle, 2 to 3 winged the latter 4 to 6 mm broad; seeds 4 mm, ovate, flattened.

The *Aalii* or *Aalii Kumakua* is a small tree, reaching a height of 15 to 25 feet or more; the branches are angular, stiff, and glutinous at the ends. It develops a rather short trunk of only a few feet in height with a diameter of 5 to 10 inches. The bark is thick, longitudinally and very closely wrinkled or corrugated, and of a reddish-brown color. Plants may be found only a foot high and bearing profusely, while sometimes trees can be observed up to 30 feet in height. The male and female flowers are borne on different trees, but female trees are met with much oftener than male trees. The *Aalii* varies tremendously in habit and stature. The two-winged, papery capsules are of a bright red, or pale yellow, and very conspicuous on that account. It has been said that owing to the viscousness of the very light capsules, they easily adhere to the plumage of birds, to which agents the plant owes its world-wide distribution; the capsules of the Hawaiian Dodonaea are only viscous when young, and are perfectly glabrous and papery when mature.

The wood of the *Aalii* is of a golden-brown color, with black heartwood, and is extremely hard. Its density and heaviness would make it a very desirable wood for cabinet work and many other purposes. In New Zealand it has been employed as a substitute for brass for machine bearings, with good results.

The *Aalii* is common on all the islands of the Hawaiian archipelago, and is gregarious at elevations of 1000 to 4000 feet. On Oahu it can be found on the main range, as well as on the Waianae mountains, but is especially common in Palolo valley at an elevation of 1000 feet. As already mentioned, it is a cosmopolitan, and occurs in all tropical countries from Australia to New Zealand, Chatham Islands, Tahiti, Viti, and Samoan Islands, to Africa, America, and Asia. In Hawaii it has a variety named by Hillebrand *β.* var. spathulata. It is a stunted shrub and occurs on the higher elevations, especially on Hawaii. It forms almost 50 per cent of the vegetation at the summit slope of Mt. Hualalai (8270 feet).

Undoubtedly the wood was employed by the natives for various purposes, but no information can be obtained from this generation. The leaves were used as medicine.

It is known to the Samoans as *Togovao*, who employ its leaves for baths as a remedy for rheumatism and other inflammations. In the Viti Islands it is

PLATE 109.

DODONAEA ERIOCARPA Smith.
Aalii Kumakani.
Typical specimen from the upper slopes of Mt. Haleakala. Male flowering branch.
Mature capsules at the left.

the *Wasc*, and in Tahiti, *Apiri*. It is the *Ake* of Rarotonga and New Zealand; in the latter place often called *Akeake*.

Dodonaea eriocarpa Smith.

Aalii kumakani.

(Plate 109.)

DODONAEA ERIOCARPA Smith in Rees. Cycl. XII. No. 6;—DC. Prodr. I. (1824) 617;—Endl. Fl. Suds. (1836) No. 1540;—Gray Bot. U. S. E. E. (1854) 260;—Mann Proc. Am. Acad. l. c. et Flora Haw. Isl. l. c. p. 176;—Hbd Fl. Haw. Isl. (1888) 88;—Del Cast. l. c.;—Heller. Pl. Haw. Isl. (1897) 839.

Flowers polygamous, with male, female and hermaphrodite flowers on the same plant; leaves narrow, lanceolate or oblanceolate, acute, puberulous when young; panicle terminal, pubescent; sepals 5, ovate, pubescent, stamens 10, round a ciliate torus in the male flowers; ovary pubescent, shortly stipitate; style short, stigmas indicated by 4 dots, or 3 to 6 mm long in the female flowers; capsule turgid; 8 to 16 mm high, 3 to 4 winged, pubescent along the margins of the wings; seed ovoid.

The *Aalii kumakani* is a small shrub, or tall, much-branched shrub or medium-sized tree of 20 feet or so in height. It differs very little from the *Aalii kumakua*, and that mainly in the pubescent capsules, which are three or four-winged, instead of having two wings. It is a shrub on the leeward side of Kauai, above Waimea on the open, barren slopes at an elevation of 2000 feet, and is a small tree on the upper slopes of Mt. Haleakala at elevations of 6000 to 8000 feet, where it grows in gulches and along dry stream beds in company with a species of Suttonia, with the Silversword, *Argyroxiphium sandwicense* var. *macrocephalum*, *A. virescens*, the green sword plant, and numerous other Compositae, as Raillardia, and Artemisia. It is a handsome tree with dark-green, viscous, shining leaves, forming a beautiful, symmetrical, round crown. It also occurs on Hawaii in the dry regions of Kau, and on the central plateau on the slopes of Mauna Loa.

On Molokai above Kamalo grows another species (*Dodonaea stenoptera* Hbd.) peculiar to the above locality. It is, however, never a tree and therefore here omitted.

RHAMNACEAE.

The family Rhamnaceae occurs in all regions whose climate permits lignaceous growth. The genus Rhamnus is the widest distributed; its center of development is Europe and extra tropical Asia. Here in the Hawaiian Islands the family, with its 45 genera, has only two representatives, the genera Alphitonia and Colubrina, with only one endemic species belonging to the latter genus.

KEY TO THE GENERA.

Fruit three-grooved at the apex, the calycine cup not extending beyond the base. **Colubrina**

Fruit not grooved, globose, the calycine cup extending to the middle..... **Alphitonia**

COLUBRINA Brongn.

Sepals, petals and stamens 5. Calycine cup hemispherical, not extending beyond the ovary. Disc broad annular, more or less flat. Style trifid. Ovary immersed in the cup of the calyx, three-celled. Fruit dry or with somewhat fleshy exocarp, enclosed at the

PLATE 110.

COLUBRINA OPPOSITIFOLIA Brongn.
Kauila.
Flowering and fruiting branch pinned against trunk of tree. Growing on the ancient lava flows of Puuwaawaa, Mt. Hualalai, Hawaii; elevation 2000 feet.

base by the calycine cup. Endocarp divided into three cocci, opening elastically. Seeds with thick smooth testa, occasionally with small arillus. Albumen present.—Unarmed shrubs or trees with glabrous or more or less tomentose leaves which are usually alternate, or opposite in one of the Hawaiian species, cordate to elongate, three to penninerved. Flowers usually in axillary, short peduncled cymules or single.

The genus Colubrina consists of about 15 species distributed mainly in tropical America and the warmer regions of North America. One is endemic in the Hawaiian Islands, and one is widely distributed in the tropics of the old world.

Colubrina oppositifolia Brongn.

Kauila.

(Plates 110 and 111.)

COLUBRINA OPPOSITIFOLIA Brongn. (In Herb. Gray) H. Mann Proc. Am. Acad. VII (1867) 161, et Fl. Haw. Isl. Essex Inst. V. (1867) 173;—Wawra in Flora (1873) 170;—Hbd. Fl. Haw. Isl. (1888) 80;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 140;—Weberb. in Engl. et Prantl III. 5. (1896) 415.

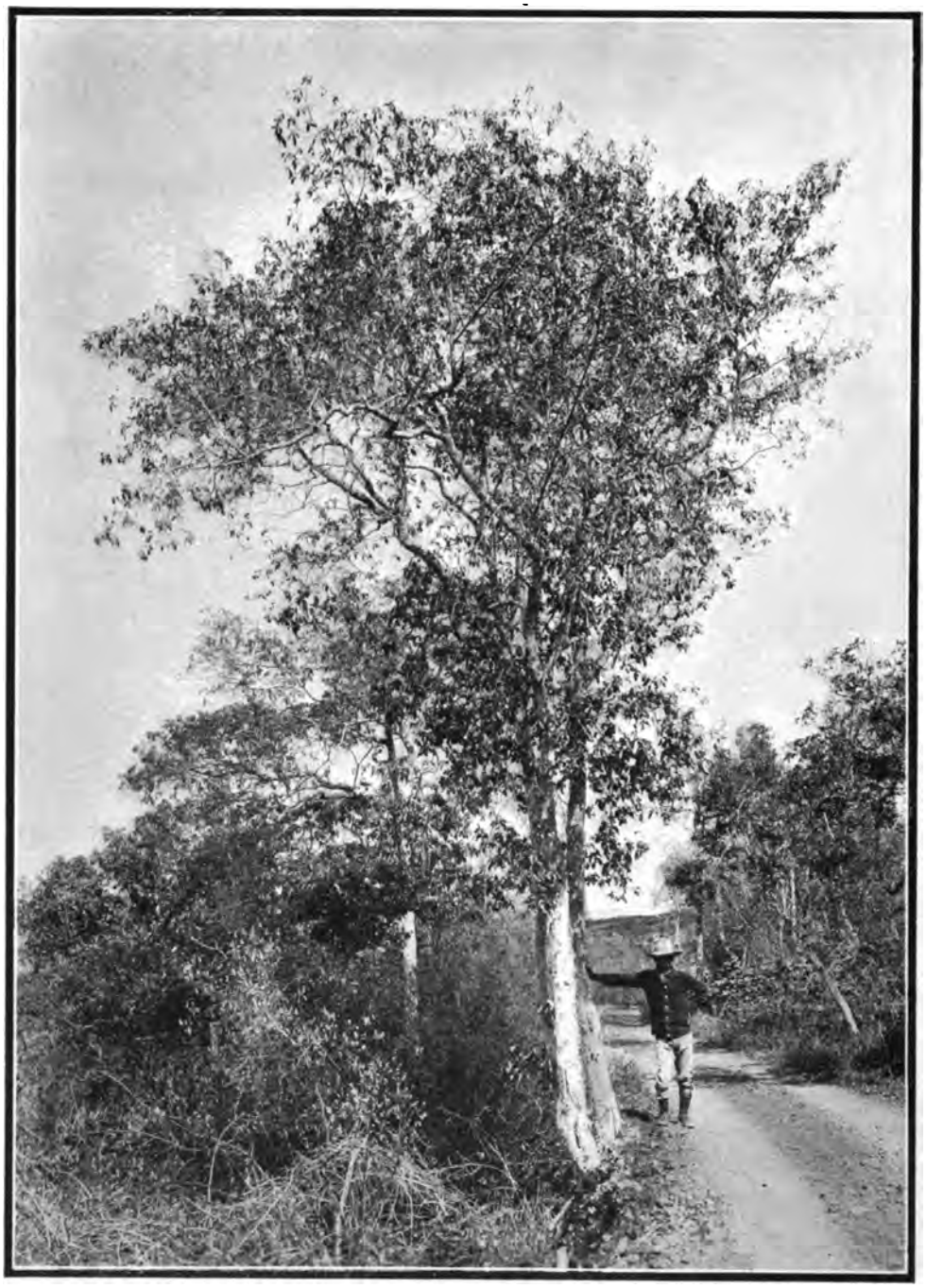
A medium sized tree (and not a shrub) 10 to 12 m high with a trunk of often 3 dm and more in diameter; leaves opposite, ovate or oblong 7 to 15 cm long, 3 to 6 cm wide, on petioles of 3 to 5 cm, thin chartaceous, bright green on both sides, entire; penninerved, with a gland at the base of each nerve on the lower face; flowers 5 to 10 in an umbellate cyme on a common peduncle of about 1 cm or more, the pedicels 6 to 12 mm, with minute ovate bractlets at the base; calyx cup-shaped 3 mm, parted to the middle; petals not exceeding the calyx and enclosing the short stamens; anthers ovoid; style very short, three-lobed; fruit subglobose, 3-grooved at the apex, about 10 to 12 mm in diameter, the calycine cup not exceeding the lower third; exocarp woody, not separating from the endocarp, cocci 3; seeds reddish-brown, angular convex; cotyledons rather thick and fleshy, nearly as long and broad as the thin albumen; radicle short.

This is the *Kauila* of South and North Kona, Hawaii. It is in the latter locality that the tree is quite common, while in South Kona on the lava fields of Kapua the tree is quite scarce. Between Puuwaawaa and Huehue, on the slopes of Hualalai in North Kona, the tree reaches its best development. Trees 35 feet or more in height are not uncommon, with a trunk of often a foot or more in diameter. The bark is of a light brown color and scales off in large round flakes. It is associated with *Kokia Rockii* (*Kokio*), *Mezoneurum Kauaiense* (*Uhiuhi*), *Myoporum sandwicense* (*Naio*), and many others.

The wood of this *Kauila* is harder than the *Kauila* (*Alphitonia excelsa*) of Kauai, Hawaii and Maui; it is exceedingly hard, close grained and of a dark red color, without black streaks such as occur in *Alphitonia excelsa.*

The wood of this tree was used by the natives for spears on account of its hardness and durability. It is peculiar to the Hawaiian Islands, as it is not known from other parts of the world. A second species occurs in the islands, which is a small rambling shrub (*Colubrina asiatica*) and is at once distinguishable by its alternate leaves. Its native name is *Anapanapa* or *Kukuku.* It is extremely poisonous and was often used for stupefying fish. It grows only near the sea. It is a cosmopolitan and is widely distributed over the tropics of the old world.

PLATE 111.



COLUBRINA OPPOSITIFOLIA Brongn.
Kauila tree.
Growing along the North Kona road between Huehue and Puuwaawaa, Hawaii; elevation 2000 feet.

ALPHITONIA Reissek.

Flowers polygamous; sepals, petals and stamens 5; disc flat annular. Style 2 to 3 fid. Ovary 2 to 3 celled. Fruit below and at the middle invested by the cup-shaped calyx-tube and coalesced with the same; exocarp strongly developed, brittle, but not so much in the Hawaiian plants. Endocarp divided into 2 or 3 cocci with woody or crustaceous partitions opening inward by a longitudinal slit. Seeds with aril, often enclosing the seed completely. After the falling away of the pericarp, the seeds remain on the receptacle; in the Hawaiian plant the pericarp never falls away but it is often not even cracked owing to the calyx tube investing the drupe up to the middle and even beyond. (A fact which Hillebrand pointed out and correctly). A tree with leaves, petioles, and inflorescence tomentose. Leaves alternate, coriaceous, penninerved, broadly ovate to lanceolate, glabrous above, with a whitish to reddish brown tomentum underneath. Flowers in terminal or lateral loose cymes.

The genus Alphitonia consists of a single extremely variable species, which is distributed from Australia to Polynesia and Borneo.

In Hawaii the tree is known as *Kauila.* Hillebrand in his Flora of the Hawaiian Islands described it as a new species, "*Alphitonia ponderosa.*" It is true it is a quite different plant from those in the writer's possession from Australia. In the Australian plants the fruits are barely 6 mm. in diameter and are cracked to the base, while the Hawaiian plants have the fruits 14 mm. in diameter; they also are hardly even split; only on rare occasions the writer found cracked fruits on a tree.

He, however, refers this tree to *A. excelsa,* as he has not seen the intermediates of the Australian and South Polynesian plants.

Alphitonia excelsa Reiss.

Kauila, Kauwila or *O'a* on Maui.

(Plate 112.)

ALPHITONIA EXCELSA Reiss. ex Endl. Gen. (1840) 1098;—Seem. Fl. Vit. (1866) 43;—H. Mann, Proc. Am. Acad. VII. (1867) 161, et Fl. Haw. Isl. (1867) 174;—Wawra in Flora (1873) 170;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VI. (1890) 140 (ex parte) et Fl. Polyn. Franc. (1893) 33;—Weberb. in Engl. et Prantl III. 5. (1896) 419;—Brigham Ka Hana Kapa (1911) 174, fig. 103.—**Colubrina excelsa** Fenzl. in Hugl. Enum. (1837) 20.—**Rhamnus zizyphoides** Soland. in Forst. Prodr. (1786) no. 510 absqu. char.);—Sprgl. Syst. I. (1825) 768;—DC. Prodr. II. (1825) 27;—Pancher, in Tahiti, (1860) 230.—**Pomaderris zizyphoides** Hook. et Arn. Bot. Beech. (1832) 61;—Endl. Fl. Suds. (1836) no. 1570;—Guill. Zephyr. Tait. (1836-1837) no. 330;—**A. zizphoides** Gray Bot. U. S. E. E. (1854) 278 t. 22;—Nadeaud Ennm. (1873) no. 451.—**A. franguloides** Gray l. c. 280 t. 22.—**Zizphoides argentea** Soland. Prim. Fl. Pac. 378, et in Parkins Draw. Tahit. Pl. (ined. cf. Seem, l. c.)—**A. ponderosa** Hbd. Fl Haw. Isl. (1888) 81;—Del Cast. l. c. 140;—Heller Pl. Haw. Isl. (1897) 849.

Leaves ovate, ovate-oblong, lanceolate, generally acute, entire, dark green above, with a rust colored tomentum underneath; flowers in the axils of the youngest leaves, in short tomentose dichotomous cymes; calyx 6 mm, lobes expanded; petals half as long as calyx lobes, spathulate, enclosing the short stamens; anthers ovoid, style very short 2 to 3 fid; fruit globose 14 to 18 mm in diam. ringed at the middle by the border of the adnate calyx in the Hawaiian plants, almost indeshiscent; arillus a dark red separable film enveloping the whole seed. Cotyledons broad, oblong.

The *Kauila* is a stately tree and attains its greatest height, 80 feet, on the Island of Kauai, especially in the forest of Kopiwai. It has a straight trunk of 1½ to 2 feet in diameter with a whitish deeply corrugated bark in the dry districts.

PLATE 112.

ALPHITONIA EXCELSA Reiss.
Kauila or **O'a.**
Fruiting branch pinned against trunk of tree. Growing on the *aa* (rough) lava fields of Auahi, Kahikinui, southern slopes of Haleakala, Maui; elevation 2600 feet.

It inhabits the dry regions on the leeward slopes of all the islands, but is nowhere common except on Kauai and at Auahi, district of Kahikinui, on Maui, where it is gregarious on the *aa* lava fields. It is in this latter place that the writer met with trees whose trunks were more than 2 feet in diameter.

On the islands of Molokai and Lanai it is very scarce indeed and found only on exposed ridges as straggling shrubs. On Maui, on the southern slopes of Haleakala at an elevation of 2600 to 3000 feet, it is a beautiful tree with a straight trunk. The name *Kauila* is unknown on the Island of Maui, for this species; it is always referred to as the *O'a*, while the name *Kauila* is applied to *Colubrina oppositifolia*, from Hawaii.

On Oahu it can be found on Mt. Kaala on dry exposed ridges, while on Hawaii it is not uncommon in Kau and North and South Kona; but never in company with *Colubrina oppositifolia*, which inhabits the more ancient lava flows.

The wood, which is of a beautiful reddish color with black streaks, is very durable, close and hard grained and exceedingly heavy. It was employed by the natives for their spears as well as for tapa beaters or mallets and other tools.

The *Kauila* or *O'a* is indigenous to Hawaii, but not endemic, as it is also found in most of the Polynesian islands of the South Seas, Australia and Borneo.

It is known as *Doi* in Fiji and as *Toi* in Tahiti, while the Samoan name of the species is also *Toi*.

The Samoans use the leaves for medicinal purposes. They are also often ground between stones, and are used in washing out the lime from the hair.

In Australia the tree is known as Mountain Ash, Red Ash, Leather Jacket, and Cooper's Wood. The aboriginals of Australia have also several names for it; among them are *Mee-a-mee*, *Culgeraculgera*, and *Murrrung* in the Ilaawara district of New South Wales.

ELAEOCARPACEAE.

The family Elaeocarpaceae is rather small, consisting of only seven genera, with somewhat more than 120 species. It is distributed over the tropics of the old and new world, and reaches its most northern point in Japan, where two species, belonging to the genus Elaeocarpus, are to be found.

The genus Elaeocarpus, represented in these islands by one species, is the largest in the family, with more than 60 species. The distribution of the family ranges from the West Indies to the latitude of the Island of Chiloe, and from Japan to New Zealand.

ELAEOCARPUS L.

Flowers usually hermaphrodite. Sepals 5. Petals 5, usually bifid at the apex, at the base flat, free, valvate in the bud. Androgynophor mostly 5 lobed. Stamens numerous, anthers linear, often ciliate, with two adnate cells opening at the apex into transverse valves. Ovary 2 to 5 celled with several ovules in each cell. Stone fruit with hard, 3 to 5 celled, 1 to 5 seeded stone, usually very hard and rugose. Trees with usually alternate leaves, which are either entire or serrate. Flowers in simple axillary, often many flowered racemes.

PLATE 113.

ELAEOCARPUS BIFIDUS Hook. et Arn.
Kalia.
Flowering and fruiting branch about one-half natural size.

Elaeocarpaceae

A genus of more than 60 species of trees. It is distributed from India through the Malayan Archipelago to Australia, New Caledonia, and New Zealand; also over the Philippines to Japan, with a single species in Hawaii.

Elaeocarpus bifidus Hook. et Arn.

Kalia.

(Plate 113.)

ELAEOCARPUS BIFIDUS Hook et Arn. Bot. Beech. (1832) 110, t. 24;—Endl. Fl. Suds. (1836) no. 14;—A. Gray, Bot. U. S. E. E. (1854) 205;—H. Mann, Proc. Am. Acad. VII (1867) 158, et Fl. Haw. Isl. (1867) 143;—Wawra in Flora (1873) 171;—Hbd. Fl. Haw. Isl. (1888) 53;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 126;—Heller Pl. Haw. Isl. (1897) 850.—**Beythea bifida** End. Gen. Pl. Walp. Rep. I. (1840) 365 et V. 121.

Leaves ovate to ovate-oblong 10 to 18 cm long, 5 to 9 cm wide, on petioles of 5 cm, acuminate, crenate or bluntly serrate, often nearly entire, chartaceous; stipules lanceolate, 2 mm long, caducous; racemes 25 to 50 mm long with 5 to 8 flowers on pedicels of 12 mm; sepals narrow lanceolate, petals as long as sepals, about 8 mm, greenish, linear oblong, shortly bifid or scarcely emarginate, pubescent on both faces; stamens 13 to 16, 1/3 the length of the sepals, with short filaments; anthers obtuse or emarginate, ovary ovoid, 2 to 3 celled, tapering into the simple 2 to 3 grooved style; ovules 3 to 6 in each cell, stone fruit olive-shaped, 25 to 30 mm long, the putamen thick woody; seeds generally solitary, rarely two, with a thin testa.

The *Kalia* is a perfectly glabrous tree, reaching a height of 30 to 40 feet, with a trunk of several inches to sometimes a foot in diameter. The bark is dark-gray, one-fourth of an inch thick, and roughened. Its branches are drooping and sending out many branchlets, which are gummy at their ends. The flowers of the *Kalia* are attacked by an insect, which accounts for the monstrous deformation of the flowers, which can be seen on nearly every tree. The insect is a species of Acari. The layman would certainly mistake it for the flowers, as its bright-red color is not altogether unattractive. The writer on all of his rambles found very few trees, indeed, which had normal flowers. The real flowers, however, are small and greenish and rather inconspicuous. The drupe is olive-shaped and over an inch long, with usually one seed, rarely two.

The *Kalia* is most common on Kauai, where it inhabits the leeward side at an elevation of 3500 to 4000 feet. It is distinctly a tree of the rain forest, and is never found in the dry region or on lava fields.

It loves boggy forests and gray loam. It associates with Straussia, Bobea, *Cheirodendron platyphyllum, Cryptocarya Mannii, Pelea* sp., etc. On Oahu it is not uncommon and can be found on all the ranges, windward and leeward. It is, however, not as common as on Kauai, where it forms 30 per cent of the leeward forest. On all the explorations undertaken by the writer he was unable to find a single tree on any of the other islands, making the tree peculiar to Kauai and Oahu. This may be explained on account of the large seed, which is impossible to be carried either by birds or winds, and as the tree inhabits the middle forests zones, the ocean currents can have nothing to do with its dispersal, especially as the seeds are not buoyant.

PLATE 114.

HIBISCUS ARNOTTIANUS Gray.
Koki'o Keokeo.
Native white Hibiscus from Oahu. Flowering branch, reduced one-half.

The bast of the *Kalia* was made into cordage, while its slender branches were employed for "*ahoa*" or thatching rods for house building, the larger branches being selected for rafters.

MALVACEAE.

The family Malvaceae is distributed all over the world with exception of the frigid zones. The most northern species is *Malva rotundifolia* L., which can be found in Sweden and Russia. The farther we advance towards the tropics the richer in species becomes this very useful family. The members of this family inhabit usually the lower regions, but in the South American Andes they can be found at considerable elevation. A few genera have a very restricted distribution, as, for example, Hibiscadelphus, which is peculiar to Hawaii, while the genus Hoberia is only found in New Zealand. On the other hand, we find genera as Hibiscus, Abutilon, Sida and others distributed over both hemispheres. In the Hawaiian Islands we have several genera, of which two are endemic (Kokia and Hibiscadelphus), and also Hibiscus and Thespesia, all of which have arborescent species.

KEY TO THE GENERA.

Style branches long as many as divisions in the ovary.
- Calyx persistent with fruit..... **Hibiscus**
- Calyx deciduous before maturity of fruit..... **Hibiscadelphus**

Style branches simple, club-shaped or divided into short erect clavate branches.
- Bracteoles small or narrow..... **Thespesia**
- Bracteoles large ovate, sinuate or slightly lobed..... **Kokia**

HIBISCUS L.

Involucre none or consisting of 3 to many bracts. Staminal column antheriferous below the truncate or 5 toothed apex. Ovary 5-celled, with several ascending ovules in each cell. Style-branches short, 5, somewhat thickened towards the apex. Capsule loculicidal; endocarp always smooth and glabrous, rarely detached.—Trees, shrubs, or herbs, the trees usually clothed with a stellate pubescence. Leaves lobed or entire. Flowers usually large, and of a conspicuous color, mostly single, axillary. The calyx remains with the fruit.

The genus Hibiscus is exceedingly large, consisting of not less than 180 species, which occur nearly all in the tropics with the exception of two found in Europe.

KEY TO THE SPECIES.

Flowers yellow.
- Leaves cordate, acuminate..... **H. tiliaceus**

Flowers white.
- Leaves entire, ovate, bluntly acuminate..... **H. Arnottianus**
- Leaves crenate, suborbicular, tomentose..... **H. Waimeae**

Flowers red.
- Leaves crenate, acuminate, style branches horizontal..... **H. Kokio**

PLATE 115.

HIBISCUS WAIMEAE Heller.
Kokio Keokeo.
Kauai white Hibiscus, one-half natural size.

Malvaceae.

Hibiscus tiliaceus L.

Hau.

HIBISCUS TILIACEUS Linn. Spec. plant. ed. I. (1753) 694;—Forst. Prodr. (1786) no. 261;—DC. Prodr. I. (1824) 454;— Endl. Fl. Suds. (1836) 182, no. 1504;—Seem. Fl. Vit. (1865) 18;—Mann in Proc. Am. Acad. VII. (1867) 157, et Fl. Haw. Isl. Proc. Ess. Inst. V. (1867) 140;—Wawra in Flora (1873) 173;—Mrs. Sinel. Indig. Flow. Haw. Isl. (1885) pl. 1;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 121;—Brigham Ka Hana Kapa, Mem. B. P. B. Mus. III. (1911) 132, fig. 82.—**Paritium tiliaceum** A. St.-Hil. Flora Bras, mer. I. (1827) 256;—Gray Bot. U. S. E. E. (1854) 178;—Nadeaud Enum. Tahit. Pl. (1873) no. 429;—Hbd. Fl. Haw. Isl. (1888) 49.

Leaves on long petioles, orbicular-cordate, shortly acuminate, entire, palmately 7 to 9 nerved; stipules large ovate, caducous; involucre campanulate, half the length of the calyx with 10 to 12 acute lobes; lobes of the calyx lanceolate; petals large yellow, usually with a dark center or pure yellow; capsule about 2.5 cm in diameter, opening into 5 valves; 3 naked seeds to each cell.

The *Hau* is one of the most common trees found on the lowlands and on the beaches on all the islands; it is a cosmopolitan and occurs in all tropical countries, but is especially plentiful in the South Sea Islands. It is a very useful tree and is much desired on account of its shade, and is therefore trained into *lanais* or arbors. The wood serves for outriggers of canoes, while the bark furnishes a tough and pliable bast for ropes. In Fiji the bark is chiefly used for the women's "*liku,*" a dress consisting of a number of fringes attached to a waist-band. The bark is stripped off, steeped in water to render it soft and to allow the fibers to separate. According to Dr. Hillebrand, a decoction is made of the flowers by the natives as a useful emollient in bronchial and intestinal catarrhs. The Vitian and Tahitian name is *Fau, Pago* at Guam, *Varo* or *Baro* in Madagascar, and *Au* in Rarotonga.

Hibiscus Arnottianus Gray.

Kokia keokeo.

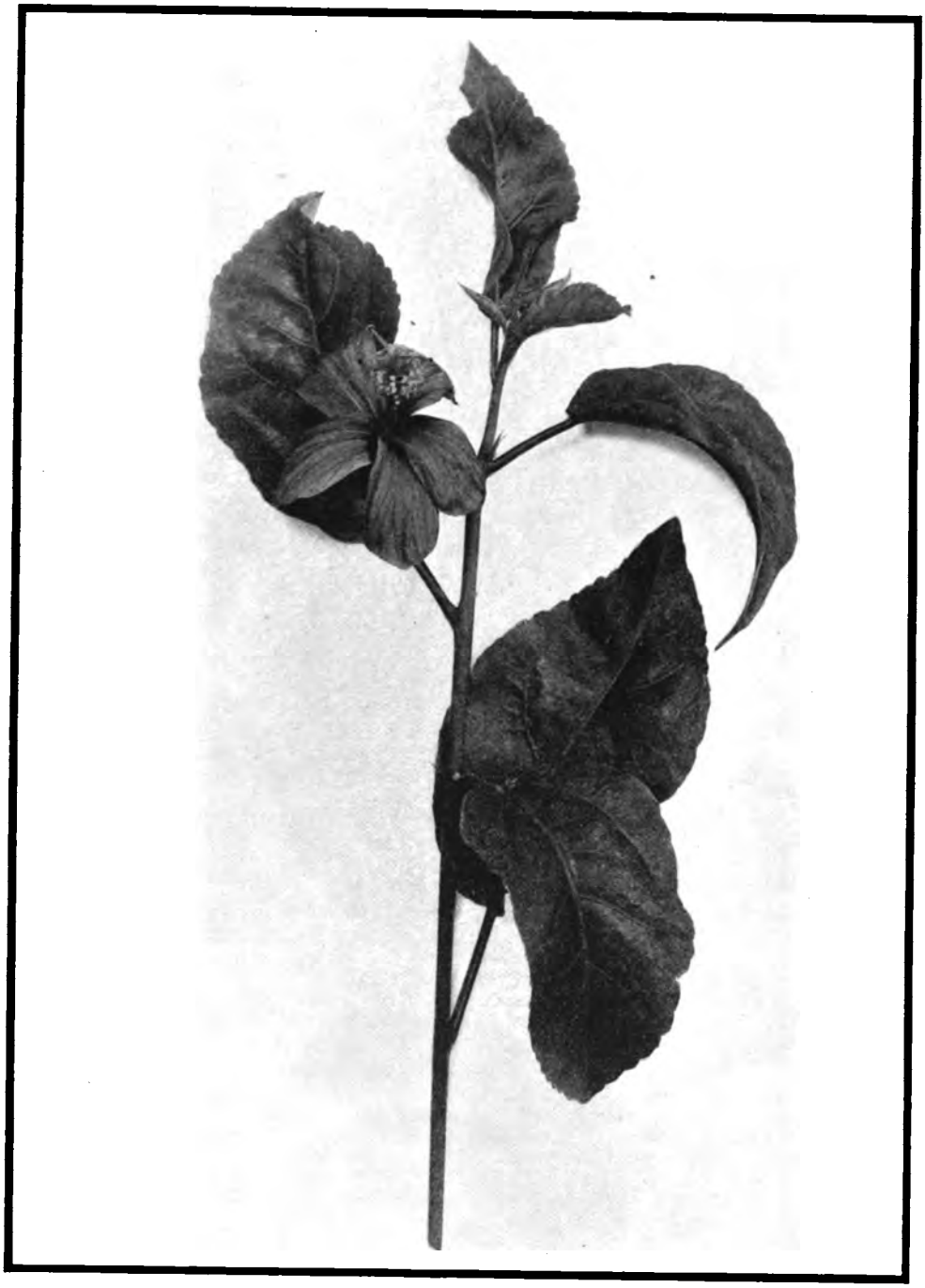
(Plate 114.)

HIBISCUS ARNOTTIANUS Gray Bot. U. S. E. E. (1854) 176;—Mann in Proc. Am. Acad. VII. (1867) 157,—et Fl. Haw. Isl. Proc. Ess. Inst. V. (1867) 139;—Wawra in Flora (1873) 173;—Hbd. Fl. Haw. Isl. (1878) 48;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 121;—Heller in Minnes Bot. Stud. Bull. IX. (1897) 851.—**H. Boryamus** H. et A. Bot. Beech. (1832) 79. (n. DC.);—Endl. Flora Suds. (1836) 182, no. 1495.—**Hibiscus Fauriei** Leveil. Fedde Repert. X. 6/9. (1911) 120.

Leaves large of variable size, ovate, bluntly acuminate, entire, 3-nerved, chartaceous, dark green; stipules subulate, caducous; flowers solitary in the axils, white with pinkish veins, or pure white even the pistil, (Molokai, Wailau), pedicels articulate near the end; involucral bracts 5 to 7, triangular to lanceolate, 4 to 6 mm long, calyx 16 to 24 mm, tubular, 5-toothed splitting laterally when with fruit; petals white, obovate-oblong, or lanceolate and free, (very variable), 7.5 to 10 cm or more long; staminal column long exserted, 10 to 15 cm long, red or white, sending off filaments of 12 to 16 mm, from its upper half or third; style branches 6 to 8 mm, erect; capsule elongate, as long as the calyx, chartaceous; seeds 5 mm, reniform.

In regard to the nomenclature of this species there seems to have been some doubt. Heller and others thought that the white native Hibiscus was without a name, as Gray in his description of *H. Arnottianus* says: flowers red * * *.

PLATE 116.



HIBISCUS KOKIO Hbd.
Kokio or Pualoalo.
Red native Hibiscus, somewhat reduced.

This also accounts for the publication of a *Hibiscus Fauriei* by Léveillé, coming from the mountains behind Honolulu, where the tree is quite common. In order to straighten matters out the writer sent specimens to the Gray Herbarium to be compared with Asa Gray's type. Dr. B. L. Robinson kindly replied as follows: "There can be no question that the white flowered species (no. 8831) from Oahu is precisely the real *H. Arnottianus* Gray.

"The red flowered species (a photograph was sent) as far as can be made out from the photograph corresponds very well with authentic material of *H. Kokio* Hbd.; the chief difference being the larger petioles." This, however, may be due to the fact that the plant was grown in cultivation; it came from the garden of Mr. Gerrit P. Wilder. This now settles the controversy in regard to one of the most beautiful native flowering trees which the Islands possess. Along streambeds in the mountains of Koolau, Oahu, it is usually a tree 30 feet tall and when in flower makes a beautiful display. It is also cultivated by residents of Honolulu. On the other islands it is not uncommon, but varies to some extent. A pure white flowered one occurs on the beach of Wailau Valley, on Molokai.

Hibiscus Waimeae Heller.

Kokia keokeo.

(Plate 115.)

HIBISCUS WAIMEAE Heller in Minnes. Bot. Stud. Bull. IX. (1897) 851, pl. 53.—**Hibiscus Arnottianus** Gray forma Mrs. Sinclair Indig. Flow. Haw. Isl. (1885) pl. 8.

Leaves suborbicular about 5 cm or more in diameter, pale green, crenate, pubescent on both sides, velvety to the touch; petioles half the length of the leaves; stipules small; flowers axillary near the ends of the branches, large white or tinged with pink, on pubescent pedicels; calyx broadly tubular, pubescent outside, woolly within, petals 10 to 15 cm long, 18 to 25 mm wide, prominently veined, pubescent on the outside; staminal column rather stout, long exserted, red, otherwise as in *H. Arnottianus* Gray.

This rather distinct plant occurs as a tree 20 to 30 feet in height on the leeward side of Kauai below the forests of Kaholuamano at the bottom of vertical cliffs, in dry situations, and in gulches on open grass lands below Halemanu, Kauai, at an elevation of 2500 feet up to 3000 feet, in company with *Dracaena aurea, Osmanthus sandwicensis* and others. It is also cultivated now in Honolulu.

Hibiscus Kokio Hbd.

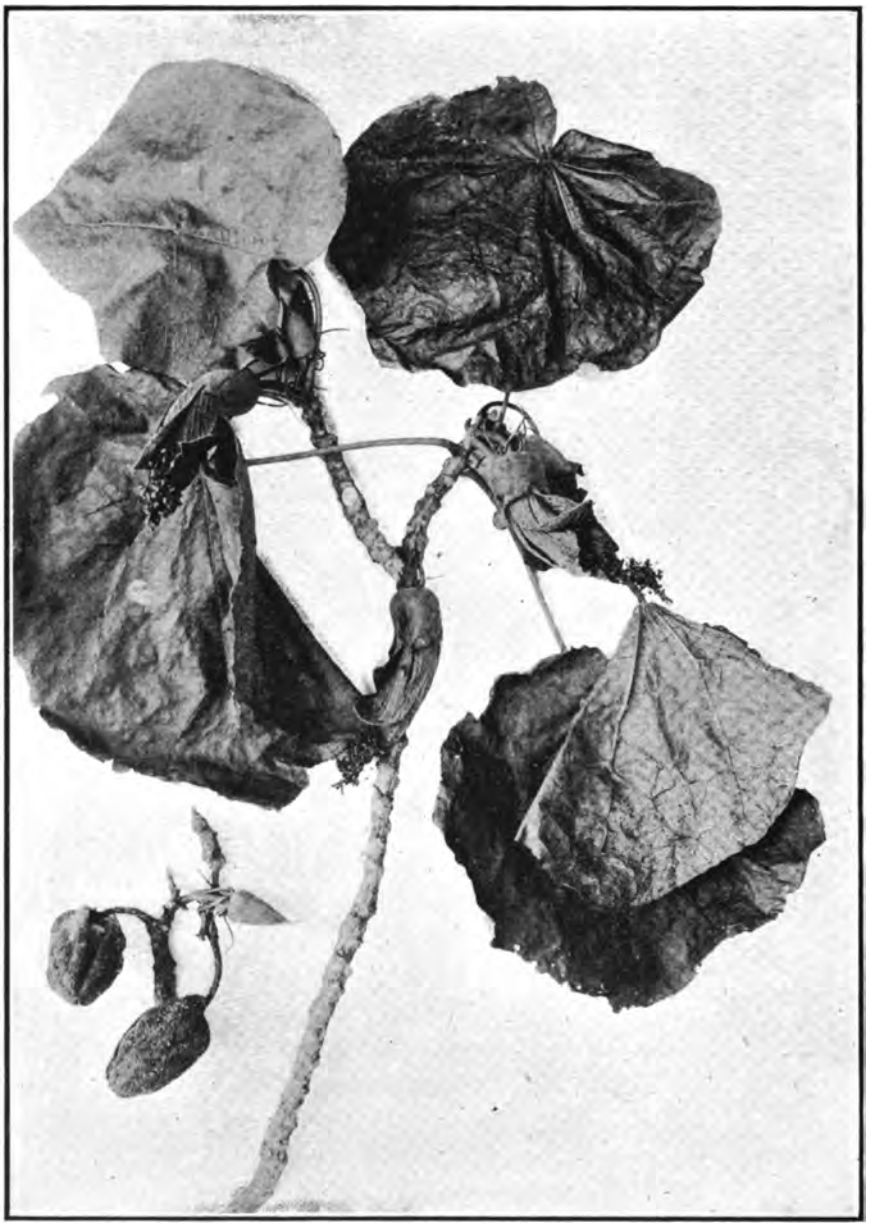
Kokia ula or *Pualoalo.*

(Plate 116.)

HIBISCUS KOKIO Hbd. mss. in Flora (1873) 174;—Hbd. Flora Haw. Isl. (1888) 48;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 121.—**H. Arnottianus** A. Gray forma Mrs. Sinclair Ind. Fl. Haw. Isl. (1885) pl. 9.

Leaves ovate or elliptical-oblong, rather acuminate, sinuately crenate, scarcely palmate-nerved, chartaceous, glabrous, on petioles of 6 to 18 mm or more; flowers axillary, solitary; pedicels 18 to 30 mm, pubescent, articulate in the upper third; involucral bracts 6 to 7, linear, 8 to 12 mm long; calyx tubular or subcampanulate, 8 to 30 mm, cleft to the middle into 5 acute lobes, glabrate; petals 5 to 6.5 cm, entire, red; staminal column

PLATE 117.



HIBISCADELPHUS GIFFARDIANUS Rock.
Hau Kuahiwi.
Showing flowering branch and mature fruits in lower left hand corner, reduced.
Showing flowering and fruiting branch; one-half natural size.

shorter, red, the short filaments crowded near the five-toothed apex; style branches 8 to 10 mm, spreading horizontally, ciliate; capsule glabrous, 18 mm; seeds 5 mm, reniform covered with a coarse brownish pubescence.

This species is somewhat rare, at least not so common as the white native Hibiscus. The writer met with two varieties on Molokai— one at Mapulehu, where it is a shrub at about 1000 feet elevation; the other at the bottom of Wailau Valley, only a few hundred feet above sea level. On Kauai only, it is apparently a tree. Mr. Lydgate informed the writer that he saw a tree about 40 feet in height back of Lihue, along the pole-line. As the writer did not see specimens, it is doubtful whether it is *H. Kokio* or Forbes' *H. Kahilii,* a tree 27 feet high, which, however, seems not to differ very much from the former, according to Forbes, only in the pubescent calyx and in other minor points, one of which, according to his figure, seems to be the bluntly acute or somewhat obtuse apices of the leaves. His specimen came from near the Wahiawa swamp, Kauai. *H. Kahilii* Forbes Occ. Pap. B. P. B. Mus. V. (1912) 4, with plate.

HIBISCADELPHUS Rock.

Bracteoles 5 to 7, very narrow linear or dentate, free. Calyx deeply and unevenly 2 to 3 cleft. Staminal column antheriferous below the 5-dentate apex. Ovary 5-celled, with 1 to 3 ovules in each cell; style branches 5, suberect with capitate flesh-colored stigmas. Capsule woody or coriaceous, 5 valved; endocarp chartaceous, detached. Seeds reniform, covered with a dirty white tomentum.—Medium sized trees with a stellate tomentum. Leaves cordate, unevenly 3 to 5 pointed or rounded and entire. Flowers single or several in the axils of the leaves at the ends of the branches; color of petals magenta, yellowish and green. Calyx deciduous before maturation of the fruit.

The genus Hibiscadelphus established by the writer consists of 3 species which are peculiar to the dry sections of Hawaii and Maui. Of two of the species only an individual tree is in existence, while of the third several can still be found on the slopes of Mt. Hualalai, in the forest of Waihau, in North Kona, Hawaii.

The genus, of which *Hibiscadelphus Giffardianus* is the type, is closely related to Hibiscus, from which it differs mainly in the deciduous calyx, and quite different flowers.

KEY TO THE SPECIES.

Flowers 5 to 6 cm long.
- Involucral bracts 2 cm, filiform, free..... **H. Giffardianus**
- Involucral bracts linear-spathulate, one nerved..... **H. Wilderianus**

Flowers 2.5 to 3 cm long.
- Involucral bracts dentiform, 1 mm..... **H. Hualalaiensis**

Hibiscadelphus Giffardianus Rock.

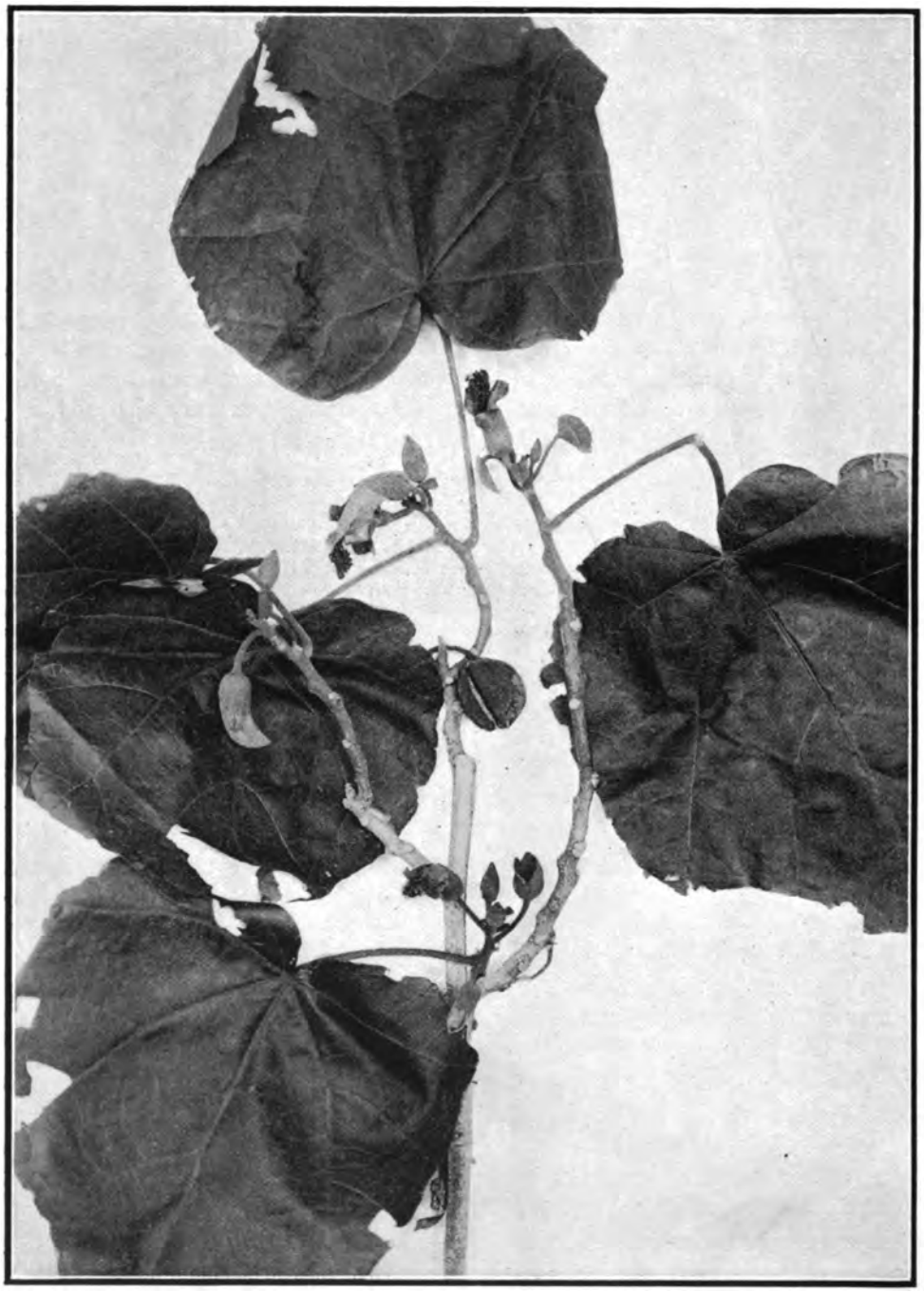
Hau kuahiwi.

(Plate 117.)

HIBISCADELPHUS GIFFARDIANUS Rock in Bull. Hawaii Bd. of Agric. and Forestry I. (1911) 10. pl. 4.

A medium sized tree; bark smooth, fibrous, whitish; branches terete, glabrous, covered with leaf scars; leaves on long petioles orbicular in outline cordate, bluntly acute at the apex, 12-15 cm each way, unevenly lobed or pointed, chartaceous, covered on both sides

PLATE 118.



HIBISCADELPHUS HUALALAIENSIS Rock.
Hau Kuahiwi.
Showing flowering and fruiting branch; less than one-half natural size.

with a stellate tomentum, palmately 7-nerved, with hispid glands in the angles of ribs and veins on both sides; stipules small triangular caducous; flowers solitary or several in the axils of the leaves on the ends of the branches; bracteoles 5 to 7 very narrow, 2 cm long, free, filiform; calyx saccate, deeply and unevenly 2 to 3 cleft, lobes acuminate, many-nerved, yellowish green outside, with stellate hairs, glabrous inside; corolla convolute, curved, only the very apex slightly opening, on account of the almost completely contorted aestivation; on pedicels of 2 to 3 cm, petals 5 to 6 cm long acute at the apex, oblong very uneven-sided, deep magenta inside, grayish-green outside with a stellate hispid tomentum on the exposed parts, especially on the prominent nerves; staminal column 1/3 longer than the petals, with numerous long filaments on nearly half its length, hispid at its base; style branches sub-erect 5 mm, hispid; stigmas flesh-colored; capsule coriaceous to woody oblong tapering toward the apex 4 to 5 cm x 2 to 2.5 cm, broadest at the base, rugose, yellowish-green, covered with stellate hairs; the calyx and bracteoles deciduous before maturation of fruit; endocarp chartaceous shining glabrous, loose; seeds large 7 to 10 mm, reniform, covered with dirty whitish-gray wool.

The *Hau Kuahiwi* is a remarkable tree. At first appearance one would think it to be the common *Hau* (*Hibiscus tiliaceus*), but at closer inspection one cannot but wonder at the most peculiar shape of the flowers, which are of a deep magenta, and the large yellowish tuberculate capsules. It is a rather low tree, with not erect but rather inclining trunk of a foot in diameter, with a many-branching round crown. The genus "Hibiscadelphus," meaning "brother of Hibiscus," was described by the author and the species named in honor of Mr. W. M. Giffard of Honolulu, in whose company the writer collected his first specimens.

It differs from the genus Hibiscus in its very peculiar flowers and mainly in the calyx, which is not persistent with the capsules, but drops together with the bracts as soon as the capsules are formed.

Unfortunately the tree, of which a specimen is figured in this book, is the only one in existence. It is unique among all Hawaiian plants, and the author is sorry to relate that nothing has been done to protect it. Like many other Hawaiian trees, it will succumb to the ravages of cattle, which inhabit a great many of our native forests.

This single tree is found on a small Kipuka of 56 acres called Puaulu, on the land of Keauhou, near Kilauea Volcano, at an elevation of 4200 feet, on the Island of Hawaii. It is surrounded by a great many rare trees, which will share its fate sooner or later. Among them are beautiful trees of *Sapindus saponaria*, Pèlea, Xanthoxylum, Urera, Straussia, Ochrosia, etc.

The genus consists of three species—the above described one on Hawaii, one on Maui with only a single tree left, and the third on Hualalai, Hawaii. The wood is white, not so soft as in the *Hau*, while the bark is whitish and fibrous.

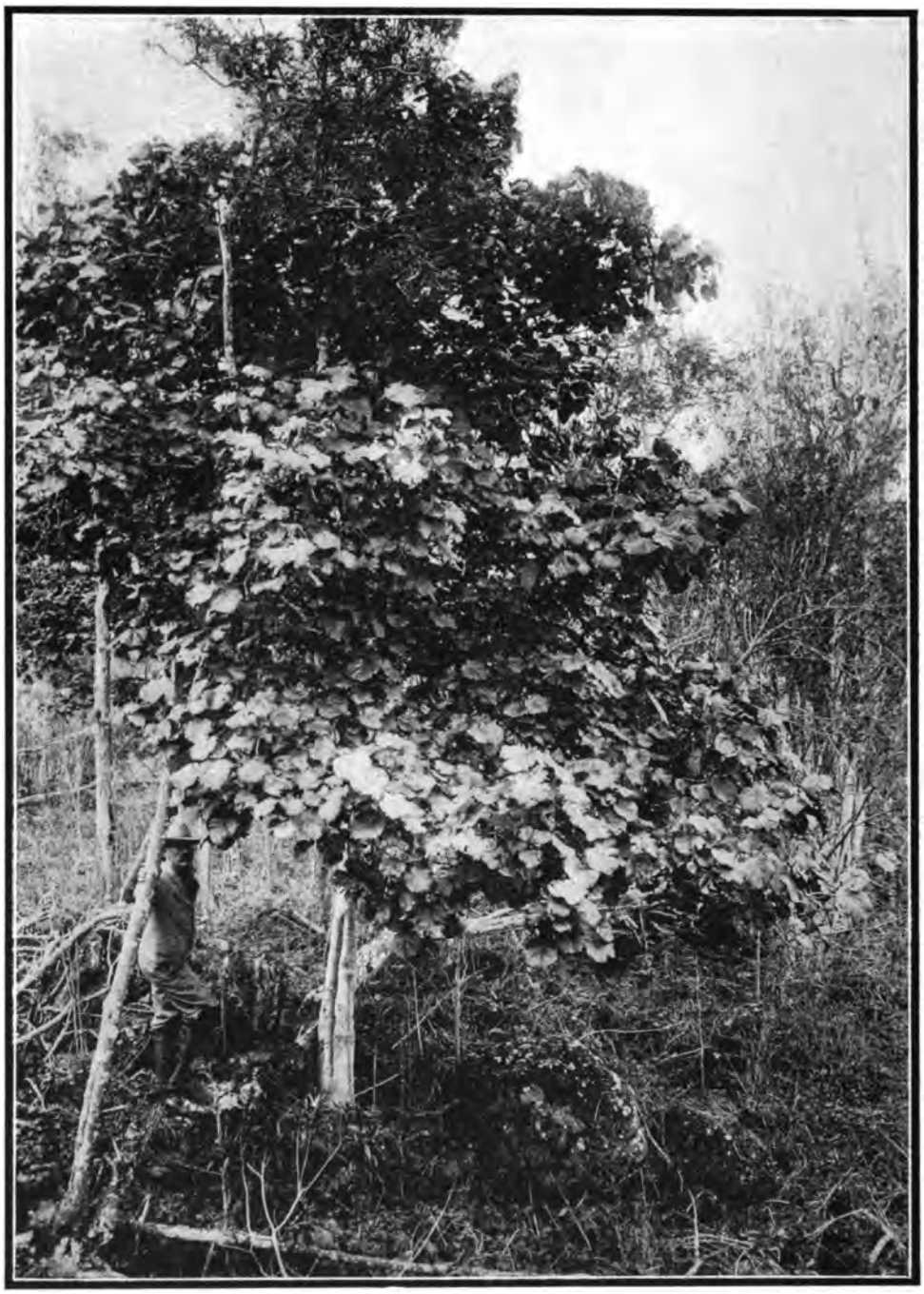
Hibiscadelphus Wilderianus Rock.

Hau kuahiwi.

HIBISCADELPHUS WILDERIANUS Rock in Bull. Haw Bd. of Agric. & For. I. (1911) 12. pl. 5.

A tree 5 m, trunk erect; leaves orbicular in outline trilobed wavy, cordate with a broad sinus at the base, with subacute or blunt apex, on petioles of 7 to 10 cm, palmately 5 to 7 nerved, puberulous above, with minute stellate hair underneath; nerves prominent,

PLATE 119.



HIBISCADELPHUS HUALALAIENSIS Rock.
Hau Kuahiwi tree.
Growing inWaihou forest slope of Mt. Hualalai, North Kona, Hawaii; elevation 3000 feet.

hispid; the subulate stipules small and puberulous; flowers solitary on pedicels of 1.5 to 4 cm, bracteoles linear, spathulate, free, 2 cm long one-nerved; calyx saccate unevenly tri-lobed, the lobes triangular acute; hirsute outside, puberulous inside, 2.5 cm long, flowers nearly the same size as in *H. Giffardianus*, petals greenish yellow outside, yellowish inside, many and strongly ribbed, the nerves branching at the apex, densely hirsute especially on the very prominent nerves, 4 to 5 cm long, contorted, with blunt or acute apex; staminal column long exserted, antheriferous to the five lobed apex, the lobes acuminate, less than 2 mm; stamens numerous, filaments 6 mm long, anthers dark red; style branches erect, 3 mm; capsule ovoid 3.5 cm x 4 cm greenish-black, woody, tuberculate, stellate hispid, seeds same as in the previous species.

Of this interesting tree only one is in existence and when last visited (1912) by Mr. Gerrit P. Wilder, who also collected the first open flowers from which the description is drawn, the tree was found to be in a dying condition; the branches were completely covered with a species of *Usnea*, probably *australis*. The tree occurs on the ancient lava fields of Auahi, on the land of Kahikinui, southern slope of Mt. Haleakala, on the lee side, where rain is very infrequent. Mr. Wilder visited the tree twice, and only on the last trip was enabled to find one open flower and a few more or less developed buds. Seeds of this species were planted by Mr. Wilder, who succeeded in raising one single plant. As the tree is situated on a cattle ranch, it will be only a very short time until it will have disappeared from its natural habitat. It was first discovered by the writer in November, 1910. The type is 8663 in the Herbarium of the Board of Agriture and Forestry, now in the safe-keeping of the College of Hawaii Herbarium.

Hibiscadelphus Hualalaiensis Rock.

Hau kuahiwi.

(Plates 118, 119.)

HIBISCADELPHUS HUALALAIENSIS Rock in Bull. Hawaii Bd. Agric. & For. I. (1911) 14. pl. 6.

Tree 5 to 7 m high, with an erect trunk 0.3 m in diameter, bark white, branches terete, with young leaves densely hirsute, leaves somewhat reniform, or bluntly and shallow trilobed, on long petioles (10 to 16 cm) with scattered stellate hair above, tomentose underneath, the main nerves branching several times; flowers usually single on tomentose pedicels of 1.5 to 2 cm; bracteoles minute dentiform about 1 mm, calyx irregularly 3 to 6 lobed, the lobes acuminate of unequal size, some only 2 mm, others 15 mm, flowers half the size as in the two other species, 2.5 to 3 cm curved, petals green, somewhat reddish inside, contorted, many ribbed hirsute near the bluntly acuminate lobes and on the nerves, silky at the base, the margins even ciliate; corolla only slightly opening, apex of the petals recurved; staminal column exserted one-third its length, bearing numerous filaments, with semicircularly curved anthers; style branches erect, ciliate, with clavate hirsute stigmas; ovary conical densely silky tomentose five celled, with 3 ovate ovules in each cell of which the upper is ascending the lower horizontal; capsule small ovate, 2 cm long, 1.5 cm wide covered with yellowish stellate hair; seeds reniform, covered with a yellowish white wool.

This exceedingly interesting and distinct species was found by the writer in the year 1909 on the lava fields of Mt. Hualalai, in North Kona, Hawaii, and in the forest of Waihou of the same district, where about a dozen trees are still in existence. The writer revisited the above locality in March, 1912, and found the trees in flower, while on his previous visit, June 18, 1909, only a few worm-eaten capsules could be found. The trees are badly attacked by several species

of moths which feed on the leaves and also mature capsules. Mr. Gerrit Wilder, however, succeeded in growing a few plants from healthy seeds collected by the writer.

THESPESIA Corr.

Involucral bracts 3 to 5, small. Calyx not punctate, usually cup-shaped and truncate. Staminal column antheriferous below the toothed apex. Ovary 5-celled, with few ascending ovules in each cell; style club-shaped, 5-grooved. Capsule woody or coriaceous, almost baccate, dehiscent or almost indehiscent. Seeds woolly; cotyledons black-punctate.—Trees with entire leaves. Flowers large, single in the axils of the leaves.

This genus possesses only a few species in tropical Asia and Polynesia. *T. populnea* (L.) Corr., the Hawaiian *Milo,* is a cosmopolitan beach-tree, occurring in tropical Africa, Asia and Polynesia; in Hawaii it is not as common now as in the early days.

Thespesia populnea (L). Corr.

Milo.

THESPESIA POPULNEA (L.) Corr. in Ann. Mus. Par. IX. (1807) 290, t. 8. fig. 2;—DC. Prodr. I. (1824) 457;—H. et A. Bot. Beech. (1832) 60;—Endl. Fl. Suds (1836) 182. no. 1506;—Gray Bot. U. S. E. E. (1854) 179;—Seem. Fl. Vit. (1865) 18;—Mann in Proc. Ess. Inst. V. (1867) 140;—Mrs. Sincl. Indig. Flow. Haw. Isl. (1885) pl. 10;—Hbd. Fl. Haw. Isl. (1888) 49;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 119;—Brigham Ka Hana Kapa, Mem. B. P. B. Mus.. III. (1911) 135.—**Hibiscus populneus** Linn. Spec. pl. ed. I. (1753) 694.—**H. bacciferus** Forst. Prodr. (1786) no. 260.

Leaves roundish, cordate, acuminate entire, 10 to 12.5 cm in diameter, glabrous; peduncles as long as the petioles; involucral bracts lanceolate equalling the calyx, soon deciduous; calyx truncate 12 mm; petals obovate-oblong 5 cm, yellow; capsule globose, 24 to 30 mm in diameter, almost woody, very tardily dehiscent; seed 8 mm, villous at the base and angles.

The *Milo,* like the *Hau,* is a tree not uncommonly found along the sandy beaches on all the islands. Its habit of growth is, however, different, as it develops a straight trunk of often 2 feet or more in diameter, with a thick corrugated bark.

It is a favorite shade tree, reaching a height of over 40 feet, and is often planted. The name *Milo* occurs also in Tonga, Samoa, and Tahiti for the same tree, while it is called *Miro* in Rarotonga and *Mulo* in Viti.

Hillebrand in his Flora p. 50 remarks that the tree was regarded sacred in Tahiti and used to be planted in Morais or temples and its leaves were employed in religious ceremonies. That the tree was held in high esteem by the Hawaiians is shown by the fact that several of them surrounded the house of King Kamehameha I. at Waikiki.

The wood of the *Milo* is very beautiful, being of a rich brown color and capable of taking a fine polish. It is made into *poi* calabashes by the natives, and is highly prized, though not so much as those of the less common *Kou* (*Cordia subcordata*).

Malvaceae.

KOKIA Lewton.

Tree 4 to 8 m high, woody throughout. Flowers single in the axils of the uppermost leaves; peduncle bearing below the middle a broadly sessile, obliquely clasping caducous, ovate bract. Bracteoles 3, persistent, accrescent, ovate, entire, sinuate or slightly lobed, narrowed at the base, not in the least auriculate, coriaceous, glabrous, strongly reticulated, 7 to 13 nerved. Calyx urceolate, thin scarious, punctate with black warts; lobes 5, shallow, rounded, the scarious almost hyaline margins overlapping and completely enclosing the bud. Calyx tube often with median transverse vein, the upper half of the calyx usually soon breaking off at this point, giving the appearance of being truncate. At the base of the calyx at the point of insertion of the petals there is a ring of stiff brownish hairs. Floral nectary naked, extra floral nectaries not evident. Corolla two to three times the length of the bracteoles, red. Ovary 5-celled, with one ascending ovum in each cell. Capsule ovoid, ligneous, opening tardily. Seeds ovoid, sharply angled on the ventral side, rounded on the dorsal, covered with short brick-red tomentum. Cotyledons punctuate with black dots. Bark containing a reddish brown sap.

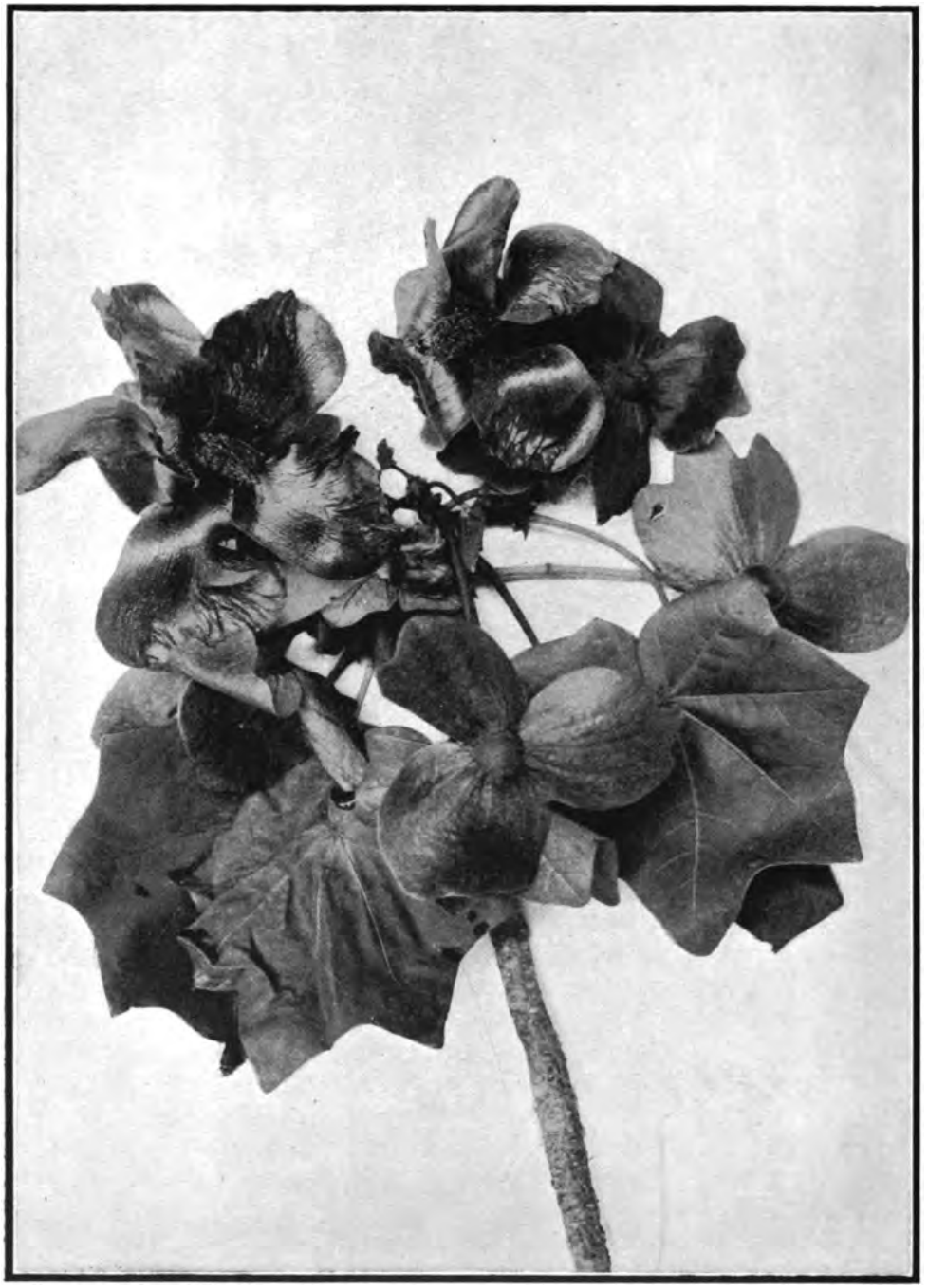
This genus established by Lewton consists of two species and one variety. The type is *Kokia Rockii* Lewton, no. 691082 in the U. S. National Herbarium. The co-type is in the Herbarium, College of Hawaii, no. 3549.

The writer sent specimens of this plant to Mr. Fairchild, agricultural explorer in charge of the U. S. Department of Agriculture, Washington, D. C., at his request, as there were no specimens of this plant in the U. S. Nat. Herbarium, Mr. Fairchild's attention having been called to this interesting plant in the writer's report to the Board of Commissioners of Agriculture and Forestry, 1910. The plants were sent under the name *Gossypium drynarioides* Seem., with the remark that it is at least a new variety of the plant by the above name, which is found on Molokai, while the writer's material came from a new locality: slopes of Mt. Hualalai, lava fields of Puuwaawaa, Kona, Hawaii. The specimens, with additional notes on the living trees, were furnished Mr. Lewton, who then proceeded to describe the plant under a new genus. Specimens of the original *Gossypium drynarioides* Seem. from Molokai were also sent. Hillebrand found one tree on Oahu, with lanceolate bracts, which he called variety β. Mr. Lewton named this variety *Kokia lanceolata* on the strength of a few scraps of lanceolate bracts in the Gray Herbarium. The writer does not think it justifiable to create a new species on such incomplete material and more or less on the strength that it grew on another island. The writer knows the Hawaiian flora thoroughly, and is well acquainted with tremendous variations found in all Hawaiian plants, and therefore prefers to retain the varietal rank rather than specific. The plant in question has, however, become extinct. The fact that Lewton's third species grows on another island is not sufficient to make it a species. Besides, Makapuu Point, on Oahu, where Hbd's var. β grew, is exactly opposite the point on Molokai where *Kokia drynarioides* grows, and is only about 25 miles distant.

KEY TO THE SPECIES.

Bracts broadly obovate, 6.5 cm x 8 cm.....	**K. Rockii**
Bracts broadly ovate, entire, 2.5 to 3 cm x 2.5 cm.....	**K. drynarioides**

PLATE 120.



KOKIA ROCKII Lewton.
Kokio.
Flowering branch, flowers bright red of silky texture. About one-third natural size.

Malvaceae.

Kokia Rockii Lewton.

Kokio.

(Plates 120, 121.)

KOKIA ROCKII Lewt. in Smithson. Misc. Coll. LX. 5. (1912) 3, pl. 1, 2, 3, 4;—Rock in Report. Haw. Bd. Agric. & For. (1912) pl. 19-20;—**Gossypium drynarioides** Rock in Rep. Haw. Bd. Agr. & For. (1910) 71. pl. 13.

Bracts broadly obovate 6.5 cm long 6.5 to 8 cm broad, with three to five blunt and shallow lobes, very strongly reticulated and veined below. Leaves glabrous below except for a dense patch of rusty hairs 2 to 2.5 cm in diameter at point of attachment of the petiole, the pulvinus of which is also hairy; staminal tube 9 to 10 cm long curved; seeds 2 cm long by 1 cm wide; lint 3 mm long.

The *Kokio* or native red cotton (not to be mistaken for the *Kokio ula* or *Pualoalo,* red native Hibiscus) is an exceedingly rare tree of 12 to 13 feet in height, with a trunk up to one foot in diameter and vested in a thin grayish-brown bark, which is covered with lenticels. The trunks of the Hawaii plants are straight and not gnarled. It is sparingly branching and woody in its last ramification. The leaves resemble those of a young *Kukui* tree, though they have the color of a maple leaf with the autumn tints from reddish-yellow to green.

The tree is of striking beauty when in flower and is worthy of cultivation.

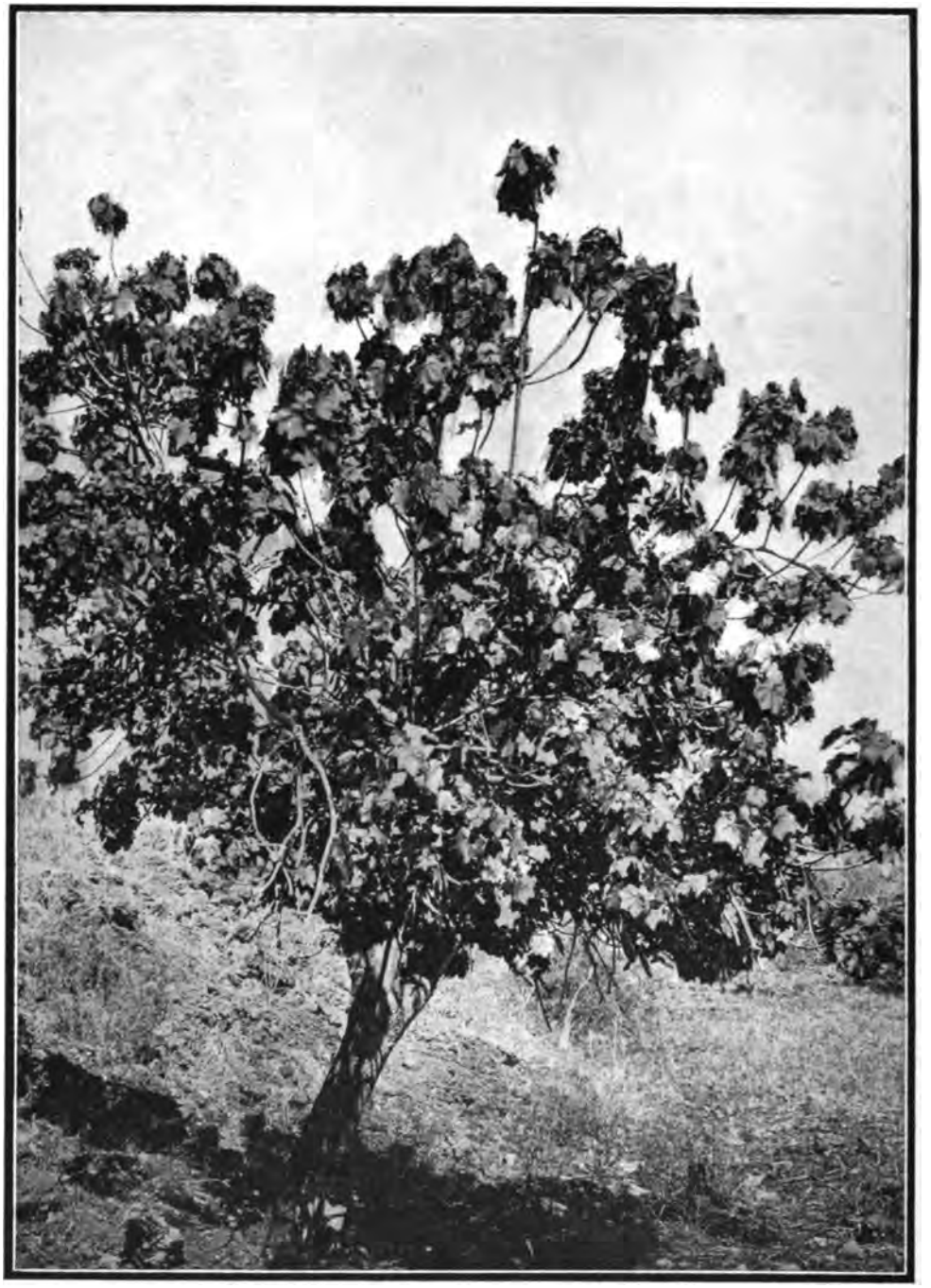
The writer observed a young tree in Kona, Hawaii, which was literally loaded with the bright red blossoms which excel in beauty many a Hibiscus flower. On the Island of Hawaii the writer discovered several trees of this species, some of which were in excellent condition. It inhabits the dry region of North Kona and is scattered all along the Government Road between Huehue and Puuwaawaa, elevation 2000 feet. There it is associated with the *Lama* (*Maba sandwicensis*), *Kauila* (*Colubrina oppositifolia*), *Halapepe* (*Dracaena aurea*), etc.

The bark, which contains a rich reddish-brown juice, is used by the natives, who dye their fish nets with it. They strip the tree for several feet of its bark, which is macerated, and the juice thus obtained is used as a dye. The wood is soft and of a reddish-brown color.

This particular *Kokio* is endemic and peculiar to the Island of Hawaii, where it is still in its prime and, if properly protected from cattle and man, should not become extinct.

The writer is glad to relate that the owners as well as the lessee of the land on which these few trees are growing, have already fenced these trees, so as to protect them from the ravages of cattle. A regulation has also been posted to prevent the natives from stripping the trees of their bark, and thus the writer hopes that this interesting species may live many more years. Abundant seed has been collected and forwarded to the U. S. Department of Agriculture in Washington, D. C. A quantity of seed has also been distributed here in Honolulu, and people interested in showy flowers have been urged to plant them Quite a number are now growing in Honolulu.

PLATE 121.



KOKIA ROCKII Lewton.
Kokio tree.
Growing on the lava flows of Puuanahulu, Kona, Hawaii; elevation 2500 feet.

Kokia drynarioides (Seem.) Lewt.

Kokio.

KOKIA DRYNARIOIDES (Seem.) Lewt. in Smithson. Misc. Coll. LX. 5. (1912) 3. pl. 5.—**Gossypium drynarioides** Seem. Fl. Vit. (1865) 22;—H. Mann in Proc. Am. Acad. VII. (1867) 157; et Fl. Haw. Isl. Proc. Ess. Inst. V. (1867) 141;—Hbd. Fl. Haw. Isl. (1888) 51;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 120.—**Hibiscus drynarioides** Kuntze Rev. Gen. Pl. I. (1891) 68.

Leaves on long petioles, membraneous, glabrous, but with a few brownish hairs at the base of the veins, cordate 7 to 5 lobed, the deltoid lobes about 3.5 cm deep, the basal sinus quite open; flowers single in the axils of the uppermost leaves, on stout peduncles of 2.5 to 5 cm, which bear at the middle a broadly sessile and obliquely clasping caducous bract of 8 to 10 mm in length; involucral bracts broadly ovate to sub-cordate, obtuse, entire, 7 to 13-nerved, 2.5 to 3 cm long, and 2.5 cm or more broad, glabrous, coriaceous; calyx urceolate, truncate, thin scarious; petals red, obovate-oblong, entire, 7.5 to 10 cm long, silky outside; staminal column of same length, truncate or obsoletely 2 to 3-toothed at the apex, antheriferous in the upper third with short filaments; style shortly exserted, clavate, 5-grooved; ovary 5-celled, each cell with one ascending ovule; capsule ovoid 2.5 cm, thick woody, opening tardily near the apex; seeds obovoid, covered with a short reddish-brown tomentum.

Of this exceedingly interesting species there has been only one tree in existence up to a few months ago. This same tree which was declared dead, showed still some signs of life and produced a few capsules with mature seeds; but this is evidently the last, only a small branchlet having produced a few leaves. Seeds of this tree have been planted by the manager of the Molokai Ranch Co. and by Mr. G. P. Wilder, who secured the last ones to be had. A few have been sent to Washington to the Bureau of Plant Introduction. Thus it is hoped still to perpetuate this most interesting plant. Several trees occurred on the west end of Moloaki, at Mahana, all having now died, owing to ravages of cattle, sheep and goats, which eat off the bark and leaves. On Oahu, at the eastern end, on the hills of Makapuu and Koko Head, grew a variety of this species with lanceolate involucral bracts, which has long been extinct. It was described by Lewton as a new species, though really only of varietal rank.

It should be called *Kokia drynarioides* var. *lanceolata*. The reasons for this change are explained in the generic discussion.

THEACEAE.

The family Theaceae, with its 16 genera and about 174 species, is rather confined to the tropical and subtropical regions of the world. A few appear in the temperate regions of the northern hemisphere in America and Asia. The genus Eurya is the only representative of this family in the Hawaiian Islands, where it has one endemic species. To this family belongs *Thea sinensis* L., the Tea of commerce, which is found wild in the interior of the south Chinese island Hainan, and Upper Assam in Bengal, from whence it was introduced as an agricultural plant into China and Japan about 810 A. D.

Theaceae.

EURYA Thunb.

Trees or shrubs with coriaceous leaves. Flowers single or exceptionally in very short racemes, which are axillary.

Subgenus **TERNSTROEMIOPSIS** Urb.

Flowers dioecious, corolla fleshy. Male flowers, with 10 to 15 stamens in one row, the anthers twice as long as the filaments, linear lanceolate, split down to the base. Ovary 3-celled, in each cell 15 ovules, of which the most are pendulous while the upper are nearly horizontal. Styles 3, with ovate lanceolate stigmas. Fruit a berry with 12 seeds in each cell. Cotyledons shorter than the radicle of the embryo.—Leaves spiral. To this subgenus belongs the Hawaiian species (*Eurya sandwicensis* Gray) only.

The genus to which the Hawaiian species belongs consists of about 36 species and several subspecies which are distributed over Mexico, South America and the East and West Indies.

Eurya sandwicensis A. Gray.

Anini or *Wanini.*

EURYA SANDWICENSIS A. Gray. Bot. U. S. E. E. (1854) 209;—H. Mann. Proc. Am. Acad. VII (1867) 156, et Fl. Haw. Isl. (1867) 134;—Wawra in Flora (1873) 168;—Hbd. Fl. Haw. Isl. (1888) 41;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 117;—Szyszyl. in Engl. et Prantl Pflzfam. III. 6. (1895) 189, et Engl. in Nachtr. (1897) 247;—Heller Pl. Haw. Isl. (1897) 856.—**Ternstroemiopsis sandwicensis** Urban in Ber. Deutsch. Bot. Ges. XIV. (1896) 49.

A small tree 5 to 6 m in height, or at higher altitudes a shrub 2 to 3 m, the ultimate branchlets pubescent; leaves obovate oblong, obovate or oval, obtuse, or bluntly acuminate at the apex, cordate at the base, closely serrate, thick coriaceous, or subchartaceous, somewhat shining above, 5 to 7.5 cm long, 25 to 30 mm wide, on short petioles of 2 to 3 mm; flowers solitary in the axils, subsessile or on pedicels of 6 mm; sepals dark purplish, coriaceous, suborbicular, persistent; petals deciduous in the fertile flowers, somewhat fleshy, ovate or obovate, about 8 mm, yellowish; stamens free, very short; anthers mucronate; styles 2 to 3, distinct; berry dryish, globose, black, about 10 mm in diameter, tuberculate, crowned by the styles; seeds 12 in each cell, globular-reniform, with a thin testa; albumen scanty; cotyledons thick and broad; radicle somewhat longer.

Hillebrand in his Flora of the Hawaiian Islands describes a variety β, with larger leaves, rounded or acute at the base, from Kealia, Kauai.

Wawra in Flora (1873), page 168, describes this particular form as *Eurya sandwicensis* Gray, fm. *grandifolia* Wawra, *arbuscula foliis tenerioribus, sparsis, 4 poll. longis, 1½ poll. latis, basi rotundatis vel acutis, minutissime serrulatis; pedunculis 4 lin. longis.* Kauai um Kealia, etc. 2025.

The variety is not known to the writer. The species occurs on all the islands of the group, especially in the middle forest zone up to 5000 feet and even higher. It is a small, rather glabrous tree, but more often a shrub. It is known to the old natives as *Wanini*, or *Anini*. On the summit of Waialeale, Kauai, the writer met with this species as a stiff shrub, with very large fruits, as compared with those of the middle forest zone, where the berries do not become larger than 6 mm.

The *Wanini* is peculiar to the Hawaiian Islands, outside of which it has not been found.

GUTTIFERAE.

The family Guttiferae reaches its highest development between the tropics of Cancer and Capricorn, and only the genus Hypericum is found also outside the tropics. To this family belong the Mammei apple, the Mangosteen, and other edible fruits. The genus Calophyllum is here represented by only one cosmopolitan species.

CALOPHYLLUM L.

Flowers polygamous; sepals and petals not always distinguishable from each other, together 4 to 12, in 2 to 3 rows, imbricate; stamens many, free or hardly united at the base, filiform, with ovate or elongate anthers, long style and peltate stigma. Fruit a drupe with thin sarcocarp, with crustaceous stone and globose or ovoid seed. Trees with shiny coriaceous leaves, with numerous parallel nerves, and medium sized or rather small flowers, arranged in racemes or panicles.

The genus Calophyllum with its 55 species occurs in the old world, with the exception of 4 species which are found in tropical America. Only one species, *C. Inophyllum,* the true Hawaiian *Kamani,* is represented in these islands. It is the most noteworthy species of those occurring in the old world. It produces the real *Balsamum Mariae,* and a resin called *Tacamahak.*

Calophyllum inophyllum Linn.

Kamani.

(Plate 122.)

CALOPHYLLUM INOPHYLLUM Linn. Spec. Plant. I. (1753) 513;—Forst. Prodr. (1786) no. 225;—DC. Prodr. I. (1824) 562;—Guillem. Zeph. Tait. (1836-1837)—no. 337;—Endl. Fl. Suds. (1836) no. 1397;—A. Gray, Bot. U. S. E. E. (1854) 218;—Pancher in Cuzent, Tahiti (1860) 223;—Seem. Fl. Vit. (1865) 12;—Parkins Draw. Tah. Pl. (ined. cf. Seem.) t. 55;—H. Mann, Proc. Am. Acad. VII. (1867) 156, et Fl. Haw. Isl. in Proc. Essex Inst. V. (1867) 133;—Nadeaud Enum. Tahit. Pl. (1873) no 440.—Wawra in Flora (1874);—Hbd. Fl. Haw. Isl. (1888) 40;—Del Cast. Ill. Ins. Mar. Pac. VI. (1890) 116, et Fl. Polyn. Franc. (1893) 10;—Engler in Engl. et Prantl Pflzfam. III. 6. (1895) 222. Fig. 105;—Wilder Fr. Haw. Isl. (1911) 152. pl. 74.—Brigham Ka Hana Kapa (1911) 171, fig. 102.

Leaves coriaceous, shining, broadly oblong or obovate, 20 cm x 10 cm rounded or emarginate, on petioles of about 2.5 cm; racemes axillary, 5 to 17 cm long, the pedicles 2.5 to 3.5 cm with short, soon deciduous bracts at the base; sepals 4, rounded 8 to 10 mm long; petals 4, rarely 6 to 8, white, oblong 14 to 16 mm; stamens numerous, style 4 to 6 mm; fruit globose 2.5 to 4 cm thick; the flowers are fragrant.

This beautiful cosmopolitan tree, which grows always near or at the sea-shore, reaches a height of 50 to 60 feet or even more; it forms large groves in certain districts of the islands. One is especially remarkable on the Island of Molokai, at the entrance of the valley of Halawa, which has been referred to by the earliest navigators. Trees of this species, which was found here by the first white men and is therefore counted as indigenous, occur on all the islands of the group on the sea-shores. It is also known through all tropical Asia and Polynesia. Its Tahitian name is *Tamanu,* while it is known in Samoa as *Tefau.* The Samoans employ the oil of the nuts as a remedy for eye catarrh, while in

PLATE 122.

CALOPHYLLUM INOPHYLLUM Linn.
Kamani.
Trunk of tree with fruiting and flowering branch pinned to it. Leaves badly infested with scale.

Nauru (Micronesia) it is employed for skin diseases. In Fiji the tree is known as *Diol.* Seeman in his Flora of Fiji writes: "The most valuable oil produced in Fiji is that extracted from the seeds of this tree. The natives use it for greasing their bodies and polishing their arms."

The Hawaiians used the wood for calabashes or poi bowls. In India the tree is known as Alexandrian Laurel and its wood is used for cabinet work, machinery, railway sleepers and mast spars. The wood is moderately hard, close grained and of a reddish brown color. The resin exuding from the bark is useful in indolent ulcers.

FLACOURTIACEAE

This family, consisting of 70 genera and more than 500 species, is exclusively tropical. Not a single species is found either in Europe or North America. They are distributed from India to Australia, Africa and the Pacific islands. Nearly all Flacourtiaceae inhabit the lowlands or lower forest zone.

The family is represented in the Hawaiian Islands by two species belonging to the genus Xylosma.

XYLOSMA Forst.

Flowers dioecious, rarely polygamous. Calyx lobes 4 to 5, somewhat united at the base, imbricate, usually ciliate. Petals none. Stamens numerous, surrounded by an annular discus, the latter often consisting of several glands; filaments free, filiform, long; anthers round or elliptical, 2-celled, extrorse, versatile. Ovary wanting in the male flowers, surrounded by a discus or rarely by staminodia, 1-celled, free, with 2 to 3 placentas, each with 2 or (4 to 6) ascending, epitropous ovules. Style short, occasionally entirely missing. Stigma peltately lobed. Fruit a 2 to 8 seeded berry with little fruit flesh. Seeds obovoid with rich albumen, embryo large, with broad cotyledons.—Small trees or shrubs, often with axillary thorns, but unarmed in the Hawaiian species. Leaves alternate, shortly petioled, entire or dentate-crenate, coriaceous without stipules. Flowers small, in short axillary racemes with small bracts.

A genus of 45 species, distributed over all tropical countries, with the exception of Africa. Thirty-two species alone are found in America, while only four are known from Polynesia, including the two Hawaiian species.

KEY TO THE SPECIES.

Leaves entire; stigma sessile, generally 3..... **X. Hawaiiense**
Leaves crenate or sinuate; stigmas raised on a style, generally 2..... **X. Hillebrandii**

Xylosma Hawaiiense Seem.

Maua.

XYLOSMA HAWAIIENSE Seem. Flora Vit. (1865) 7;—Mann Proc. Am. Acad. VII. (1867) 150, et Fl. Haw. Isl. Proc. Ess. Inst. V. (1867) 122;—Wawra in Flora (1873) 171;—Hbd. Fl. Haw. Isl. (1888) 20;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 109.—**Myroxylon Hawaiiense** (Seem.) O. Ktze. Rev. Gen. Pl. (1891) 44;—Warburg in Engl. et Prantl III. 6a. (1893) 41;—Heller Pl. Haw. Isl. Minnes. Bot. Stud. Bull. IX. (1897) 856.

Leaves distichous on petioles of 12 mm, ovate or rounded 7.5 to 10 cm long, 6 to 7.5 cm wide, shortly acuminate, entire, thick, coriaceous, glabrous; flowers small greenish or

PLATE 123.

XYLOSMA HILLEBRANDII Wawra.
Maua.
Fruiting branch, one-half natural size.

reddish, about 8 in racemes of 10 to 15 mm in length, often several racemes from one gemma, the pedicels of about the same length, bracteolate below the middle; male flowers: sepals 4, connected at the base, ovate, obtuse 3 mm, margins ciliate; stamens 2 or 3 times as long, on a raised torus and surrounded by a crenulate disc; female flowers: sepals 5, quincunial; ovary surrounded by a crenulate disc and a few rudimentary stamens; stigma sessile, peltately 2 to 3 (or 4) lobed, the lobes reflexed; placentas 3 (-4) with 3 pendulous ovules to each; berry reddish somewhat dry 8 to 12 mm long, ovoid; seeds 5 mm; embryo straight in copious albumen, but shorter, the radicle shorter than the broad foliaceous cotyledons.

The *Maua* is a very handsome tree, conspicuous in the forest by its reddish young leaves. It thrives best in the drier districts on the Islands of Oahu and Kauai only. The *Maua* of Molokai, Hawaii, and Maui is botanically referred to another species.

In the forest of Kopiwai, a semi-dry district on the leeward side of Kauai. it grows to a height of 30 feet, developing a more or less straight trunk of sometimes more than a foot in diameter, with a smooth bark. It is conspicuous on account of its large ovate or rounded leaves, which are of a dark-green color with reddish hue and shining. It is not uncommon at an altitude of 2000 feet, and sometimes as high as 3000 feet, where it can usually be found in company with the *Hame* or *Haa*, *Kopiko*, *Ahakea*, and others.

It is confined, like the *Kalia*, to the Islands of Oahu and Kauai. In the former island it grows in nearly all the valleys of the leeward side, but has also been observed in Punaluu, on the windward side of Oahu; at lower elevation it usually is not taller than 20 feet, or sometimes even less.

On Kauai it is found in the lower forest zone above Waimea, in the woods of Kopiwai, where it is associated with the *Alphitonia excelsa (Kauila)*, *Dracaena aurea*, the *Halapepa*, *Santalum pyrularium*, Sandalwood, and others; also at Kaholuamano and probably in the woods above Koloa. It is not found outside of the Hawaiian group, but has a relative in the Marquesas, Tonga and Viti islands.

There seem to be intermediate leaves between this species and the following; on Lanai occurs a tree with entire leaves, while others have a faint suggestion of crenate leaves; evidently the two species are very little distinct specifically. The following may only be a good variety of the former.

Xylosma Hillebrandii Wawra.
Maua.

(Plate 123.)

XYLOSMA HILLEBRANDII Wawra in Flora (1873) 171;—Hbd. Fl. Haw. Isl. (1888) 20;—Del Cast. Ill. Fl. Ins.. Mar. Pac. VI. (1890) 109.—**Myroxylon Hillebrandii** (Wawra) O. Ktze. Rev. Gen. Pl. I. (1891) 44;—Warburg in Engl. et Prantl Pflzfam. III. 6 a. (1893) 41.

Leaves on petioles of 12 mm, ovate-oblong, 6 to 10 cm long, 3 to 7 cm wide, somewhat obtuse, or acute, contracted at the base or rounded, repandly crenate, even sinuate, the teeth tipped with a callous gland, membraneous, chartaceous or in very dry districts coriaceous, glabrous and shining, racemes puberulous, 12 to 25 mm long, with 10 to 12 flowers on pedicels of 2 to 6 mm, which are bracteolate above the base and articulate; male flowers: sepals 4, broadly ovate or triangular, with a white pubescence on both faces,

PLATE 124.

WIKSTROEMIA OAHUENSIS (Gray) Rock.
Akia.
Flowering branch, two-thirds natural size.

ciliate, disc 4-lobed; female flowers: sepals 4, occasionally 5, stigma 2-lobed, on a short style; placentas (2, rarely 3), each with 3 pendulous ovules; fruit subglobose to obovoid, beaked with the permanent style..

This tree, which is also called *Maua* by the natives, is to be found on all the islands of the group, with the exception of Oahu and Kauai. It differs mainly from its cogener in its leaves, which are not entire, but crenate. It is a much smaller tree in certain localities, only reaching a height of 10 to 15 feet, prefering the very dry lands on the leeward sides of Lanai, Molokai, Hawaii, and Maui. On the latter island on the southern slopes of Haleakala, and on Hawaii in the rain forest of Kau, it reaches its best development: there have been observed trees 40 feet in height with a trunk of over one foot in diameter. This *Maua* presents a very poor appearance on the west end of Molokai, where individual trees are still to be found on the slopes of Mahana valley. Windswept and stunted, it stands as a relic of by-gone days, the remnant of what was once a beautiful forest. Its associates, *Gardenia Brighami (Nau), Reynoldsia sandwicensis (Ohe), Kokia drynarioides (Kokio),* and others, of which only a few are left, have experienced a similar fate, and in time not far hence will be things of the past. On Hawaii, it grows on the *aa* (rough) lava fields of Puuwaawaa and Huehue, North Kona, and Kawaihaeiuka (2000 feet), and at an elevation of 4000 feet on the slopes of Mauna Loa on the land of Keauhou near Kilauea volcano. Here the tree is larger and of similar size to the *Maua* of Kauai and Oahu. On Lanai it may be found on the dry ridges as well as on the flat land of Kaa, where a peculiar forest of an area of perhaps 30 acres has withstood the ravages of cattle and sheep, but, as on Molokai, is rapidly succumbing.

On Maui it grows above Makawao and on the southern slopes of the crater of Haleakala on the lava field of Auahi. district of Kahikinui, at a height of 2600 feet above sea level. Both *Mauas* blossom usually in midsummer, but no particular month can be stated, as the flowering period varies greatly according to locality and environment.

This species is closely related to the Tahitian *Xylosma suaveolens* Forst., while the other *Maua* approaches very closely *Xylosma orbiculatum* from the Viti, Marquesas, and Tongan islands.

This species is quite variable. Specimens from the west of Molokai are quite distinct from those of East Maui, above Makawao; from the latter place the racemes are the longest in any specimen of this species, being 25 to 30 mm long on the naked branch below the leaves, while in those from Molokai the racemes are very short and axillary only. In regard to the leaves, the crenation differs very much also, some having almost entire leaves.

THYMELAEACEAE.

The family Thymelaeaceae is a rather small one, consisting of 37 genera with about 455 species. With the exception of the Polar zones, the family is distributed over the whole globe, and ranges from Terra del Fuego to Canada,

in America, and in the old world from New Zealand to Norway. It is poorly represented in the tropical and temperate regions, but is very rich in species in the sub-tropical regions of Africa and Australia, and in the steppes of Asia. In the Hawaiian Islands the family is represented by the genus Wikstroemia, which has about eight species in this archipelago, all of which, with the exception perhaps of one, are endemic. Three species become trees. The others are small shrubs.

WIKSTROEMIA Endl.

Flowers hermaphrodite, tetramerous. Receptacle long cylindrical. Calyx lobes spreading, petals none. Stamens in two alternate rows, inserted in the upper portion of the receptacular tube, the upper near the top of the tube opposite the lobes. Hypogynous scales 4 to 2. Ovary sessile, glabrous or tomentose. Style very short, the large globose stigma therefore almost sessile. Fruit a drupe, or dry, and then enclosed by the receptacular base. Albumen scanty or none. Embryo with fleshy cotyledons.—Shrubs or trees with opposite or rarely alternate leaves. Flowers terminal in short racemes or spikes. Bracts none.

This genus, whose Hawaiian species are known to the natives by the name *Akia*, is composed of about 20 species, found in the Indo-Malayan region, China, Australia and the Hawaiian Islands; in the latter locality about eight species are endemic. All have a very tough bark and furnished one of the strongest Hawaiian fibers. The Hawaiian *Akia* or *Akea* contain an acrid narcotic and were used for stupefying fish.

KEY TO THE SPECIES.

Leaves ovate, small, 3.5 cm, glabrous.
  Spikes short, glabrous..... **W. oahuensis**
Leaves large, ovate-oblong, occasionally pubescent.
  Spikes tomentose, thick.
    Branches often drooping, spikes often 3 cm long..... **W. sandwicensis**
    Branches stiff, erect, spikes 4 to 7.5 cm, many forked..... **W. furcata**

Wikstroemia oahuensis (Gray) Rock.

Akia.

(Plate 124.)

WIKSTROEMIA OAHUENSIS (Gray) Rock.—**Wikstroemia foetida** var. **Oahuensis** Gray in Seem. Journ. Bot. III. (1865) 302;—Seem. Flora Vit. (1866) 207;—H. Mann in Proc. Am. Acad. VII. (1867) 199;—Wawra in Flora (1875) 175;—Hbd. Fl. Haw. Isl. (1888) 385.—**Wikstroemia indica** Del Cast. Ill. Fl. Ins. Mar. Pac. VII (1892) 280.—**Diplomorpha Oahuensis** Heller in Minnes. Bot. Stud. Bull. IX. (1897) 860.

Leaves ovate or ovate-lanceolate 2.5 to 5 cm long, 12 to 25 mm wide, on petioles of 2 to 4 mm, acute at the apex, rounded or slightly contracted at the base, glabrous, pale underneath, thin chartaceous; flowers 6 to 12 on pedicels of 1 mm, clustered at the head of a short terminal peduncle, the cluster at most elongating into a spikelet of 4 mm in length; perianth pale or greenish yellow, tubular, puberulous, about 7 mm long, including the spreading lobes, which are somewhat obtuse, and perhaps half, often less, the length of the tube; lower stamens at the middle of the tube or somewhat higher; hypogynous scales 4 to 5, linear, connate at the base, as long as the ovary, which is glabrous except the apex which is often, but not always, strigose-pubescent, style very short, with capitate stigma; drupe ovoid, 6 to 8 mm, reddish yellow.

This species of *Akia* is usually a shrub 2 to 4 feet high, but on the upper slopes of Mt. Konahuanui it is a small tree 12 to 15 feet in height, where it

grows in company with *Cheirodendron platyphyllum, Lobelia macrostachys, Pittosporum spathulatum,* several species of Pelea, *Scaevola glabra* and others. On the low lands on the outskirts of the forest on open glades, as in Niu Valley, it is only 2 feet or so in height. The trunk and branches are clothed in a black, very tough, fibrous bark, which, owing to its strength, was employed by the natives for ropes and other purposes where strong fiber was needed; it almost equals the *Olona* in strength. The plant is poisonous and was employed by the natives, similarly to the *Auhola* or *Auhulu* (*Tephrosia piscatoria*) for fishing. The plant was pounded to pulp and thrown into the water, which stupefied the fishes in the immediate neighborhood, which floated to the surface of the water. This mode of fishing has been forbidden of late.

Wikstroemia sandwicensis Meisn.

Akia.

WIKSTROEMIA SANDWICENSIS Meisner in DC. Prodr. XIV. (1856) 545;— Gray in Seem. Jour. Bot. III. (1865) 303;—Seem. Fl. Vit. (1866) 206;—Mann Proc. Am. Acad. VII. (1867) 199;—Hbd. Fl. Haw. Isl. (1888) 386;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 280;—Gilg. in Engl. et Prantl Pflzfam. III. 6a. (1894) 235.— **W. foetida** var. **glauca** Wawra in Flora (1875) 176—**Diplomorpha sandwicensis** Heller in Minnes. Bot. Stud. Bull. IX. (1897) 861.

Leaves dark green, glabrous, or slightly pubescent underneath, especially along the midrib and veins, chartaceous and faintly nerved, ovate or ovate oblong to lanceolate, 5-10 cm long, 2.5-4 cm wide, on petioles of 6-8 mm which are often pubescent, acute at both ends or often rounded at the base; adult spikes 4-30 mm long on peduncles of 2-6 mm, suberect or drooping, usually terminal, densely flowered near the apex, the rachys thick squarrose and tomentose, sometimes dichotomously forking; perianth on a short pedicel of 1 mm, silky tomentose 5-6 mm long, the lobes somewhat obtuse; scales 4 linear, free, as long as the ovary, drupe ovoid 8-10 mm, usually only two maturing at the apex of the spike.

To this species will have to be referred Léveillé's *Wikstroemia Fauriei,* which is based mainly on the pubescent leaves.

The writer has large material of this species (*W. sandwicensis*) with perfectly glabrous leaves, and again specimens with leaves which are pubescent underneath. Pubescence in Hawaiian plants is not at all a characteristic to be relied upon, which anyone who has collected in these islands can readily verify. If one should make new species of a plant based on such characteristics there would be no end and the number of Hawaiian plants would reach several thousand.

This species occurs mainly on Hawaii on the lava fields and on the great central plain on the outskirts of the forest and in the *Koa* forest at an elevation of 5000 feet, where it is a small tree 15 feet high. At this elevation it is much branching and the branches are drooping and sparingly foliose. Like all other Hawaiian *Akia,* the bark is very tough and blackish. It fruits prolifically during the winter months. Hillebrand records it from Hilo, where Faurie's specimens were collected also.

PLATE 125.

JAMBOSA MALACCENSIS (Linn.) P. DC.
Ohia Ai or **Ohia**, Mountain Apple.
Flowering branch, about one-half natural size.

Wikstroemia furcata (Hbd.) Rock.
Akia.

WIKSTROEMIA FURCATA (Hbd.) Rock.—**Wikstroemia sandwicensis** Meisn. var. **furcata** Hbd. Flora Haw. Isl. (1888) 386;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 280.

Leaves 6 to 14 cm long, 2 to 5 cm wide, dark green above, pale underneath, glabrous on both sides, shortly contracted at the base, acute or rounded or subcordate, acute or obtuse at the apex, on petioles of 4 to 8 mm, chartaceous; spikes 5 to 7.5 cm long repeatedly forking 3 to 5 times, yellowish pubescent, many flowered, the perianth silky tomentose on a pedicel of 2 mm, tube of perianth yellowish, about 4 mm, the spreading lobes acute, about one third the length of the tube, apex of ovary silky pubescent, as well as the short style and thick stigma; drupes much larger than in *W. sandwicensis*, 15 mm long, ovoid, bright red; seed ovoid to acute, testa thin, black, and shining.

Found on Kauai, especially in the swampy jungles back of Kaholuamano and Halemanu at an elevation of 4000 feet. It certainly is a very striking plant, especially during the month of October, when the small trees are loaded with the rather large, bright red fruits. The branches are erect and not drooping, and rather stout.

It differs from *W. sandwicensis* in the long and many-forked spike, the large leaves, and the large bright red drupes. The native name, like that of all other species, is *Akia*.

MYRTACEAE.

The family Myrtaceae consists of 72 genera with about 2750 species, which belong to two main evolutional centers, one in tropical America, the other on the Australian continent. It is less numerous in species in Polynesia, tropical Asia, Africa and subtropical America. In the Mediterranean region only one species occurs, the ordinary Myrtle. The family cannot adapt itself to cold climates; only a few species of Eucalypti occur in such regions in Tasmania as are covered with snow for several months in the year.

In the Hawaiian Islands four genera are represented, three of which possess one species each, while the genus Metrosideros has several species, of which one occurs from sea-level to 9000 feet elevation in the most varied forms.

Of early introduction are the various Guayava species (Guava) and of late the genus Eucalyptus, with about 60 to 70 species.

KEY TO THE GENERA.

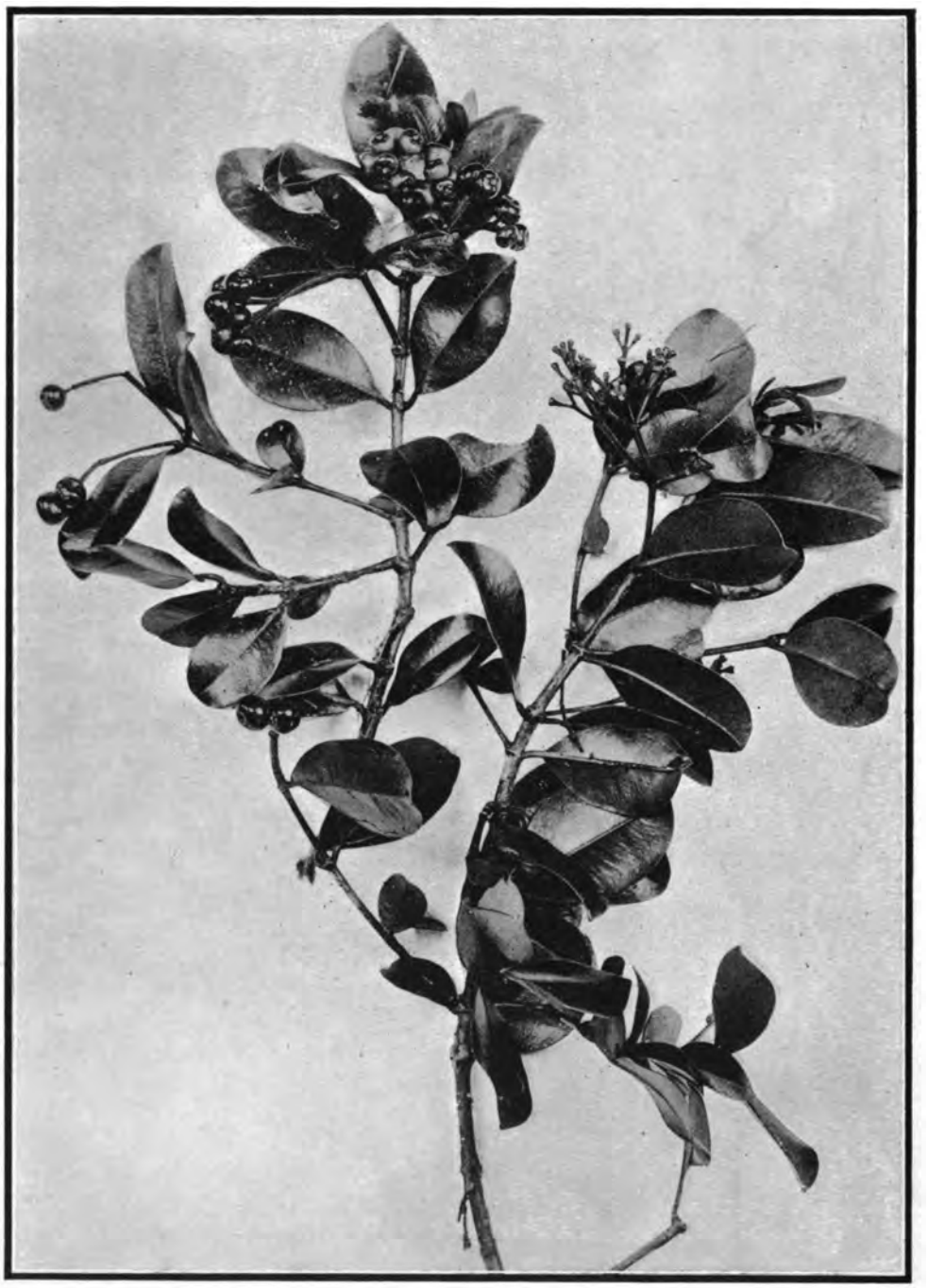
Fruit a berry.
- Petals falling off single; staminal discus distinct..... **Jambosa**
- Petals cohering, falling off together; staminal discus not distinct..... **Syzygium**

Fruit a capsule..... **Metrosideros**

JAMBOSA DC.

Receptacle obconical, funnel-shaped, cup-shaped or cylindrical, gradually tapering into the peduncle, and prolonged over the ovary; dilated discus-like at the insertion of the stamens. Calyx lobes comparatively large, usually semicircular. Flowers single or in terminal or lateral cymes or corymbs.

PLATE 126.



SYZYGIUM SANDWICENSE (Gray) Ndz.
Ohia Ha or **Paihi.**
Flowering and fruiting branch, about one-half natural size.

The genus Jambosa consists of about 120 species, which are distributed over the Indo-Malayan, but especially Malagassic, regions; also over north-eastern Australia and Polynesia.

In the Hawaiian Islands the genus is represented by one cosmopolitan species.

Jambosa malaccensis (Linn.) P.DC.

Ohia ai, Mountain Apple.

(Plate 125.)

JAMBOSA MALACCENSIS (Linn.) P. DC. Prodr. III. (1828) 286;—Hook. et Arn. Bot. Beech. (1832) 83;—Endl. Flora Suds. in Ann. Wien. Mus. (1836) 181, n. 1466;—Guillem. Zeph. Tait. (1836-1837) no. 298;—Pancher in Cuz. Tahiti, (1860) 232;—Jardin Hist. Nat. Iles Marqu. (1858) 24;—Nadeaud Enum. Tah. Pl. (1873) 488;—Niedenzu in Engl. et Prantl Pflzfam. III. 7. (1893) 84;—Wilder Fruits Haw. Isl. (1911) 20. pl. 8.—**Eugenia malaccensis** Linn. Spec. Pl. ed. I. (1753) 470;—Forst. Prodr. (1786) no. 220;—Gray Bot. U. S. E. E. (1854) 510;—Seem. Fl. Vit. (1866) 77;—Mann Proc. Am. Acad. VII. (1867) 166, et Fl. Haw. Isl. Proc. Ess. Inst. V. (1867) 245;—Mrs. Sinclair Ind. Flow. Haw. Isl. (1885) pl. 41;—Hbd. Fl. Haw. Isl. (1888) 128;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 169, et Fl. Polyn. Franc. (1893) 67;—Heller in Minnes. Bot. Stud. Bull. IX. (1897) 862;—Brigham Ka Hana Kapa Mem. B. P. Bish. Mus. III. (1911) 156, fig. 93.—**Jambosa domestica** Rumph. Herb. Amb. I. (1741) 127. t. 37;—Blume Mus. Bot. (1849) 91.—**J. purpurascens** DC. l. c.

Leaves opposite, elliptical or obovate-oblong, 15 to 20 cm long, 5 to 7.5 cm wide, on petioles of 12 mm, suddenly acuminate, dark green and shining, not dotted, the sinuate marginal nerve distant from the edge; cymes axillary, usually cauline, short, about 5 cm long, their lowest branches 8 to 12 mm long and 3 flowered, the middle and terminal branch racemose; pedicels short, gradually enlarging into the calyx; calyx turbinate, produced beyond the ovary, with 4 rounded lobes; petals obovate, red, reddish-purple or white, 6 mm; the red or white stamens 18 mm long; fruit obovate, about 7.5 cm in diameter, umbilicate at the top and crowned by the truncate scar of the calyx-lobes, deep crimson, pale pinkish, or white; seed generally one.

Occasionally a tree of 60 feet in height. It is the mountain apple of the white man and the *Ohia ai* or edible *Ohia* of the native Hawaiian. So much has been written about this cosmopolitan species that only a brief account of it will be given in the following lines.

The *Ohia ai* was undoubtedly brought to Hawaii by the natives long before the arrival of the first white man, and was the only Hawaiian fruit before the coming of the latter. It is widely distributed over the islands of the Pacific, where it is known by various names. It favors the windward sides of the islands in the valleys and gorges, where it forms almost pure stands, along streambeds. It is restricted to the lowlands and never ascends into the mountains.

It flowers and fruits at various times of the year according to locality. In one district the trees can be seen in flower while in another the trees are loaded with the bright red watery apples.

The *Ohia ai* played an important role in the legends of Hawaii and Polynesia as a whole, and was regarded as sacred, and from its wood many idols were carved.

The white variety is known in Hawaii as *Ohia ai hua keokeo,* and in Fiji as

PLATE 127.

METROSIDEROS POLYMORPHA Gaud.
Ohia Lehua.
High mountain form from Mt. Haleakala, Maui; belongs to section II. var. η reduced.

Kavika vulavula, while the red is called *Kavika damudamu* by the Fijians. In Samoa the tree is called *nonufi afi'a* or *nomula* for the red variety, while the white variety is known as *nonuui.* The bark of the trees is used as an astringent, while the flowers and leaves are used for lung troubles.

The trunks of the trees were hewn into posts and rafters for houses, also used in making the enclosures about temples. From it were also made the sticks to couple together the double canoes.

SYZYGIUM Gaertn.

Staminal discus wanting. Sepals usually short and broad or entirely missing. Petals usually united and falling off together at the opening of the flowers.—Otherwise as in Jambosa.

The genus Syzygium consists of more than 140 species, of which only two or three are found in tropical Africa. The majority of the species of this genus occur in the East Indian-Malayan archipelago or region, while four are found in Australia, of which two are endemic. The Hawaiian Islands possess a single endemic species which is known by the natives as *Ohia ha* or *Paihi.*

Syzygium sandwicense (Gray) Ndz.
Ohia ha or *Paihi* on Maui.
(Plate 126.)

SYZYGIUM SANDWICENSE (Gray) Ndz. in Engl. et Prantl Pflzfam. III. 7. (1893) 85.—**Eugenia sandwicensis** Gray Bot. U. S. E. E. (1854) 519;—Mann Proc. Am. Acad. VII. (1867) 166, et Fl. Haw. Isl. (1867) 246;—Wawra in Flora (1873) 171;—Hbd. Fl. Haw. Isl. (1888) 129.—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 170;—Heller in Minnes. Bot. Stud. Bull. IX. (1897) 862.

Sometimes a tree of 20 m; branches angular, sharply margined; leaves obovate or obovate-oblong, rounded and usually emarginate at the apex, glabrous, dark green or yellowish brown with red veins, subcoriaceous, 4-10 cm long, 3-5 cm wide, on petioles of about 12 mm, the marginal nerve continuous; cymes single or compound in the axils of the upper leaves, the common peduncle angular and elongate, 2.5-3.5 cm, the pedicels only about 3 mm, articulate and bibracteolate below the calyx; bractlets small triangular; calyx turbinate, 3-4 mm long, 4-lobed, imbricate, early deciduous; petals obovate, often emarginate, pinkish, about 2 mm, generally discreet, but sometimes united and falling off together; stamens 20-30, shorter than the petals; style short; ovary 2-celled, with 10 or more ovules in each cell; berry turbinate or globose, flat at the top, 8-10 mm in diameter, red; seeds 1 or 2, with a pale thin testa, the thick cotyledons not consolidated.

The *Ohia ha,* or *Paihi* as it is called on Maui, occurs on all the islands of the group and becomes often a tree 60 feet or more in height, with a diameter of trunk of one to one and a half feet.

The bark is reddish brown and smooth and it can therefore be distinguished easily from the *Ohia lehua* (Metrosideros), which has rough scaly bark. The wood of the *Ohia ha* is hard and durable and is of a reddish color. It inhabits the forests of lower elevations, but can often be found also up to 4000 feet, as, for example, on Kauai in the forests of Kaholuamano and Halemanu. It reaches its best development in the dense rain forest, while on open, exposed ridges it becomes stunted and is inclined to be shrubby. During the late summer

PLATE 128.

METROSIDEROS POLYMORPHA Gaud.
Ohia Lehua.
From near Kilauea Volcano, Hawaii; belongs to section III. var. *c*; reduced.

months the trees are often loaded with the bright red berries, which are edible, though somewhat insipid. The inflorescence is often monstrously deformed, similarly to that of the *Kalia* tree (*Elaeocarpus bifidus*), the work of a species of Acari.

The wood was used as fuel and also in house-making, while the bark was employed in staining tapa a black color.

METROSIDEROS Banks.

Flowers perigynous. Receptaculum funnel-shaped or campanulate. Calyx-lobes deltoid or obtuse, 5. Petals 5, rounded. Stamens numerous, usually in a row; filaments free, long; anthers elongate, dorsifixed, versatile. Ovary united at the base with the receptaculum, 3-celled. Style very long; stigma simple. Seeds many, covering the whole placenta, only partially fertile; testa thin; embryo straight; cotyledons flat or folded, longer than the radicle.—Trees or shrubs, rarely climbers (in New Zealand). Leaves opposite. Flowers in terminal or axillary cymes.

The genus Metrosideros consists of over 20 species, of which only one occurs in the Cape Colony, one in the Sunda Islands, and the remainder are distributed over Australia and Polynesia. The Hawaiian Islands possess five species, of which one is cosmopolitan (*M. polymorpha*) and occurs here in numerous varieties, while the others are peculiar to the Hawaiian Islands.

This genus furnishes the bulk of the Hawaiian forests; next in number is the *Acacia Koa*.

For the numerous varieties of the *Ohia lehua* the natives of the olden days had many names, as, for example, *Lehua mamo,* an orange yellow flowering *Metrosideros polymorpha*; *Lehua kumakua,* with sessile cordate leaves; *Lehua laulii,* with very small leaves; *Lehua puakea,* with white flowers, and others.

KEY TO THE SPECIES.

Leaves on short petioles.
- Leaves suborbicular, cordate ovate or oblong; capsule almost free.... **M. polymorpha**
- Leaves linear or elliptical, acute at both ends..... **M. tremuloides**
- Leaves rugose and impressed above; capsule adnate to near the apex **M. rugosa**

Leaves on long petioles of 2 to 5 cm.
- Leaves ovate to ovate-oblong; capsule hidden in the calyx tube..... **M. macropus**
- Leaves acuminate-caudate, capsule projecting beyond the calyx-tube **M. tremuloides** var. **Waialealae**

Metrosideros polymorpha Gaud.

Ohia lehua or *Lehua.*

(Plates 127, 128, 129, 130, 131, 132.)

METROSIDEROS POLYMORPHA Gaud. Bot. Voy. Uranie (1826-1830) 482. pl. 108 et 109;—DC. Prodr. III. (1828) 225;—H. et A. Bot. Beech. Voy. (1832) 82;—Endl. Fl. Suds. (1836) 181. no. 1452;—A. Gray Bot. U. S. E. E. (1854) 562;—Seem. Fl. Vit. (1866) 83;—Mann in Proc. Am. Acad. VII. (1867) 166, et Fl. Haw. Isl. Proc. Ess. Inst. V. (1867) 243;—Wawra in Flora (1873) 171;—Mrs. Sinclair Indig. Flow. Haw. Isl. (1885) pl. 2;—Hbd. Fl. Haw. Isl. (1888) 125.—**Metrosideros collina** Gray Bot. U. S. E. E. (1854) 558. pl. 68;—Nadeaud Enum. Tahit. Pl. (1873) no. 484;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 167, et Fl. Polyn. Franc. (1893) 64;—Ndz. in Engl. et Prantl III. 7. (1893) 87.—**M. lutea** Gray Bot. U. S. E. E. (1854) 560 pl. 69. B.—**M. villosa** Smith in Trans.

PLATE 129.

TRUNK OF METROSIDEROS POLYMORPHA Gaud., showing scaly bark and young branches growing from the base of the trunk. In the forests of Kaholuamano, Kauai; elevation 4000 feet.

Linn. Soc. III. (1797) 268.—**M. spectabilis** Gaertn. Fruct. I. (1788) 172, pl. 34. fig. 9;—Sol. Prim. Fl. Ins. Pacif. 263 (ined.) et in Parkins. Draw. Tah. Pl. t. 54.—**M. diffusa** Hook. et Arn. Bot. Beech. (1832) 63, (non Smith).—**M. obovata** Hook. et Arn. Bot. Beech. (1832) 63. pl. 12.—**Melaleuca villosa** Linn. fig. m-p.—**Nania collina** O. K. Rev. Gen. Pl. I. (1891) 242.—**Nania pumila** Heller in Minn. Bot. Stud. Bull. IX. (1897)864.—**Nania glabrifolia** Heller l. c. 866.—**Nania lutea** Heller l. c. 867.—× **Nania Fauriei** Levl. in Fedde Repert. X. 10/14 (1911) 150.—× **Nania Feddei** Levl. l. c. 150.—**N. polymorpha** var. **nummularifolia** Levl. Repert. X. 10/14 (1911) 149.

Branches angular or terete, tomentose or glabrate; bracts of leafbuds short, scarlet, early deciduous; leaves opposite on short or long petioles, lanceolate, oblong, ovate, obovate or orbicular, at the base acute, rounded or cordate, glabrous or tomentose underneath, with faint nerves; flowers in terminal cymose corymbs, pedicellate or subsessile, 3 on a branchlet or peduncle, red, salmon, pink, or yellow, bractlets 3 mm caducous; calyx turbinate, 3 to 5 mm, glabrose or tomentose, with deltoid or rounded lobes; petals 3 to 6 mm, oblong or obovate; capsule semi-adnate, at last almost free, 3-lobed, 3-valved, glabrous or tomentose; seeds linear fusiform.

The numerous varieties of *Metrosideros polymorpha* may be arranged into three sections as follows:

Sect. I. Glabrae.
Leaves glabrous on both sides, calyx also glabrous.
Sect. II. Hemilanatae.
Leaves glabrous on both sides, calyx silvery or whitish tomentose or woolly.
Sect. III. Tomentosae.
Leaves whitish or grayish tomentose, calyx tomentose or woolly.

Sect. I. Glabrae.

α Small plants usually only found at the summit swamps as on Mt. Puukukui, and Mauna Eke on Maui, (no. 8145).

Leaves small cordate, suborbicular, glabrous on both faces, strongly but finely reticulated; calyx glabrous or here and there with a small patch of minute silky pubescence; petals and stamens red, the former slightly ciliate at the margins.

β Trees on the main range of Oahu, at an elevation of 1000-2000 feet. Niu Valley, (no. 4829), Pauoa Valley (no. 1010), Manoa Valley.

Leaves small ovate-elliptical, acute or rounded at the apex, tapering at the base into a somewhat margined petiole; calyx perfectly glabrous, the lobes triangular acute, branchlets red; resembles *M. tremuloides*. Inflorescence occasionally but sparingly sprinkled with a silky pubescence.

γ Large trees, probably the typical *M. polymorpha* on the main range, Koolau Mts. (no. 1279), Oahu; also from Kauai.

Leaves elliptical to ovate-oblong, larger, glabrous on both faces bluntly acute, dark green, with a straight marginal nerve, shortly petioled; calyx and corolla glabrous or very finely pubescent, of a silky white.

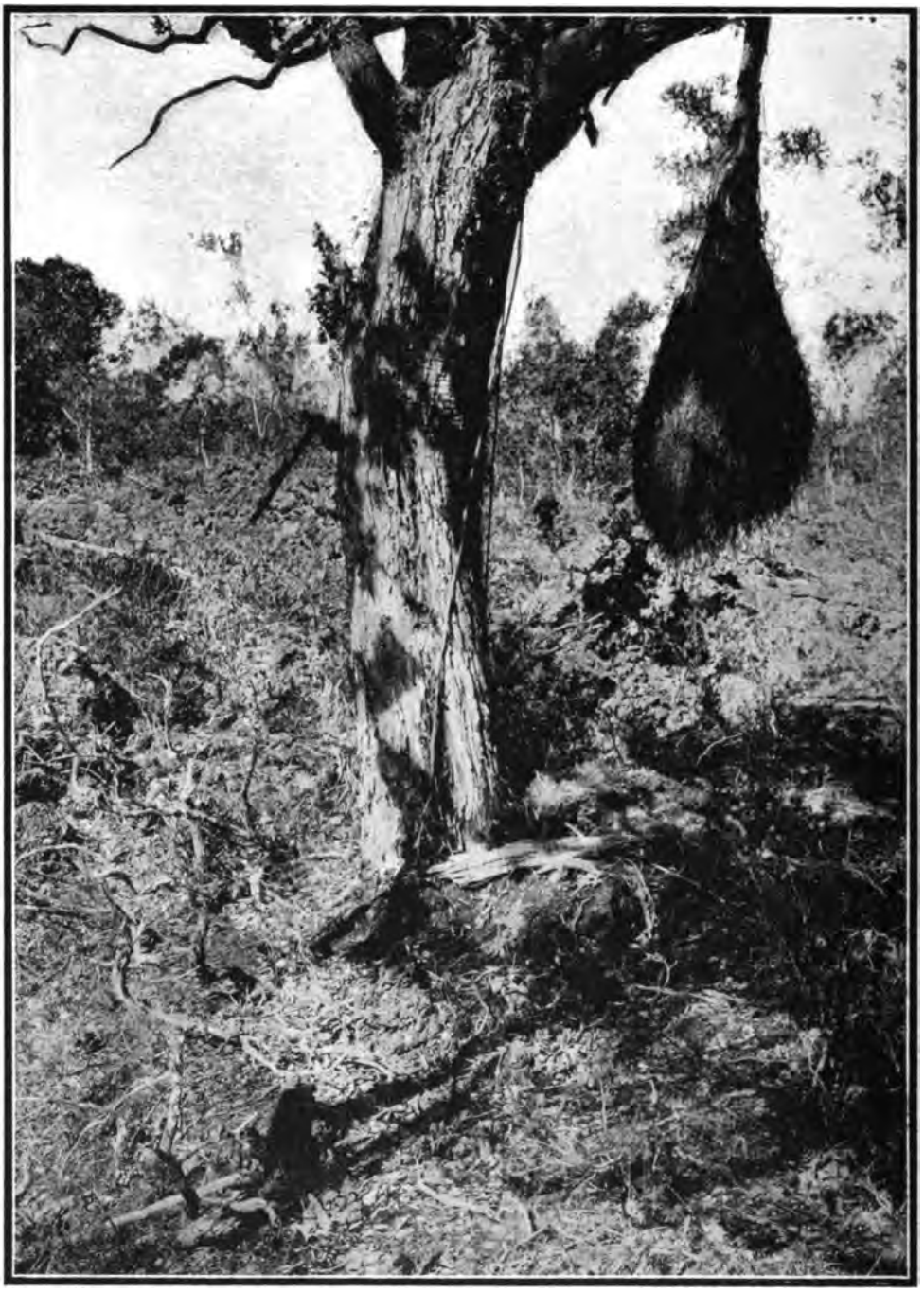
Sect. II. Hemilanatae.

δ Trees or shrubs. Kamoku forest, Molokai, (no. 6181).

Leaves ovate to ovate-oblong, obtuse at both ends, rather large, long petiolate, glabrous on both faces with indistinct marginal nerve; calyx and pedicels densely white tomentose, the rounded sepals green and glabrous, petals red and margins not ciliate.

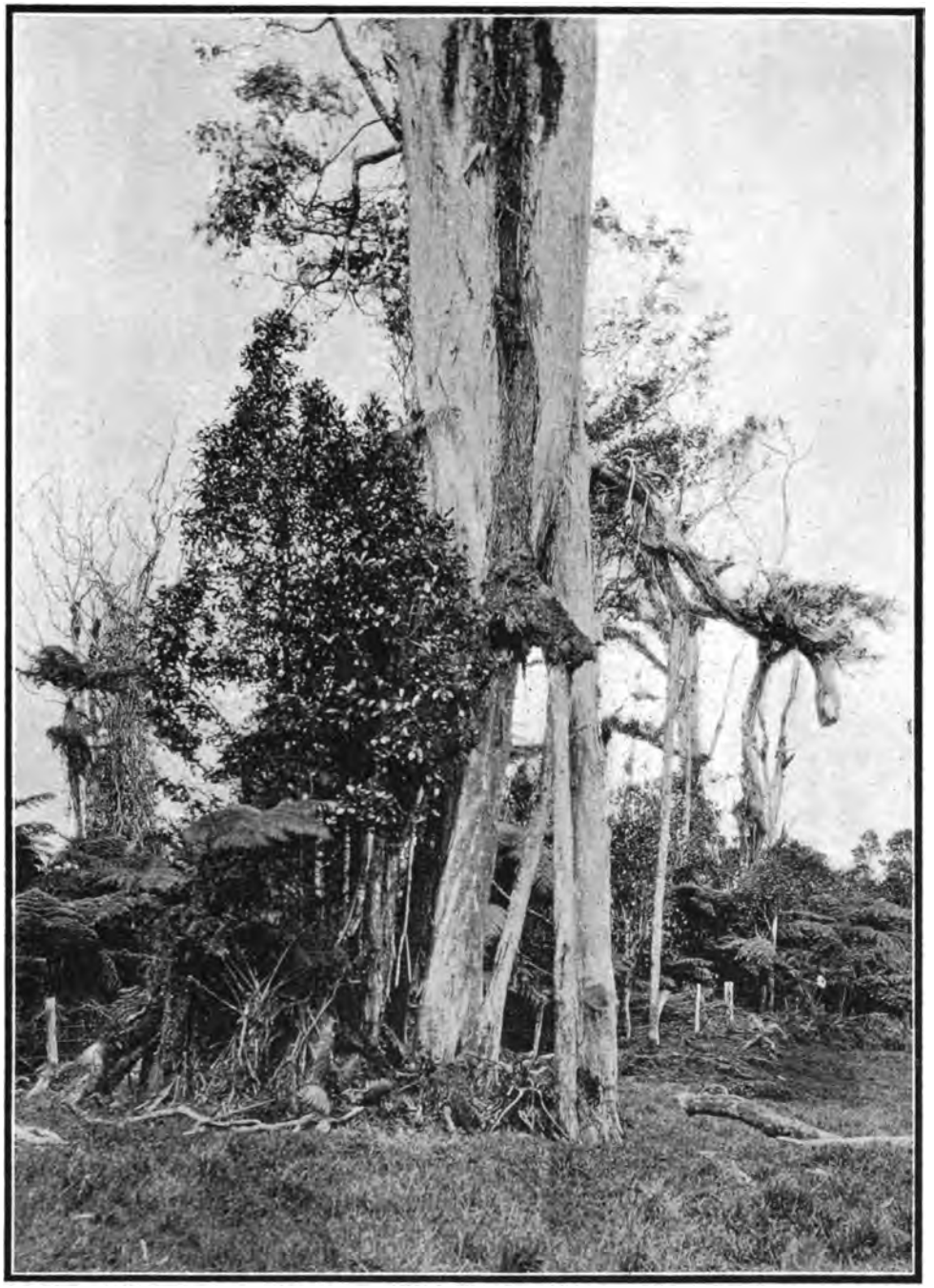
ε Creepers in swampy open places, or bogs, on Molokai, Kawela, (no. 5087 and 6097), resembles var. α sect. I. glabrae.

PLATE 130.



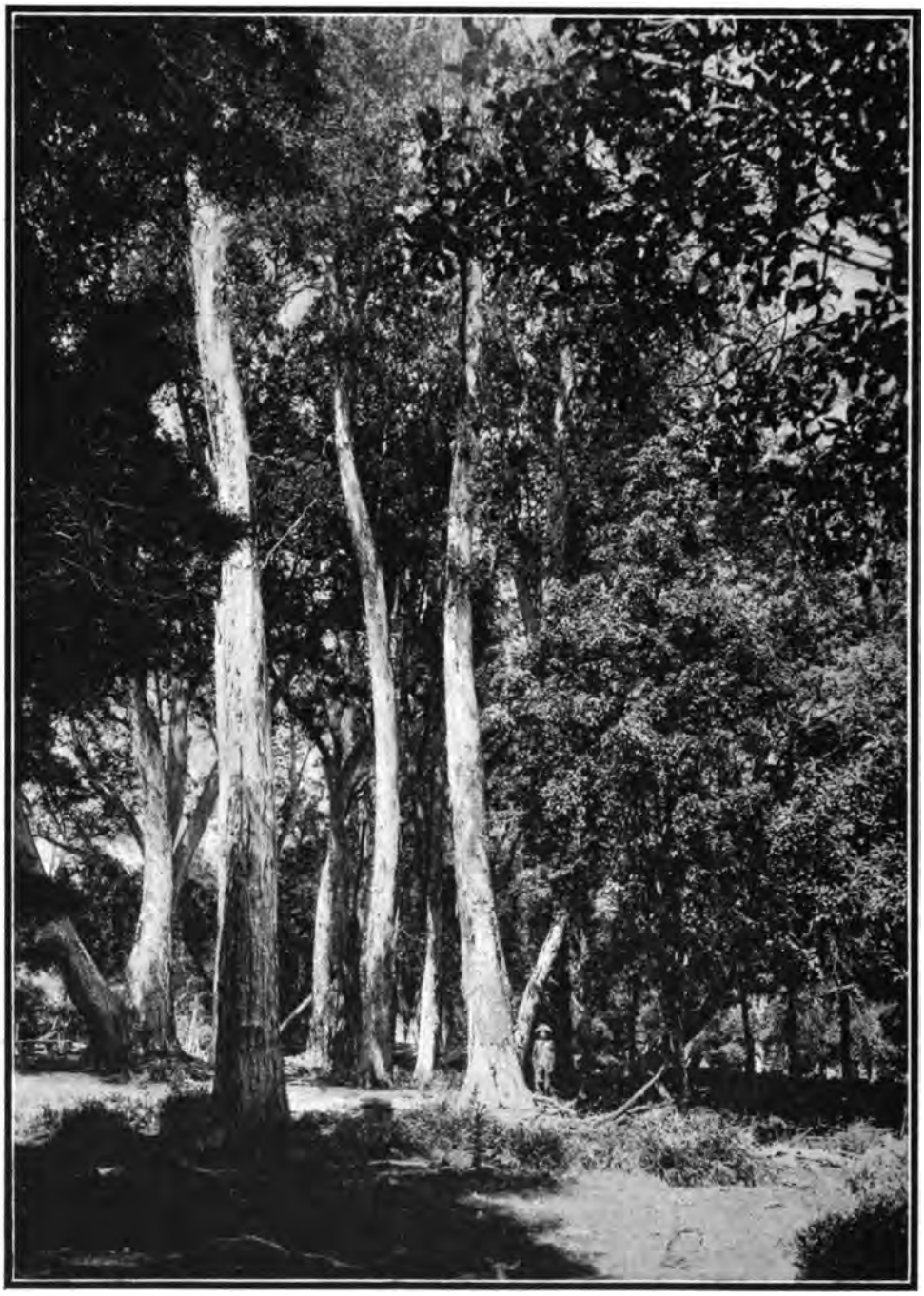
METROSIDEROS POLYMORPHA Gaud.
Ohia Lehua Tree.
Showing large bunch of aerial roots common to this species. Growing on lava fields, Hawaii.

PLATE 131.



STILT-ROOTS OF METROSIDEROS POLYMORPHA Gaud. **Ohia Lehua.** Note the remnants of tree-fern trunk in the upper portion of tree trunk. For explanation see text. Forests near Glenwood, Hawaii; elevation 3500 feet. The tree to the left is **Straussia** sp.

PLATE 132.



GROVE OF METROSIDEROS POLYMORPHA Gaud., **Ohia Lehua**; near the Volcaño of Kilauea, Hawaii, elevation 4000 feet. Some of the trees are nearly 100 feet high.

Leaves small, suborbicular, cordate, subsessile, pale green or yellowish, glabrous on both faces; inflorescence and calyx densely tomentose or white woolly, the lobes green, pubescent, with ciliate margins, red-punctate on the outer face, petals glabrous; leaves often slightly pubescent when young.

ζ Large trees found on Kauai, above Waimea, (no. 2044).

Leaves large, ovate oblong, shortly petiolate, the petioles and part of leaf-midrib pubescent, thick coriaceous, subcordate at the base; young branches and inflorescence covered with a white pubescence; calyx, sepals and petals white tomentose or woolly, the latter showing the red through the white pubescence, the margins white ciliate.

η Trees, at high elevation 6000-7000 feet. Mt. Haleakala, Maui, (no. 8593).

Branches stout, stiff and gnarled, scaly; leaves small, thick coriaceous, suborbicular, cordate, sessile, or auriculate at the base; inflorescence densely and thickly white woolly, as are the pedicels and calyx lobes, petals red, glabrous, the margins only white ciliate.

θ Trees, main ridge of Mahana, Lanai, (no. 8055).

Leaves ovate, or suborbicular, cordate at the base, thin, subcoriaceous, entirely glabrous on both faces, very shortly petiolate; calyx slightly or thinly pubescent, of a dark silvery or dirty gray color, sepals green and puberulous or glabrous; petals and stamens yellowish, or salmon pink, the former glabrous with slightly ciliate margins; here also belongs a form with longer petiolate leaves, which are suborbicular and cordate, pale green; calyx and sepals densely white woolly, petals large, yellow, glabrous, with ciliate margins; the petioles pubescent.

Sect. III. Tomentosae.

ι Trees at 4000-9000 feet elevation Kilauea, Hawaii, also Oahu, Pauoa Valley (no. 722); Hualalai, Hawaii (no. 3626).

Leaves large orbicular, cordate at the base, coriaceous, glabrous above, or finely pubescent, tomentose underneath of a dirty gray color, petioles short, tomentose, inflorescence and calyx pubescent; often yellow flowered.

κ Creepers from the summit swamp of Kohala, Hawaii, (no. 8414).

Leaves small, orbicular, emarginate at the apex, cordate at the base, sessile, glabrous above, densely covered underneath with a yellow strigose pubescence; inflorescence, calyx and sepals with yellowish strigose hairs, petals red, slightly pubescent, margins ciliate.

The *Ohia lehua* is the most prevalent tree in the forests of the islands of the Hawaiian archipelago. It can be found from sea-level to an elevation of 9000 feet. It certainly deserves its specific name *polymorpha* as it is the most variable tree which the Islands possess. On the summits of Kohala, Hawaii, Mt. Waialeale on Kauai, and Puukukui, West Maui, which have an elevation ranging from 5000-5600 feet, it is a creeper, only a few inches in length, though flowering. It grows in company with native violets, geraniums and sundews (*Drosera longifolia*) while in the middle forest zone it becomes a giant of often 100 feet in height, with a trunk of several feet in diameter. At the seashore, as for example at Napoopoo, Hawaii, it is a stunted gnarled tree 10-15 feet in height growing on ancient *pahoehoe* lava in company with *Reynoldsia sandwicensis*, the *Ohe kukuluaeo* of the natives, and other trees. On the windward side of Hawaii, not far from Hilo, it covers the vertical cliffs down to the water's edge, but does not attain any size. Its best development and the largest forests composed of this tree are found on the volcanic slopes of Mauna Loa and Mauna

PLATE 133.

METROSIDEROS TREMULOIDES (Heller) Rock.
Lehua Ahihi.
Flowering branch, one-half natural size.

Kea, on the island of Hawaii, and it is there that the trees reach their biggest size.

On Hawaii the *Ohia lehua* is usually associated with the tree ferns, the *Hapu* and *Hapu Iii* (which see). In such forests, the seeds of the *Ohia* trees fall on the moist woolly trunks of the tree ferns; there they germinate. At first the young tree finds enough nourishment in the humus, dead leaves, etc., which collect in the axils of dead fern leaves all along the tall fern trunks, but finally it sends its roots down along the fern trunks into the ground. As the tree grows larger and taller, the fern becomes enclosed between the stilt-like roots of the *Ohia* tree, until finally the fern dies and decays, leaving the stilt roots standing some 15-20 feet above the ground, after which the real trunk of the tree commences. Such stilt-like *Ohia* trees are very common in the Hawaiian forest, but mainly on Hawaii. The accompanying illustration shows an *Ohia* tree with stilt-roots between which remnants of a decayed tree-fern trunk are still visible.

The wood of the *Ohia lehua* is of a dark reddish color, durable, hard and equal in strength to the Oak. It was employed by the natives for the carving of their idols, spears, mallets, etc., but is used now for paving-blocks, flooring, and interior house finishings. Mills have been erected on Hawaii at Pahoa where lumber is turned out at a profit. Several railroads, especially the Santa Fé railroad of the mainland, have ordered large shipments of *Ohia* ties.

The flowers of the *Ohia lehua* are of a bright red, pale yellow to orange yellow and pink-salmon, while some are even white. They are the source of food for some of the native birds, as the *Iiwi* and *Olokele*, both of which possess a bright red plumage, matching the scarlet *Lehua* blossom while flitting from flower to flower for their honey.

The name *Lehua* is an interesting one. *Lehua* in everyday language means "hair." It was undoubtedly applied to the tree in question on account of the numerous long red stamens resembling fine hair, which makes the *Ohia lehua* flower attractive.

The tree in its various forms is not peculiar to Hawaii, but is well distributed over Polynesia and New Zealand, where the tree is known as *Rata* and *Pohutukawa*. It has the most numerous varieties, however, in the Hawaiian Islands. A number of species have been described from other islands of the Pacific, which later turned out to be identical with the *Ohia lehua*.

Metrosideros tremuloides (Heller) Rock.

Lehua ahihi.

(Plate 133.)

METROSIDEROS TREMULOIDES (Heller) Rock comb. nov.—**Nania tremuloides** Heller in Minnes. Bot. Stud. Bull. IX. (1897) 866.—**Metrosideros polymorpha** Gaud. var. ? Hbd. Flora Haw. Isl. (1888) 127.

A small tree, with slender trunk and smooth grayish bark, glabrous throughout, even the inflorescence; branches slender, loosely spreading; leaves narrowly lanceolate, acute or acuminate at both ends, bright green, shining above, paler underneath, coriaceous, on

PLATE 134.

METROSIDEROS RUGOSA A. Gray.
Lehua papa.
Two-thirds natural size.

flat slightly winged petioles of about 6 mm in length, not prominently veined, but midrib conspicuous; cyme branches divaricate, peduncles slender of varying length though hardly longer than 10 mm; pedicels half the length; calyx campanulate, the lobes rounded and equaling the tube in length, margins scarious; petals, bright red, almost orbicular twice the length of the calyx lobes, stamens bright red, barely 2 cm in length, capsule half free.

The *Lehua ahihi* is one of the handsomest species of the genus Metrosideros. The fine bright green graceful foliage stands quite distinct from all the other species and varieties and certainly deserves specific rank. It can be found on Oahu at the lower elevation around Tantalus back of Honolulu, and in nearly all the neighboring valleys on their upper slopes at about 1000-2000 feet elevation. When in full flower the slender branches are drooping and almost continually in motion, whence its specific name.

Var. **Waialealae** Rock. var. nov.

Leaves larger, bright green above pale underneath, with bright red midrib and leaf-margin, 5 to 7 cm long, 2 to 2.5 cm wide, coriaceous, acute at the base, acuminate-caudate at the apex, the apex curved, the bright red petiole 15 to 20 mm long, flat and somewhat margined; flowers as in the species; fruits very large, the same size as in **M. macropus**, the calyx-lobes persistent but the capsule projecting almost its whole height beyond the calyx, almost free; seeds linear, lunulate, pointed at each end.

This variety is peculiar to the summit ridge of Mt. Waialeale on Kauai, where it was observed and collected by the writer. It certainly is the most beautiful Metrosideros or *Ohia lehua* known to him. It only grows at a certain ridge at the summit of the mountain of Kauai where it forms pure stands with hardly any other tree around it. It is a small tree 25 feet high. Collected flowering and fruiting Sept. 24, 1909, Mt. Waialeale, Kauai, elev. 5200 feet, type no. 5083, in College of Hawaii Herbarium.

Metrosideros rugosa Gray.

Lehua papa.

(Plate 134.)

METROSIDEROS RUGOSA Gray Bot. U. S. E. E. (1853) 561. t. 69 B.;—Mann in Proc. Am. Acad. VII. (1867) 166, et Haw. Isl. (1867) 244;—Wawra in Flora (1873) 173;—Hbd. Fl. Haw. Isl. (1888) 127;—Niedz. in Engl. et Prantl Pflzfam. III. 7. (1893) 87.—**Metrosideros polymorpha** Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 167 (ex parte).—**Nania rugosa** Kuntze Rev. Gen. Pl. (1891) 242;—Heller in Minnes. Bot. Stud. Bull. IX. (1897) 864.

A small tree or shrub, with quadrangular branchlets, only the ultimate ones tomentose; leaves orbicular, about 2.5 cm in diameter, thick and coriaceous, strikingly rugose above and deeply impressed along the veins, which are remarkably strong and ridged underneath, the under-surface thickly tomentose with a ferruginous wool as are the leaf-buds on both faces, the petiole scarcely 2 mm; cymes small, solitary or in pairs at the summit of the branches, the peduncles and their divisions short and stout, thick tomentose, the whole subtended by rather conspicuous and coriaceous bud-scales; bractlets as long as the calyx, oval tomentose, soon deciduous; flowers subsessile, about as large as in the common species; calyx tomentose; petals and stamens red, the former pubescent; ovary deeply immersed in the tube of the calyx, its summit only free.

This species, which is called *Lehua papa* by the natives, is peculiar to the Island of Oahu, where it can be found at the summits of the ridges of the main

range, and on the vertical cliffs or *pali* on the windward side of the island. It certainly is quite distinct from the ordinary *Ohia lehua* and can be distinguished from it at a glance by the deeply rugose small leaves. It is never a large tree, but only of about 10-15 feet in height or more often a shrub. Flowering, Koolau Mts. Punaluu, Nov. 14-21, 1908. no. 294, College of Hawaii Herbarium.

Metrosideros macropus Hook. et Arn.

Ohia lehua.

METROSIDEROS MACROPUS Hook. et Arn. Bot. Beech. (1832) 83;—Endl. Fl. Suds. in Ann. Wien. Mus. (1836) 181, no. 1453;—Gray Bot. U S. E. E. (1854) 564. t. 70;—Mann in Proc. Am. Acad. VII. (1867) 166, et Fl. Haw. Isl. (1867) 244;—Wawra in Flora (1873) 172;—Hbd. Fl. Haw. Isl. (1888) 127;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 168;—Ndz. in Engl. et Prantl Pflzfam. III. 7. (1893) 87.—**Nania macropus** O. Kuntze Rev. Gen. Pl. (1891) 242;—Heller in Minnes. Bot. Stud. Bull. IX. (1897) 865.

A well proportioned tree glabrous throughout; the branchlets angled; leaves ovate or ovate-oblong, coriaceous rather dull, acute at the base, copiously feather-veined; petioles 2.5 to 5 cm long usually margined, and standing nearly at right angles to the stem; cymes terminal usually geminate, subsessile, many-flowered, crowded, evolved from a large scaly bud, the scales of which remain persistent for some time as ovate or oblong pointed bracts, 12 mm in length; pedicels about 4 mm long, subtended by similar smaller ovate lanceolate bractlets which are deciduous; flowers larger than in the largest flowered forms of *M. polymorpha*; petals and stamens red or yellow, ovary three-celled, free nearly to the middle; capsule nearly included in the turbinate tube of the calyx, of which the lobes are persistent, free to the middle, three-valved, many seeded; seeds fusiform, subulate, not much pointed.

This species is peculiar to the Hawaiian Islands and differs from the cosmopolitan *M. polymorpha* in the long petioled leaves, large floral scales, and much larger flowers. It is a tree of considerable size and can be found in the mountains of Oahu on the main Koolau range, as well as on Molokai and on Kauai.

Hybrids of this and the cosmopolitan species can be met with wherever they occur together.

ARALIACEAE.

The family Araliaceae, which is chiefly tropical, consists of 51 genera and numerous species. In Polynesia it is represented by the genera Plerandra, Reynoldsia, Meryta, and others; while in Hawaii, the most northern islands of Polynesia, it has two endemic genera, Pterotropia and Cheirodendron, besides several species of Tetraplasandra, which now includes also Triplasandra, which genus has been merged into the former by Harms. The genus Tetraplasandra is not peculiar to the islands, as it has two species which occur outside of Hawaii, one in New Guinea and the other in Celebes. Reynoldsia, which is represented in Hawaii by one species, has also one species in the Society Islands and one in Samoa.

KEY TO THE GENERA.

Leaves pinnate, alternate.
  Leaflets entire:
    Leaflets 13-21, flowers racemose umbellate, arranged in a long drooping panicle . . .. **Pterotropia**
    Leaflets 5-13, inflor. racemose-umbellate or umbellate and paniculate . . .. **Tetraplasandra**
  Leaflets sinuate crenate..... **Reynoldsia**
Leaves digitate, opposite..... **Cheirodendron**

TETRAPLASANDRA A. Gray.

(Triplasandra Seem.)

Calyx border undulate or denticulate, petals 5 to 8, valvate in the bud. Stamens as many as petals or 2 to 3 times or even 6 times as many, arranged in 1 or 4 series, with rather thick filaments and ovate or lanceolate anthers. Ovary quite inferior, ovate, 13-7-5-2 celled. The stigmas on a short stylopod or subsessile; drupes globose to ovate-elongate or cylindrical, with a somewhat fleshy covering. Pyrenae chartaceous, crustaceous or coriaceous, compressed. Seeds often ribbed or furrowed. Unarmed glabrous or tomentose trees or shrubs with a glutinous sap. Leaves large, alternate impari-pinnate, with 5 to 13 entire leaflets; petiolule of the terminal leaflet usually articulate. Stipules wanting or rudimentary. Inflorescence a racemose umbellate panicle or a simple or compound umbel; bracts caducous, small or larger; peduncles not articulate, often very thick.

The genus Tetraplasandra derives its name from the Greek τετραπλασιος (tetraplasios), fourfold, and ανδρα (andra), stamens, having four times as many stamens as petals. It consists of possibly 12 species, two of which are not found in the Hawaiian Islands; *T. paucidens* Miq. occurs in New Guinea, while *T. Koerdersii* Harms is found in Celebes. Of Hawaiian species, only two were described originally, *T. hawaiiensis* A. Gray and *T. Waimeae* Wawra. All the species of Triplasandra (established by Seeman) have been merged into Tetraplasandra by H. Harms. The writer has since added two new species: *T. Lanaiensis* and *T. Waialealae.*

KEY TO THE SPECIES.

I. **EUTETRAPLASANDRA.** Stamens 2-6-8 times as many as petals.
  Leaves tomentose underneath.
    Inflorescence paniculate.
      Stamens 4 times as many as petals..... **T. Hawaiiensis**
  Leaves glabrous underneath.
    Inflorescence umbellate.
      Stamens numerous, 6-8 times as many as petals... **T. Waimeae**
    Inflorescence compound umbellate.
      Stamens 4 times as many as petals; ovary 6 celled.. **T. Waialealae**
      Stamens twice as many as petals; ovary 3 celled... **T. Lanaiensis**
      Stamens 2-3 times as many as petals.
        Drupe ovoid with conical vertex..... **T. Lydgatei**
        Drupe cylindrical truncate.
          Stamens 10-15; ovary 5-6 celled..... **T. Oahuensis**
          Stamens 12-18; ovary 4-3 celled..... **T. Kaalae**

II. **NOTHOTETRAPLASANDRA.** Stamens as many as petals, 5-8; ovary, 5-2 celled.
  Inflorescence umbellate or compound umbellate..... **T. meiandra** and varieties

PLATE 135.

TETRAPLASANDRA HAWAIIENSIS A. Gray.
Ohe.

Showing fruiting branch and flower buds pinned against trunk of tree, bark in the dry districts rough and scaly. South Kona, lava fields of Kapua; elevation 1200 feet.

Tetraplasandra hawaiiensis A. Gray.

Ohe.

(Plate 135.)

TETRAPLASANDRA HAWAIIENSIS A. Gray Bot. U. S. E. E. (1854) 728, t. 94;— H. Mann. Proc. Am. Acad. VII. (1867) 169;— Hbd. Fl. Haw. Isl. (1888) 154;— Del. Cast. Ill. Fl. Ins. Mar. Pacif. VI. (1890) 183;—Harms in Engler et Prantl Pflzfam. III, 8 (1898) 30, Fig. 2, g-h.

Branchlets with the leaf-stalks, inflorescence and the exterior of the flowers canescent with a soft tomentum; leaves alternate, exstipulate, 3 to 4.5 cm long, pinnately 5 to 7 foliolate; leaflets oblong or elliptical 10 to 17 cm long and 5 cm or more in width, obtuse at both ends, entire, coriaceous, glabrous above, densely canescent-tomentose underneath, the ribs hirsute; peduncle terminal stout, bearing an ample and open panicle of compound or decompound umbels; peduncles and pedicels articulate, densely tomentose; calyx tube cup-shaped, the truncate limb very short, entire; petals 5 to 8 tomentose as is the calyx, cohering at the apex, 6 to 8 mm long; stamens 4 times as many as petals or less in one circle, recurved; ovary 7 to 13 celled; the apex crowned with a short and conical stylopod which bears an obscurely 7 to 13 rayed stigma; ovules solitary; fruit a globose baccate drupe 1 cm in diameter, many ribbed when dry, containing 7 to 13 flat chartaceous compressed pyrenae.

The *ohe*, not to be mistaken for the *ohe* of the lowlands, is a beautiful tree with a broad, flat crown reaching a height of 40 to 80 feet, with a trunk of 1 to 2 feet or more in diameter. The writer met with huge trees in Kona, Hawaii, in the semi-wet forest, overtowering the tallest *Ohia* trees. The bark is whitish and more or less smooth.

It can be distinguished from afar on account of its large pinnate leaves, which are 1 to 1½ feet long, having from 5 to 9 oblong leaflets, which are light-green above and pale-ocher colored underneath, due to a dense tomentum. The flowering panicles are often more than one foot long, bearing umbellate racemes along umbellate and racemose tertiary and secondary branches. The globose fruits become many-ribbed when dry.

The *ohe* inhabits the drier as well as very wet regions and is not uncommon in the valley of Wailau, Molokai, where it grows on the steep pali or cliff covered with tropical verdure. On Lanai, from which island it had not been been recorded previously, it can be found near the summit ridges of Haalelepakai and Lanaihale, at an elevation of 3000 feet, and also on Mahana ridge.

On Maui it growes above Kaanapali, and on Hawaii it is found in the rain forests of Puna and semi-wet forests of South Kona, together with Xylosma, Pelea, etc.

Its associates are usually species of Straussia, Bobea, Metrosideros, Cheirodendron, and such as are peculiar to the rain forests.

Tetraplasandra Waimeae Wawra.

Ohe Kikoola.

(Plate 136.)

TETRAPLASANDRA WAIMEAE Wawra in Flora (1873) 158;—Hbd. Fl. Haw. Isl. (1888) 155;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VI. (1890) 184;— Heller Pl. Haw. Isl. (1897) 871;—Harms in Engl. et Prantl Pflzfam. III, 8 (1898) 30.

Leaves 30 to 45 cm long, leaflets 5 to 13, oblong or ovate-oblong, 10 to 15 cm long, 3.5 to 5 cm wide, on petioles of 12 to 18 mm, obtuse with rounded, the laterals ones with unsymmetrical, bases, chartaceous to coriaceous, glabrous; inflorescence a terminal umbel of

PLATE 136.

TETRAPLASANDRA WAIMEAE Wawra.
Ohe kikoola.
Growing in the mountains of Kauai in the forest of Kaholuamano; elevation 3600 feet.

10 to 12 rays, with or without a short common rhachis, each 10 to 15 cm long and bearing at its apex an umbel of 15 to 30 flowers on thick and long pedicels of 2.5 to 5 cm; calyx 8 to 12 mm long broad tubular, slightly constricted below the wavy denticulate border; petals 7 to 8, triangular lanceolate, 12 mm long, pink or reddish, coriaceous, glabrous, at last expanded, the open corolla measuring sometimes 3.5 cm in diameter, the largest in the genus; stamens 6, 7 or 8 times as many as petals, 8 to 10 mm long, in two rows; ovary 6 to 8 celled, the stigma on a short stylopod of 1 mm; drupe globose, about 3 cm or often more in diameter, somewhat fleshy, strongly ribbed when dry; pyrenae compressed, thick coriaceous, deeply notched at the upper inner angle, and with two prominent ridges on each side.

The *Ohe kikoola* is a medium-sized tree with an erect trunk of 30 to 40 feet in height and a diameter of a foot or more. The erect bole is vested in a grayish-white smooth bark. It divides very sparingly near the top into rather short ascending branches, which bear large leaf whorls at the apex. The leaves are over a foot long and consist of 5 to 13 leaflets. The inflorescence is a terminal umbel of several rays, bearing at its apex peculiar rose-colored flowers, which are the largest in the genus, measuring an inch or more in diameter. The drupe is globose, an inch or more across, somewhat fleshy, and becomes ribbed on drying.

The tree is peculiar to the Island of Kauai, where it grows on the leeward side above Waimea at an altitude of 3600 feet, in the drier forest or outskirts of the woods around Kaholuamano. It is associated with *Cyanea leptostegia, Cryptocaria Mannii, Bobea Mannii, Sidero ylon sandwicense, Elaeocarpus bifidus,* etc. It also is not uncommon at Halemanu, where it was first collected by Dr. Wawra of the Austrian Exploring Expedition ship "Donau," and named by him after the district of Waimea.

The wood is whitish, of a silky, wavy green, and of medium strength.

Tetraplasandra Waialealae Rock.

TETRAPLASANDRA WAIALEALAE Rock Coll. Haw. Publ. Bull. 1. (1911) 10, pl. I.

Leaves 30 to 45 cm long; leaflets oblong acuminate thick coriaceous, unevensided at the base, otherwise rounded; inflorescence a terminal compound umbel of usually 4 peduncles, each about from 7 to 10 cm long, bearing 6 rays about 6 cm long, each bearing an umbel of 2-5 pedicels about 2 cm long; calyx tubular purplish-black with an undulate border; petals 5 to 7, triangular, thick, with a prominent median nerve, glabrous; stamens in two circles, four times as many as petals; ovary 6 celled; stigma on a conical stylopod of 5 mm.

This remarkable tree, which as far as is known has no native name, is of rather small size, 15 to 25 feet high, with sub-erect long branches, bearing, crowded at their ends, irregularly pinnate leaves. The leaflets are dark-green and glossy; the trunk is rather short, is vested in a white bark, and is about 6 to 8 inches in diameter.

The inflorescence is compound umbellate, not as large as that of the *Ohe kikoola,* but is also terminal.

This interesting tree, which the writer discovered on the summit of Mt. Waialeale, on Kauai, 5200 feet elevation, was named by him after that wonderful mountain. Unlike the *Ohe kikoola,* which grows in the dryer forest on Kauai back of Waimea, it inhabits the high summit swamp, where the rainfall is immense. This swamp is enshrouded by clouds nearly all the year round, and is swept by the strong trade winds for over nine months of the year.

PLATE 137.

TETRAPLASANDRA MEIANDRA (Hbd.) Harms. var. γ.
Flowering and fruiting branch pinned against trunk of tree. Growing at Puuwaawaa, North Kona, Hawaii, elevation 2800 feet. Trunk about a foot in diameter.

Tetraplasandra Waialealae is really the only tree of any size at the summit, where the rest of the vegetation is stunted. It is associated with *Pelea Waialealae*, the *Anonia* of the natives, *Lagenophora mauiensis*, *Sanicula sandwicensis* var., *Lobelia kauaiensis*, *Lobelia macrostachys* var., *Drosera longifolia*, *Dubautia Waialealae*, *Geranium humile* var. *Kauaiense*, etc.

It is the second species of Tetraplasandra which has been so far recorded from Kauai, and is peculiar to Waialeale, though it may be found along the Kaluiti and Kailiili streams a little below the summit. The wood is soft and white.

Tetraplasandra Lanaiensis Rock.

TETRAPLASANDRA LANAIENSIS Rock. Coll. Haw. Publ. Bull. 1. (1911) 12, pl. 2.
Leaves 30 to 38 cm long, leaflets 5 to 7, oblong obtuse or bluntly acuminate, unevensided at the base, midrib prominent, 8 to 10 cm long, 4 to 5 cm wide, dark green above, light underneath, the terminal leaflet on a petiolule of 4 cm which is articulate near the blade, the lateral ones on petiolules of 1 to 1.5 cm, subcoriaceous; inflorescence thrice umbellate, not erect, but drooping, the 3 to 5 peduncles on a common rhachis of about 2.5 cm, about 20 cm long, bearing umbels of 17 to 21 slender droopings rays of 8 to 10 cm length, these again umbellate with 7 to 13 pedicels; calyx tubular 6 mm with a denticulate border, petals 5 to 6, lanceolate, greenish-yellow, 7 mm long, stamens twice as many as petals, ovary 3-celled, stigmas sessile.

This tree was discovered by the writer on the Island of Lanai and described by him under the above name. It is rather small, only about 20 feet high, with a trunk of a few inches in diameter. It branches irregularly, and as it was crowded in with other trees it was impossible to form an idea of its general aspect.

It is remarkable in the genus Tetraplasandra for its large inflorescence, which, instead of being erect, is drooping, and for its very small flowers. The leaves are dull and of a light-green color, making the tree quite conspicuous among the dark-leaved Maba, Suttonia, and Sideroxylon, with which it is associated. The tree is peculiar to the Island of Lanai and was seen only in Kaiholena Valley, crowded by other trees at an elevation of 2000 feet. Kaiholena Valley, belonging to the drier regions of Lanai, is extremely interesting and harbors a very multiformous tree flora.

Tetraplasandra Lydgatei (Hbd.) Harms.

TETRAPLASANDRA LYDGATEI (Hbd.) Harms in Engl. et. Prantl Pflzfam. III. 8 (1898) 20.—**Triplasandra Lydgatei** Hbd. Fl. Haw. Isl. (1888) 153;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VI (1890) 184.

Leaves 20 to 30 cm long; leaflets 5 to 9 on petioles of 8 to 16 mm, oblong 7.5 to 9 cm long, 2.5 to 4 cm, obtuse and slightly emarginate, contracting at the base, thin chartaceous; inflorescence compound-umbellate from a short common rhachis of about 12 mm, the 4 or 5 slender peduncles bearing umbels of about 12 slender pedicels of 16 to 18 mm; calyx broad obconical, 5 mm, with an undulating border; petals 5, cohering at their apices, 6 mm; stamens 12, about 1/3 shorter, with straight or recurved anthers; ovary 4 celled, inferior, the disk slightly raised, with sessile stigmas; drupe ovoid-globose, 8 to 10 mm in diameter, obtusely 4 angled, the short conical apex finally elongated into a short stylopod.

PLATE 138.

TETRAPLASANDRA MEIANDRA (Hbd.) Harms. var. δ
Flowering branch pinned against trunk of tree. Growing on the lava fields of Auahi, East Maui, southern slopes of Haleakala, elevation 3000 feet. Diameter of trunk 2 ft.

This species, which like the two following has no native name, is a small tree originally found by John Lydgate in the valley of Wailupe on Oahu, and resembles somewhat *Pterotropia gymnocarpa* from the same mountain range.

It has not been collected by the writer, and as there are no specimens of this plant in herbaria in the Territory of Hawaii, the above short description will have to suffice.

Tetraplasandra oahuensis (A. Gray) Harms.
Ohe mauka.

TETRAPLASANDRA OAHUENSIS (A. Gray) Harms in Engl. et Prantl Pflzfam. III, 8 (1898) 30.—**Gastonia? oahuensis** A. Gray U. S. E. E. (1854) 726.—H. Mann Proc. Am. Acad. VII (1867) 169.—**Triplasandra Oahuensis** Seem. in Journ. Bot. VI (1868) 139;—Hbd. Fl. Haw. Isl. (1888) 153;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VI (1890) 184.

Leaves about 3 cm long; leaflets 7 to 13, ovate or broad oblong, 5.5 to 8.5 cm long, 2.5 to 5 cm wide, on petiolules of 3 to 6 mm, obtuse, coriaceous glabrous; inflorescence compound umbellate, 3 to 5 peduncles, 5 to 7.5 cm long, either free or united on a short rhachis of about 12 mm, each bearing an umbel of 16 to 20 pedicels of 12 mm in length; calyx cylindrical 4 to 6 mm; petals 5 to 6, about 6 mm long; stamens 10 to 15, half as long as the petals, with recurved anthers; ovary 5 to 6 celled; drupe ovoid or short cylindrical, 6 to 8 mm, inferior 5 to 6 ribbed or angled, truncate, the stigmas on a short stylopod.

This species and a variety ♂ occur on the Island of Oahu on the slopes of Waiolani and Konahuanui back of Honolulu. It differs from the foregoing species mainly in the drupe, which is cylindrical and truncate, while the former has ovoid drupes with conical vertices.

It is a small tree about 20 feet in height and is peculiar to Oahu. The writer observed several trees at the head of Pauoa Valley and on the slopes of Konahuanui. It is sparingly branching about 6 feet above the ground; the trunk is vested in a gray, smooth bark, and is about 6 to 8 inches in diameter. According to Horace Mann, its native name is *Ohe mauka* or the mountain *Ohe,* while *Reynoldsia sandwicensis* is *Ohe makai;* the latter, however, is also known as *Ohe kukuluaeo.*

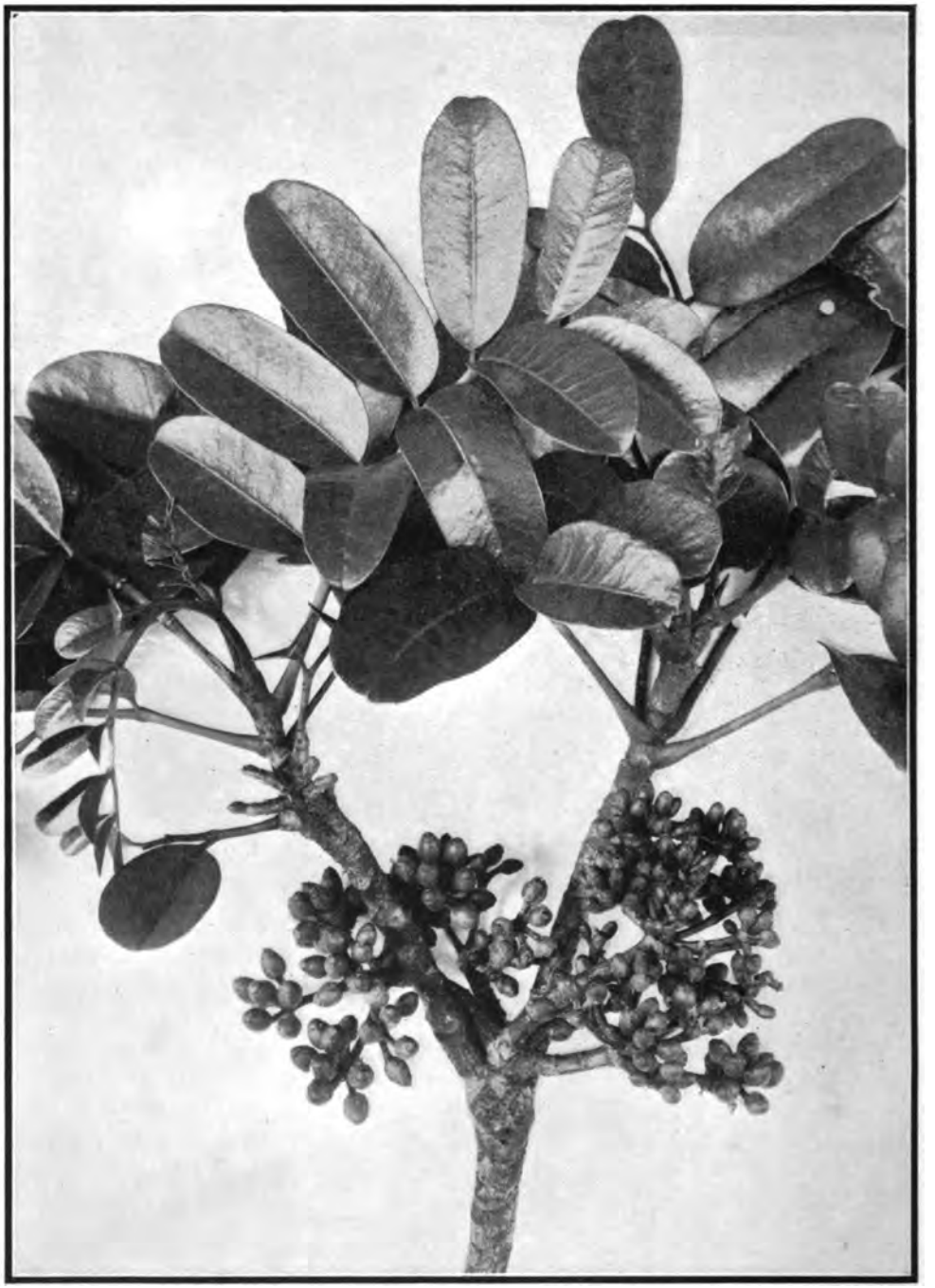
Tetraplasandra Kaalae (Hbd.) Harms.

TETRAPLASANDRA KAALAE (Hbd.) Harms in Engl. et Prantl Pflzfam. III, 8 (1898) 30.—**Triplasandra Kaalae** Hbd. Fl. Haw. Isl. (1888) 154;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VI (1890) 184.

Leaves about 3 dm long, with widely clasping base, leaflets 7 to 11, ovate or ovate-oblong. 7.5 to 10 cm long, 5 to 7.5 cm wide, on petiolules of 12 to 24 mm, obtusely acuminate, rounded and unsymmetrical at the base, thick coriaceous, glabrous underneath, dark green; inflorescence thrice umbellate, 3 to 5 peduncles rising from a short common rhachis, each 4 to 6.5 cm long, with an umbel of about 12 rays of 2.5 to 3.5 cm or more long, these again umbellate with 10 to 12 pedicels of 8 to 12 mm; calyx obconical, glabrous, 2 mm; petals 6 at last expanded, 6 to 8 mm; stamens three times as many as petals or less, 18 to 12; ovary 4- rarely 3-celled; stigmas sessile on a conical apex.

This tree was first collected by Hillebrand on the summit of Mt. Kaala of the Waianae range on Oahu at an elevation of 4000 feet. It is, like the two foregoing species, a small tree 12 to 16 feet in height and of no economic value.

PLATE 139.



TETRAPLASANDRA MEIANDRA (Hbd.) Harms. var. ζ.
Fruiting specimen, much reduced.

Tetraplasandra meiandra (Hbd.) Harms.

(Plates 137, 138, 139.)

TETRAPLASANDRA MEIANDRA (Hbd.) Harms in Eng. et Prantl Pflzfam. III, 8 (1898) 30.—**Triplasandra meiandra** Hbd. Fl. Haw. Isl. (1888) 152;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VI (1890) 184.—**Triplasandra Waimeae** (Wawra) Heller Pl. Haw. Isl. (1897) 871.—**Heptapleurum (?) Waimeae** Wawra in Flora (1873) 158. (Wawra's specific name Waimeae should hold good on account of priority, but as there is already a species with that name in Tetraplasandra, Hillebrand's meiandra is here adhered to.)

Leaves 3 to 4.5 cm long, the petiole dilated at the base and clasping; leaflets 7 to 13; inflorescence umbellate but variable: either the pedicels at the end of 3 to 5 terminal peduncles (simply umbellate, but then shrubs), or at the ends of rays which proceed from the ends of 3 to 5 peduncles, the latter rarely united by a common rhachis (compoundly umbellate); bracts broadly ovate, 4 to 8 mm long, caducous long before the flowers expand; calyx cylindrical, ovate or obovate, with a short denticulate or undulate border; petals 5 to 8, triangular or linear lanceolate; stamens as many, shorter, or as long as the petals (in one variety only). Ovary 2 to 6 celled; stigmas 2 to 6, sessile on the conical vertex, or, when 4 to 6, raised on a short stylopod, drupe cylindrical, ovate, oblong, or obovate, or subglobose.

Hillebrand, in his Flora of the Hawaiian Islands, says in a foot note on page 152:

"Under this collective species I have united the following forms, which are exceedingly rare, each corresponding to a single or a few individuals, found in closely-circumscribed localities."

He then describes six varieties, as follows:—

Stigmas 2, rarely 3.

α. 7 to 12 leaflets.

β. 7 to 9 leaflets.

γ. 11 leaflets.

Stigmas 3 (4).

δ. 7 to 9 leaflets.

Stigmas 3-4-5.

ε. 9 to 13 leaflets.

Stigmas 4-5-6.

ζ. Leaflets as in δ, drupe ovoid.

The above key to the varieties of this species can not be relied upon, as one may find plants with only 2 stigmas and 13 leaflets, and plants with 4 stigmas, 6 stamens and 9 leaflets. The specimens from Oahu are more or less shrubs, and have rather long rays or peduncles, while the plants from the other islands are always trees, and have rather short rays. It is unfortunate that Hillebrand did not define them more clearly. However, complete material is not always possible to obtain, and therefore an exact diagnosis not always possible, as the stamens play an important part in the identification of this very variable species.

Only such variations are here cited as are trees, and the writer is sorry to state that, owing to incomplete material from other varieties occuring in the Kohala Mountains, Hawaii, and West Maui mountains, certain trees are herewith omitted. They are, however, all referable to *Tetraplasandra meiandra.* It is the writer's intention later to monograph this interesting family.

On Hawaii on the lava fields of Puuwaawaa, North Kona, grow a few speci-

PLATE 140.

REYNOLDSIA SANDWICENSIS A. Gray.
Fruiting branch.

mens of a tree which may be referred to Hillebrand's var γ. It is a medium-sized tree 35 feet or so in height, with bright-green imparipinnate foliage. The inflorescence, which is compound umbellate, arises usually in the axil of the two uppermost branchlets.

On Maui, on the lava fields of Auahi, situated on the southern slopes of Haleakala, grows a beautiful tree which has to be referred to variety δ, though differing from the plants on Lanai; the drupes of var. δ resemble very much var. ζ which see. It is a handsome tree of 50 feet or so in height, with a trunk of almost two feet in diameter. The trunk is perfectly straight and vested in a smooth gray bark. The branches are thick and ascending, bearing at their ends large leaf-whorls, underneath which are umbels with small greenish flowers.

The writer found many varieties from new localities, such as Haleakala, West Maui, Kau forests, Kohala Mountains, etc., which all come under *Tetraplasandra meiandra;* while Hillebrand's varieties came mostly from Oahu. They are, however, not quite so rare as Hillebrand thought them to be; the forests have merely been opened up nowadays by ditch trails, while in Hillebrand's time the rain forests were almost inaccessible.

Varieties of the above species occur both in extremely wet forests and in exceedingly dry or mixed forests. It is in the latter regions that they reach their best development. They are there associated with Pterotropia, Alectryon, Pelea, Xanthoxylum, Hibiscadelphus, etc.

Variety ζ, which is here illustrated, grows in the forests of Kau above Naalehu on Hawaii. Hillebrand's plant came from the woods of Hilo, where it was collected by Mr. J. Lydgate. In Kau it is a medium-sized tree, 35 feet in height, with a rather short trunk and large, stout, ascending branches; the leaves are over a foot long and consist of 7 to 13 leaflets; the inflorescence is a compound umbel with usually five rays, each ray bearing an umbel of 5 to 16 peduncles, each peduncle having again from 5 to 12 pedicels half an inch long, petals 7, stamens as many; the ovarian portion is ovoid and has a conical vertex with four stigmas raised on a minute stylopod.

As far as known the natives made no use of this tree. Its wood is white and soft and of no value, as is the case with all the rest of the species belonging to this genus and those closely allied to it.

Varieties of this species grow also above Awini in the rain forests of Kohala, Hawaii; in the mountains of West Maui, on the ridges of Honokawai; on the summit ridge of Lanai, Haalelepakai; in the Punaluu Mountains, and Konahuanui on Oahu, as well as in Niu and Wailupe Valley of the same island. On Molokai, it grows in the forests of Kamoku; in the swamp forest on the windward side of Haleakala a new variety is not uncommon. The species and its forms grow at altitudes of from 1000 to 4000 feet, and are either small shrubs or medium-sized trees in the wet forests, and larger trees in the dry regions (on lava fields).

PLATE 141.

REYNOLDSIA SANDWICENSIS A. Gray.
Fruiting branch pinned against trunk of tree; diameter of the latter 2 feet; growing on the land of Kapua, South Kona, Hawaii; elevation 1800 feet.

REYNOLDSIA A. Gray.

Calyx border short, undulate. Petals 8 to 10, linear-lanceolate, valvate in the bud. Stamens as many as petals and somewhat shorter. Ovary 8 to 10 or 15 to 22 celled. Stigmas arranged in a circle around the very short, thick style. Drupe globose, somewhat fleshy. Pyrenae laterally compressed, chartaceous or crustaceous. Embryo small at the apex of an even fleshy albumen.—Unarmed, glabrous trees. Leaves large, imparipinnate, with 3 to 9 oval or cordate sinuate-crenate or (in the species not from Hawaii) entire leaflets; exstipulate. Flowers racemose-umbellate on the alternate branches of a terminal panicle. Bracts minute linear.

A genus of three species, one inhabiting Tahiti (*R. verrucosa* Seem.), one Samoa (Savaii) (*R. pleiosperma* A. Gray), and the third our islands.

Reynoldsia sandwicensis A. Gray.

Ohe, or *Ohe makai.*

(Plates 140, 141, 142.)

REYNOLDSIA SANDWICENSIS A. Gray U. S. E. E. (1854) 724, pl. 92;—H. Mann Proc. Am. Acad. VII (1867) 169;—Wawra in Flora (1873) 142;—Hbd. Fl. Haw. Isl. (1888) 156;—Harms in Engl. et Prantl Pflzfam. III, 8 (1898) 30.—**Eschweilleria Sandwicensis** Durand Ind. Gen. 167;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 182.

Leaves about 3 dm long, glabrous, the slender petioles shortly toothed at the dilating base (according to Hillebr. but not in the writer's specimens); leaflets 7 to 11, ovate to cordate, 7 to 10 cm x 5 to 8.5 cm on petiolules of 2 cm in the upper pair of leaflets and 4 cm in the lower pair, obtuse or bluntly acuminate, repando, or sinuate crenate, stiff membraneous, light green, glossy; inflorescence of 3 terminal peduncles, rising from a short common rhachis, each about 12 to 20 cm long and branching from the base upward, the branches horizontal, 4 to 5 cm when with flower, 7 to 9 cm when in fruit, and racemose umbellate in their upper halves, with pedicels of 10 to 12 mm; calyx obconical truncate, 2 to 3 mm; petals 8 to 10, about 6 mm long, cohering; ovary 8 to 10 celled, wholly inferior; drupe globose 6 to 8 mm in diameter ribbed when dry; pyrenae crustaceous, with smooth sides.

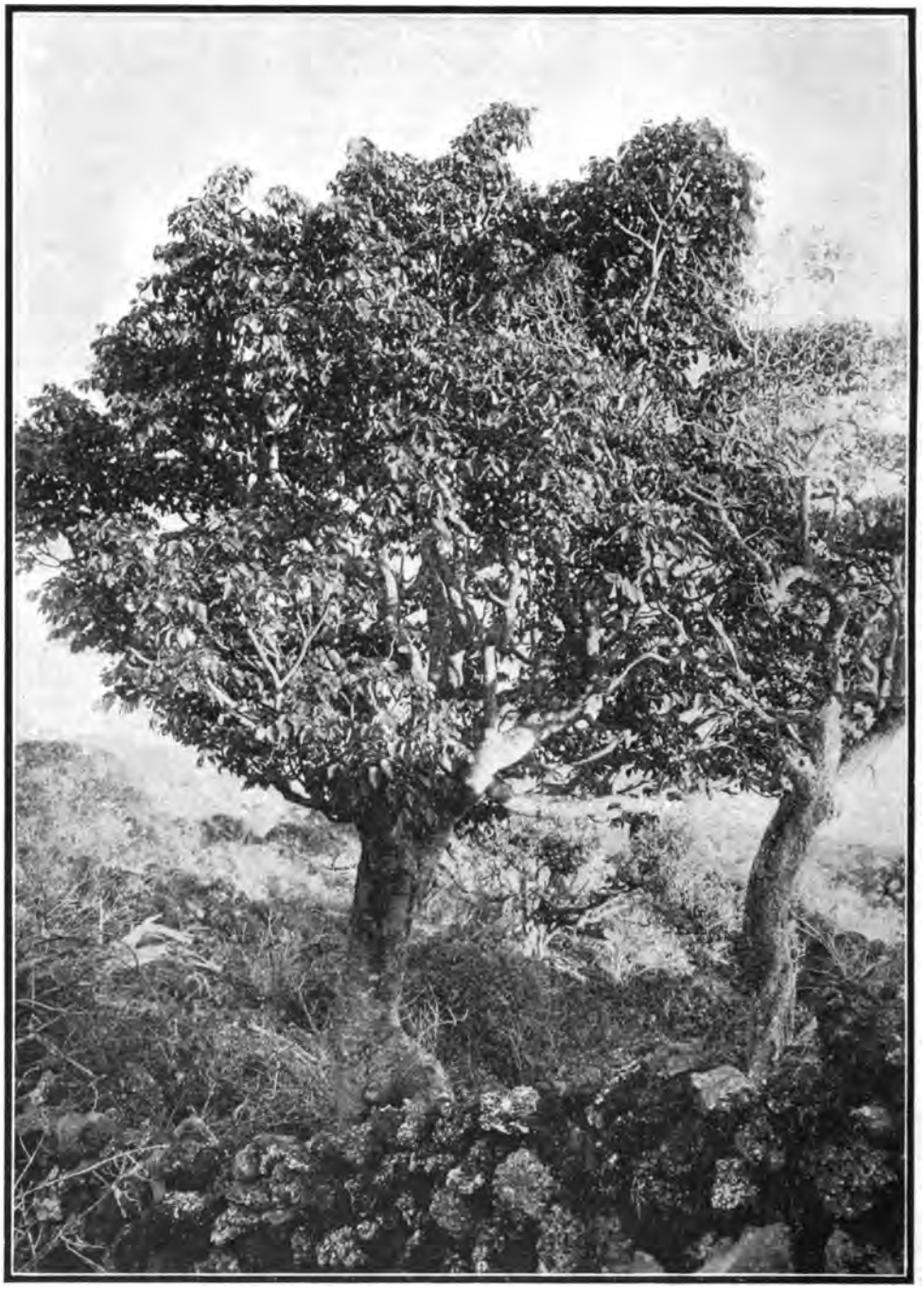
The *Ohe* is a very peculiar Hawaiian tree, which sheds its leaves in the winter months and flowers before the reappearance of the leaves in the early summer. When bare, it resembles somewhat the *Wiliwili,* which also sheds its leaves during the rainy season.

It reaches a height of from 15 to 60 feet and develops thick and often short trunks with bluish-gray, smooth bark, and a spreading crown with straight ascending branches. The leaves, which are about a foot long, consist of 7 to 11 leaflets, heart-shaped at the base. The flowers are arranged on stiff, erect terminal peduncles, rising from a short common rhachis, branching from the base upward, and racemose-umbellate in the upper half.

It is peculiar to the very dry districts of the lowland zone and especially on *aa* lava fields, where the heat is intense and rain is very infrequent. The trunk exudes a very thick resin or gum which is of a clear yellowish-golden color.

On Maui it is not uncommon on the lava fields near Ulupalakua on the southern slopes of Haleakala, as well as on Molokai, where it can be found at the western end at Mahana in gulches, and on the heights above Kamolo, associated with *Dracaena aurea (Halapepe).* On Hawaii, on the lava fields of North and South Kona. it reaches its best development, trunks with a diameter of 1½ to 2 feet being not uncommon. It also grows on Lanai on the slopes above Manele

PLATE 142.



REYNOLDSIA SANDWICENSIS A. Gray.
Growing on the lava fields of Kahikinui, southern slopes of Mt. Haleakala, Island of Maui. Elevation 1500 feet.

and Kalama in company with a variety of *Santalum Freycinetianum* (Sandalwood). Owing to the softness of the whitish wood, it is of no commercial value. The gum or resin which the tree is capable of producing was used by the natives for various purposes.

The wood was used for making the *kukuluaeo,* or stilts, employed by the old Hawaiians in a game by that name, and it is spoken of as the *"He ohe kahi laau hana ia i mea kukuluaeo."*

In Tahiti the name *"Ofe"* is applied to a tree of the same family to which our Reynoldsia belongs.

PTEROTROPIA Hbd.

(*Dipanax* Seem.)

Calyx border slightly prominent and repandly dentate. Petals 5 to 9, valvate in the bud, thick, cohering or finally spreading. Stamens as many as petals, shorter than the latter; anthers ovate to oblong. Ovary 2 to 5 celled; stigmas sessile on the top of the conical vertex or raised on a conspicuous style. Drupe somewhat succulent, ovoid or sub-globose, with conical apex, round not angular, ringed above, below or at the middle, or at the base by the calycine border and naked above. Pyrenae with a thin endocarp, ovoid or slightly compressed, with a broad back and a prominent ridge on either side.—Trees with glutinous sap. Leaves alternate, large, impari-pinnate, with 13 to 21 ovoid or oblong entire leaflets, with a scattering scaly or stellate pubescence, but occasionally glabrous. Inflorescence terminal and lateral; flowers umbellate-racemose on the umbellate racemose branches of a panicle with a short rhachis. Pedicels not articulate; bracts minute, deciduous. (The name Dipanax is not as old as Mann's section name Pterotropia and the latter is therefore retained.)

A Hawaiian genus of three species. Tall or medium-sized trees with straight trunks and smooth bark. Easily distinguished from all other Hawaiian Araliaceae by their leaves, which reach a size of over three feet and have from 9 to 21 leaflets, and their large inflorescence, which is racemose-umbellate and drooping below the leaf-whorls, often two feet and more long; in *P. gymnocarpa* apparently above the leaf-whorls.

The native name for all three species is *Ohe ohe.* They are peculiar to the dry districts, with the exception of *P. gymnocarpa,* which occurs in the rain forest.

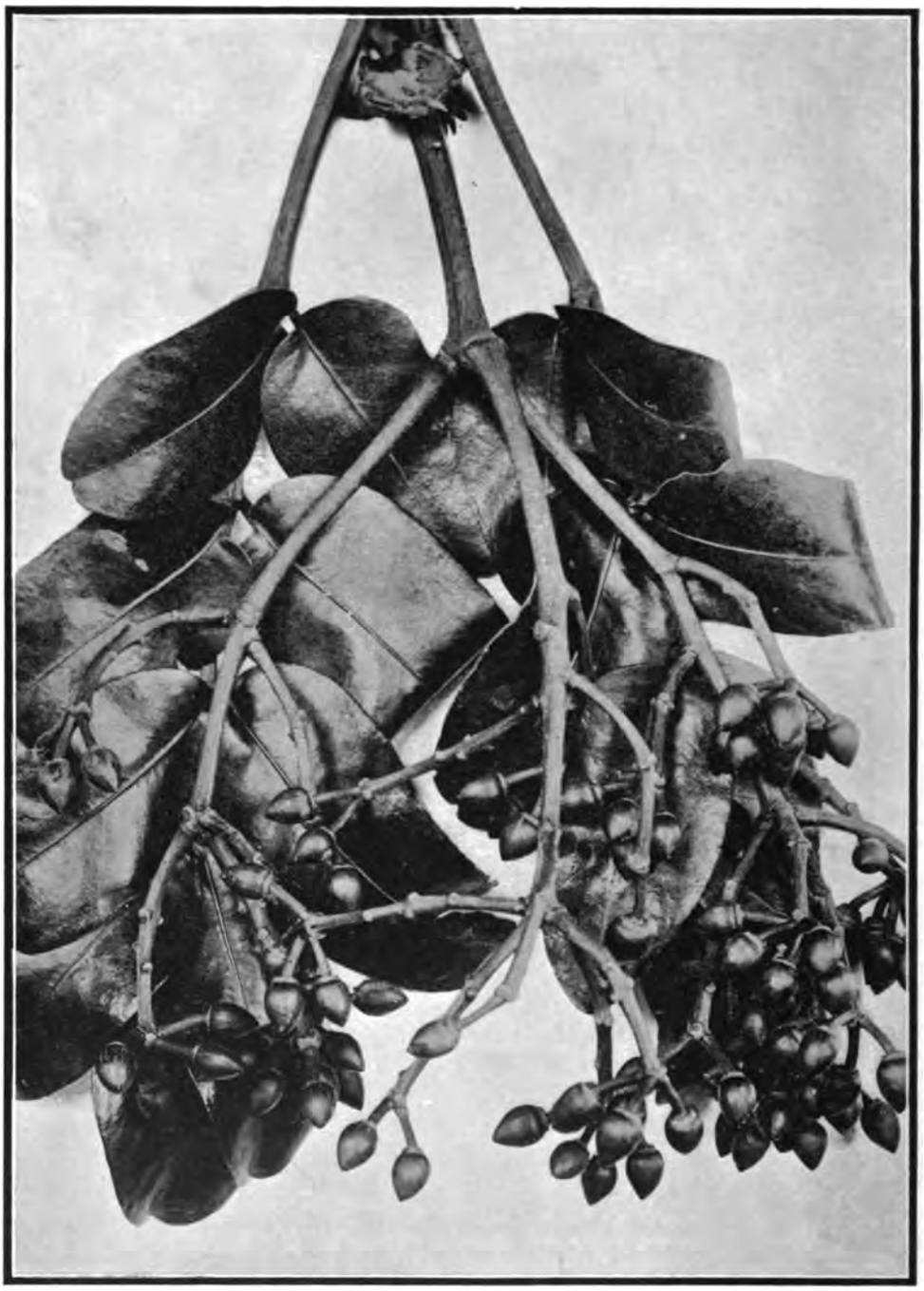
The only distinguishing character between *P. Kavaiensis* (Mann) Hbd. and *P. dipyrena* (Mann) Hbd. is the number of stigmas. In Hillebrand's key to the species he also mentions the definite number of leaflets, which, since, more material is at hand, can no longer be relied upon.

Specimens of *P. dipyrena* collected by the writer in Kau have 21 leaflets, which are truncate, and flowers with 2 to 3 stigmas. The same number of leaflets and stigmas occurs in plants from East Maui on the southern slopes of Haleakala on the lava fields of Auahi, and also on plants back of Ulupalakua.

As the number of stigmas varies in that species and differs mainly from the Kauai species in the fact that they are sessile, the writer is almost persuaded to unite them both under *P. dipyrena.*

The character of the fruit as given in Hillebrand's Flora regarding the two

PLATE 143.



PTEROTROPIA GYMNOCARPA Hbd.
One-half natural size. Fruiting specimen.

species in question is also uncertain, since drupes ringed above and below the middle can be observed in *P. Kavaiensis;* the drupes of *P. dipyrena* are ringed above the middle only.

KEY TO THE SPECIES.

Drupe ringed at the base.	
Stigmas 2 to 3, sessile	**P. gymnocarpa**
Drupe ringed either above or below or at the middle.	
Stigmas 2, 3 to 4, sessile	**P. dipyrena**
Stigmas 4 to 5 on a conspicuous style	**P. Kavaiensis**

Pterotropia gymnocarpa Hbd.

(Plate 143.)

PTEROTROPIA GYMNOCARPA Hbd. Fl. Haw. Isl. (1888) 151;—Harms in Engl. et Prantl Pflzfam. III, 8 (1898) 31.—**Heptapleurum gymnocarpum** Del Cast. Ill. Fl. Ins. Mar. Pac. VI (1890) 183.—**Dipanax gymnocarpa** Heller Pl. Haw. Isl. (1897) 870.

Leaves 3 to 4 dm long, leaflets 9 to 11 (according to Hillebrand 15 to 17), 8 to 18 cm long, 4.5 to 8 cm wide, ovate oblong, the lower pair diminishing in size on petioles of 2 to 18 mm, obtuse or obliquely acuminate, with rounded base or unevensided, chartaceous to coriaceous, glabrous underneath, shining above; rhachis of panicle rather short, with 3 to 5 umbellately radiating primary branches of 10 to 20 cm, the flowers about 12 in an umbel at the ends of racemose and umbellate secondary branches of 5 to 9 cm, on pedicels of 8 to 20 mm; calyx very short; petals 6, rarely 7, cohering at the apex, about 8 mm in length; ovary 2 to 3 celled (in one of the writer's specimens all ovaries are two celled, one of which is abortive); stigmas sessile; drupe globose (according to Hillebr.) or oblong-turbinate in the writer's specimens, 12 to 15 mm long, and about 7 mm in diameter, nearly entirely free and naked, the adherent calyx forming a low disk at its base; pyrenae thin papery, ovoid, beaked above and faintly notched below the beak.

This is a small or medium-sized tree reaching a height of 15 to 30 feet. It differs from the other two species in its smaller leaves and leaflets, which become quite glabrous when old, while only the very young branchlets are mealy.

The branching habit is similar to Oahuan species of Tetraplasandra, rather than Pterotropia, and it is often mistaken for such at first glance. It inhabits the main range of Oahu, to which island it is peculiar. It is, however, easily distinguished from Tetraplasandra by its rather dark foliage.

Fine trees may be found in the forest on the windward side of Punaluu and above Kaliuwaa valley at an elevation of 2000 feet or more, usually along streambeds and in gulches. It is associated with *Pelea sandwicensis, Euphorbia Rockii, Hibiscus Arnottianus, Syzygium sandwicense, Elaeocarpus bifidus,* Pittosporum, etc.

On Mt. Olympus at the head of Palolo Valley near the summit ridge fine trees may be observed; also on Mt. Konahuanui of the same range. The biggest trees occur in the Punaluu Mountains of the Koolau range. Hillebrand's specimens came from Niu Valley. This tree is in every respect a Pterotropia but in habit, as it does not reach the height of the other two species, which is sometimes 60 to 80 feet.

The trees from Mt. Olympus have a two-celled ovary, while those from other localities are three-celled. The inflorescence is not drooping, but almost erect above the leaves.

PLATE 144.

PTEROTROPIA DIPYRENA (Mann) Hbd.
Showing fruiting specimen. Much reduced.

Pterotropia kavaiensis (Mann) Hbd.

Ohe ohe.

PTEROTROPIA KAVAIENSIS (Mann) Hbd. Fl. Haw. Isl. (1888) 150;—Harms in Engl. et Prantl Pflzfam. III, 8 (1898) 31.—**Heptapleurum (Pterotropia) kavaiense** Mann Proc. Am. Acad. VII (1867) 168;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 183.—**Agalma kavaiense** Seem. Revis. Hederac. (1868) 103.—**Dipanax kavaiensis** Heller Pl. Haw. Isl. (1897) 871.

Leaves impari-pinnate, 6 to 9 dm long; leaflets 11 to 21, ovate oblong, 7 to 19 cm long, 4 to 8 cm wide, on petioles of 2 to 15 mm (the last upper pair of leaflets almost sessile in some specimens, the lowest pair of leaflets much smaller than the others, but on the longest petiolules), acuminate or rounded at the apex, rounded or truncate at the base, coriaceous, sprinkled above, but densely tomentose underneath; panicle large and ample, its 5 primary branches 1 to 3 dm long mostly alternate on a common rhachis of 5 to 7 cm, the secondary branches 4 to 7 cm, mostly alternate; petals 6 to 7, rarely 9, densely tomentose especially in the bud; ovary generally 4-celled, or 3 to 5 celled, stigmas on a distinct stylopod of 1 mm; drupe ovoid about 12 mm, ringed below, at, or above the middle, the pyrenae chartaceous.

This species differs very little from *P. dipyrena,* and is only distinguishable from the latter in the raised stigmas, the number of which is usually four in *P. kavaiensis* and two to three to four in *P. dipyrena.* The characters of the leaves can not at all be relied upon, the leaflets of *P. dipyrena* varying from linear oblong to ovoid, and are either cordate, truncate or rounded at the base, on petiolules of about 1 mm to 30 mm; the stigmas are more or less sessile in *P. dipyrena.*

Pterotropia kavaiensis, in the writer's mind, should be united with *P. dipyrena,* but as only one good flowering specimen from one locality is at present in his possession, he defers such action until the future, when more complete material shall be at hand.

The *Ohe ohe* of Kauai is a very beautiful and symmetrical tree reaching a height of 50 feet and occasionally more, with a trunk of over one foot in diameter. It divides near the top into a few ascending stout branches, at the end of which are large leaf-whorls. The crown is flat and is about one-fifth the height of the tree. When growing, crowded by other trees, it branches 10 or 15 feet above the ground and is not as symmetrical as trees growing apart. It is a tree which inhabits the mountains on the leeward side of Kauai, above Waimea, in the dry regions at an elevation of 2800 to 4000 feet.

Its associates are *Bobea Mannii, Cryptocaria Mannii, Cyanea leptostegia, Tetraplasandra Waimeae,* Metrosideros, etc. It can be recognized from afar, as it usually towers above the trees surrounding it, giving the landscape a peculiar aspect.

The wood of the *Ohe ohe* is white and rather soft.

Pterotropia dipyrena (Mann) Hbd.

Ohe ohe.

(Plates 144, 145.)

PTEROTROPIA DIPYRENA (Mann) Hbd. Fl. Haw. Isl. (1888) 150; Harms in Engl. et Prantl Pflzfam. III, 8 (1898) 31.—**Heptapleurum (Pterotropia) dipyrenum** Mann Proc. Amer. Acad. VII (1867) 160.—**Dipanax Mannii** Seem. Journ. Bot. VI (1868) 41;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI (1890) 182;—Heller Pl. Haw. Isl. (1897) 870.

PLATE 145.

PTEROTROPIA DIPYRENA (Mann) Hbd.
Ohe Ohe.
Growing at an elevation of 4500 feet above Ulupalakua on the southeastern slopes of Mt. Haleakala, Maui.

Leaves 36 to 100 cm long, composed of 15 to 21 leaflets varying greatly in size and shape, usually ovate oblong 8 to 21 cm long, 4 to 11 cm wide, cordate, truncate or unevensided at the base, acuminate at the apex, the longest pair of leaflets at about the middle of the leaf, the lowest pair the broadest but shorter, on short petioles in the smaller leaf-forms, and on petioles of often 25 mm in the large leaf forms, glabrous above, furfuraceous below; panicle very large almost one meter long (in the Kau, Hawaii, specimens, but about 36 cm in some of the Maui specimens) rising from a common rhachis of sometimes 15 cm, with 8 drooping rays, each ray often 7.5 dm long, covered with a brown tomentum, the secondary branches 4 to 10 cm long, alternate, the flowers racemose and subumbellate on pedicels of about 1 cm, bracts short triangular; calyx small with an undulate border; petals 6 to 8, 12 mm long, lanceolate, cohering, but finally free; stamens 6 to 8, anthers white; drupe ovoid to subglobose, ringed with the calyx border above the middle, stigmas 2 or 3 or 4, slightly raised or sessile on a conical disk; pyrenae coriaceous inseparable.

The *Ohe ohe* of Maui and Hawaii is like that of Kauai, a stately tree 50 to 60 feet and sometimes even 80 feet in height. It has a straight bole for 30 feet or more, with few stout ascending branches. The trunk, which is clothed in a whitish-gray smooth bark, is often a foot or more in diameter. The tree was first described by H. Mann, who collected it on the Island of Lanai, recording it as a small tree 12 to 20 feet in height. It has since been found on Maui and Hawaii. It is, however, still most numerous on the southeastern and strictly southern slopes of Mt. Haleakala, Island of Maui. In the former locality above Ulupalakua it is the only species alive, as can be seen in the picture, all the rest of the vegetation having been killed by cattle, goats and sheep.

On the lava fields of Auahi, district of Kahikinui, the writer found some very big trees in company with *Pelea multiflora, Bobea Hookeri, Alectryon macrococcus, Xanthoxylum* sp., *Tetraplasandra meiandra,* and many others. It is more or less peculiar to the dry districts, but is also not uncommon in the rain forest on the northeastern slope of Haleakala along the Kula pipe line trail, especially on the crater of Puukakai at an elevation of about 4500 feet.

On Hawaii it has been found by Hillebrand in the dry district of Kawaihaeiuka, but could not be located during a visit made by the writer in that locality, though the writer was fortunate, however, to find it in the forests of Hilea in Kau, the most southern point on the Island of Hawaii, at an elevation of 2000 feet. In this latter locality occur the biggest trees of this species, while in the Kaiholena Mountains, elevation 4000 feet, of the same district, the trees are smaller and resemble the description (outward appearance) given by Mann of the trees which he found on Lanai.

The wood of the *Ohe ohe* is rather soft and of no particular value. It is a hardy tree and can stand the ravages of cattle and other enemies better than any other Hawaiian tree.

CHEIRODENDRON Nutt.

Calyx border with 5 short teeth. Petals 5, valvate in the bud, triangular. Stamens 5 shorter than the petals, anthers ovoid. Ovary 5 to 2 celled, stigmas sessile on a conical elevation of the disk, or apical on a thick and short style. Fruit globose, ribbed when dry, with somewhat fleshy exocarp; pyrenae laterally compressed, coriaceous. Albumen even, not wrinkled, fleshy to horny.—Glabrous unarmed trees. Leaves opposite,

PLATE 146.

CHEIRODENDRON GAUDICHAUDII (DC.) Seem.
Fruiting branch pinned against trunk of tree, diameter of the latter nearly 2 feet. Growing in Kipuka Puaulu, near Volcano Kilauea, Hawaii; elevation 4000 feet.

digitate with 3 to 5 leaflets, long petiolate, entire or toothed. Flowers umbellate on the ultimate division of a terminal or lateral panicle, with opposite horizontal branches, which are articulate at all nodes and below the calyx. Bracts small opposite.

A genus of two species peculiar to the Hawaiian Islands, but related to Nothopanax, a genus occurring in New Zealand, Samoa and Tasmania. *Nothopanax samoense* Gray is called *Tane-tane* by the Samoans.

KEY TO THE SPECIES.

Leaflets 3 to 5, longer than broad..... **Ch. Gaudichaudii**
Leaflets 3, broader than long..... **Ch. platyphyllum**

Cheirodendron Gaudichaudii (DC.) Seem.

Olapa, or *Kauila Mahu* on Kauai.

(Plates 146, 147.)

CHEIRODENDRON GAUDICHAUDII (DC.) Seem. Journ. Bot. V. (1867) 236;— Hbd. Fl. Haw. Isl. (1888) 148;—Harms in Engl. et Prantl Pflzfam. III, 8 (1898) 48.—**Panax? Gaudichaudi** DC. Prodr. IV (1830) 253;—Hook. et Arn. Bot. Beechey (1832) 84;—Endl. Fl. Suds. (1836) no. 1340;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VI (1890) 181.—**Aralia trigyna** Gaud. Bot. Voy. Uranie (1826) (but appeared in reality 1830) 474, pl. 98.—**Hedera Gaudichaudii** A. Gray. Bot. U. S. E. E. (1854) 719, t. 90;—H. Mann Proc. Am. Acad. VII (1867) 168;— Wawra in Flora (1873) 142.—**Cheirodendron trigynum** (Gaud.) Heller Pl. Haw. Isl. (1897) 870.

Had Gaudichaud's Botany of the Voyage Uranie appeared really in 1826, as indicated on the title page, Heller's combination would hold good; Gaudichaud's description, however, appeared in 1830 after the publication of the species by DeCandolle in his Prodromus (1830).

Leaflets 3 to 5, the outer ones smaller, petioled, ovate, oblong or obovate, the margin generally thickened and toothed or serrulate, with a gland in the notch of each serrature, or entire (in specimens from the Punaluu mountains, Oahu) with no signs of any dentation, chartaceous to coriaceous, glabrous, shining above; panicle subpyramidal, shorter than the leaves, compact, with 4 to 5 nodes to the rhachis; flowers 4 mm greenish; pedicels 2 mm; petals thick ovate 2 to 3 mm, soon caducous; stamens nearly as long; ovary generally 3 celled, or 2 or 4 celled, rarely 5 celled; stigmas short and thick, recurved, sessile or subsessile on a short stylopod; drupe ovoid 6 mm long, 2 to 5 angled when dry.

Hooker et Arnott's *Panax? ovatum* is *Cheirodendron Gaudichaudii* (DC.) Seem. var. *δ.* Hbd. l.c.

The *Olapa,* as the tree is usually called on all the islands, reaches a height of 40 to 50 feet and sometimes more. It derives its name "Cheirodendron" from the Greek (Keiros—hand and Dendron—tree) on account of its leaves, which consist usually of five leaflets, giving it the shape of a hand. It is one of our most common forest trees, and is always conspicuous in the woods by its foliage, which is constantly in motion, even if there is hardly any breeze. Its trunk is sometimes two feet and even more in diameter, and is vested in a smooth, yellowish bark when growing in wet forest, and rough, scaly bark in dry districts. All parts of this tree, as well as of the *Lapalapa,* emit a very strong carroty odor when bruised, not unlike turpentine, and the wood of both species is said to burn when green. Several varieties are recognized which are peculiar to certain sections of the various islands, and are as follows:—

PLATE 147.

CHEIRODENDRON GAUDICHAUDII (DC.) Seem.
Tree growing on the old lava fields of Auahi, southern slope of Mt. Haleakala, Maui; elevation 2800 feet.

var. α.—Leaflets 5 to 3, ovate oblong, deeply crenate or serrate; panicles short, styles 3, rarely 2 to 4. (E. Maui and Hawaii.)

var. β.—Leaflets generally 3, rarely 5, ovate to suborbicular, remotely dentate, on a long common petiole, panicle large; stigmas 3 or 2. (W. Maui, Molokai, Hawaii.)

var. γ.—Leaflets 3, entire, the common petiole rather long; panicle large, open, panicle drawn out, stigmas 3 to 2. (Koolau Range, Oahu.)

var. δ.—Leaflets 3, rarely 5, remotely and faintly dentate, on rather short petioles, styles 3, 4 or 5. (Oahu, Koolau range; Mt. Kaala, and Niihau.)

var. ε.—Leaflets subentire, small, membraneous, styles 2 to 5. (Woods of Kauai.)

The *Olapa* is most common on East Maui, in the middle forest zone on the slopes of Haleakala at an elevation of 4000 feet, and it is here that it attains its best development. As mentioned before, it is common on all the islands of the group at elevations from 2000 to 4000 feet.

The performers of the native *hula,* or dance, were divided into two groups, the *Olapa* and the *Hoopaa.* The former, who undoubtedly derive their name from the *Olapa* tree, were those whose part in the dance was the agile one, who could best illustrate, by the graceful bending of their bodies, the motion of the leaves of the *Olapa* trees. From the leaves and bark the natives extracted a bluish dye, which they employed in dyeing their *tapa,* or paper cloth.

Cheirodendron platyphyllum (Hook. et Arn.) Seem.

Lapalapa.

(Plate 148.)

CHEIRODENDRON PLATYPHYLLUM (Hook. et Arn.) Seem. Journ. Bot. V. (1867) 236;—Hbd. Fl. Haw. Isl. (1888) 149;—Heller Pl. Haw. Isl. (1897) 869;—Harms in Engl. et Prantl Pflzfam. III, 8 (1898) 48.—**Panax? platyphyllum** Hook. et Arn. Bot. Beechey (1832) 84;—Endl. Fl. Suds. (1836) no. 1342;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VI (1890) 182.—**Hedera platyphylla** A. Gray Bot. U. S. E. E. (1854) 720, t. 91;—Mann Proc. Am. Acad. VII (1867) 168;—Wawra in Flora (1873) 157.

Leaflets 3, ovate, broader than long, 4 to 8 cm x 5 to 7.5 cm, mucronate or suddenly and shortly acuminate, truncate at the base, or sometimes cuneate, entire or shortly dentate or almost sinuate-dentate (Waialeale, Kauai, plants), with thickened margin, coriaceous and shining, on long spreading petioles about 4 cm, the common petioles 6 to 8 cm long; panicles single, or three together, very open, 10 to 15 cm long, pedunculate; umbellets 4 to 7 flowered, the pedicles 2 to 6 mm; flowers 6 mm; stigmas 5, rarely 4, incurved or truncate, triangular on a very short and thick stylopod; drupe subglobose, 6 to 7 mm in diameter, 5 to 4 angled when dry.

The *Lapalapa,* somewhat smaller than the *Olapa,* is a very handsome tree, though by far not as common as the latter, as it is only found on the high plateau of Kauai up to the summit of Waialeale, and on the Koolau mountain range of Oahu. It is easily distinguished from the *Olapa* by its leaves, which are much broader than long and are on long, spreading petioles with only three leaflets. What has been said of the *Olapa* in regard to the constant motion of its leaves applies also to the *Lapalapa.*

It is confined to the Islands of Kauai and Oahu and inhabits the very wet or rain forests at an elevation of 4000 feet up to 5000 feet; it hardly descends lower than 3000 feet. It thrives best in swampy ground, and is a common fea-

PLATE 148.

CHEIRODENDRON PLATYPHYLLUM (Hook. et Arn.) Seem.
Flowering branch, reduced.

ture of the vegetation on the high plateau of Kauai, bordering the extensive open bogs of Kauluwehi, Alakai, and Lehua makanoe. At the summit of Waialeale it is a small tree or rather shrub, with almost sinuate leaves. At lower elevations the leaves are entire. It is associated with Pelea, Dubautia (the high mountain forms), Labordea, *Lobelia Gaudichaudii, Scaevola glabra,* etc. On Oahu it is confined to the summit ridges of the Koolau range, especially Konahuanui, and has also been found on Kaala of the Waianae range.

The wood of the *Lapalapa* is whitish, with a yellow tinge, and is said to burn when green.

EPACRIDACEAE.

The family Epacridaceae has only a limited distribution. The bulk of its species is to be found in Australia and Tasmania, with quite a number of genera in New Zealand. The family possesses 21 genera of which 273 species occur in Australia. Of all the 21 genera only one genus with one subgenus is not to be found in Australia or Tasmania. A few endemic species occur in New Caledonia and the most southern part of South America, besides a few species of large genera in India and the Malayan-Archipelago. Here in the Hawaiian Islands we have two species represented, of the subgenus Cyathodes, formerly recognized as a genus, but now a subgenus of Styphelia by Drude.

STYPHELIA Sol.

Corolla campanulate, funnel-shaped or tubular. Stamens enclosed in the tubes of the corolla; anthers hardly visible, or exserted on long filaments. Style longer than the stamens, stigma simple small. Disc a ring or composed of 5 lobes or scales. Ovary usually 5-celled, rarely through abortion 3- or 2-celled. Fruit a berry or drupe.—Shrubs or low trees with usually broad or narrow lanceolate, spathulate-elliptical leaves, the flowers single, axillary, or in racemes, with 2 to several bracts.

This is the richest genus in the family Epacridaceae of which the largest number of species belongs to Australia. The Hawaiian species *St. Tameiameia* and *St. Grayana* come under the fourth subgenus Cyathodes which may be described as follows:

Subgen. **Cyathodes** Lab.

Calyx surrounded by many bracts; corolla funnel-shaped, its tube hardly protruding from the calyx, inside and at the throat without glands and beardless; stamens enclosed; ovary 5-10 celled.

The subgenus Cyathodes occurs in Tasmania, New Zealand, and in the Hawaiian Islands with two species.

Styphelia tameiameia F. Muell.

Pukeawe or *Puakeawe.*

STYPHELIA TAMEIAMEIA F. Muell. Fragm. VI. (1867) 55;—Drude in Engl. et Prantl Pflzfam. IV. 1. 78.—**Cyathodes tameiameia** Cham. in Linnaea I. (1826) 539;—Endl. Fl. Suds. (1836) 170. No. 1070;—DC. Prodr. VII (1839) 741;—

Epacridaceae.

Th. Nuttal in Transact. Am. Phil. Soc. VIII. (1843) 270;—A. Gray Proc. Am. Acad. V. (1862) 325;—Mann Proc. Am. Ac. VII. (1867) 188;—Wawra in Flora (1873) 59;—Hbd. Fl. Haw. Isl. (1888) 272;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 224;—Heller Pl. Haw. Isl. in Minnes. Bot. Stud. Bull. IX. (1897) 872.

Leaves stiff coriaceous, linear or oblong 8-12 mm long, 2-4 mm broad, on broadish petioles of less than 1 mm, acute or somewhat obtuse, shortly mucronate, cuneate or somewhat obtuse at the base, naked, smooth above, waxy-white or glaucous underneath and striate with 9-13 longitudinal nerves, which fork or branch more or less, particularly in the obovate leaves; peduncle with flower shorter than the leaf; bracts (5-9) and sepals obtuse coriaceous; corolla whitish, 3 mm long, the tube included in the calyx, the acute lobes ½ the length of the tube, with 5 lines of hairlets running down the tube; anthers oblong, obtuse, subexserted, about as long as their filaments; disc small; ovary 5-8 celled; style as long as the ovary, thick tapering; drupe globose 4-6 mm in diameter, red, white or pink, rather dry; seeds ovoid, with thin testa; embryo axile two-third the length of the mealy albumen, the radicle scarcely distinguishable from the cotyledons.

The *Pukeawe,* or as it is also called *Maiele, Puakeawe* and *Kawau* on Lanai, is a shrub in the lower elevations, but becomes a small tree 10-15 feet in height in the upper regions at 6000-7000 feet elevation. The trunk is rather twisted and vested in a finely corrugated brown bark; the tallest specimens were observed by the writer on the upper slopes of Mt. Hualalai on Hawaii at an elevation of 6000 feet. The species occurs on all the islands of the group and can be found at all elevations. The species besides being found in Hawaii exists also in Tahiti and Eimeo of the Society group.

Interesting legends are connected with this plant in Hawaii; it was a favorite of the Kahuna or native priest. David Malo, the Hawaiian historian, tells us that it was used in incremating the body of any one who had made himself an outlaw beyond the protection of the tabu. Dr. N. Emerson gives an interesting explanation of this procedure of incremation. He also says: "When a kapu-chief found it convenient to lay aside his dread exclusiveness for a time, that he might perhaps mingle with people on equal terms without injury to them or to himself, it was the custom for him and according to one authority those with whom he intended to mingle joined with him in the ceremony—to shut himself into a little house and smudge himself with the smoke from a fire of the *Pukeawe* shrub. At the conclusion of this fumigation a priest recited a *Pule Huikala*—prayer for a dispensation.

The *Pukeawa* is familiar to all who have been at all in the Hawaiian forests, especially around the Volcano of Kilauea on Hawaii where the plant is very common in company with the *Olelo* berries. It is very striking on account of its heath-like appearance, and the white or red dry berries. On the high mountains at from 10,000 feet elevation up to the limit of plant growth occurs another species, which is a shrub. Its scientific name, which was *Cyathodes imbricata* Stschegleew, will have to be changed, as there is already a *St. imbricata* in that genus as a synonym, and therefore will be known from now on as *Styphelia Grayana* (Stschegleew) Rock.

MYRSINACEAE.

The family Myrsinaceae consists of 32 genera and about 770 species. The family is a distinctly tropical one and is distributed over the whole world. In the eastern hemisphere it ranges from the island of Tsu Sima, Korea straits, to Victoria in Australia, and in the western hemisphere from Florida to Argentine.

In the Hawaiian Islands only two genera are represented, Suttonia and Embelia, the former occurs outside of Hawaii only in New Zealand and has arborescent forms, while the genus Embelia has two species in these Islands, which are climbers, but consists of more than 92 species which have a wide distribution (Africa, India, Hawaii, Australia).

SUTTONIA Hook.

Flowers hermaphrodite, 4 or 5-merous. Sepals shortly, or very shortly united, or free at the base, imbricate or open, with ciliolate margins. Petals free, valvate or very obscurely imbricate, broadly or rarely narrow-elliptical, or very rarely obovate, rounded or subacute at the apex, with papillulose or ciliate margins, often punctate or lineate. Anthers usually sessile and little shorter than the petals, introrse, somewhat acute at the apex or subobtuse, and papillose. Ovary ovoid, style wanting or very short; stigma capitate and often fimbriate. Placenta 2-4 ovulate. Fruits globose or ovoid, 1-seeded, crowned by the stigma; endocarp crustaceous to chartaceous. Seeds globose with the rudiments of the placenta, albumen horny, embryo cylindrical. Trees or shrubs with entire, very variable leaves. Inflorescence lateral, fasciculate in the axils of fallen leaves, few-flowered. Flowers small, pedicellate.

The Hawaiian species of the genus Suttonia form a section by themselves "Subgenus *Rapaneopsis* Mez;" with pentamerous flowers.

The Hawaiian *Kolea* were originally placed in the genus Myrsine by A. DeCandolle, and later transferred to the genus Suttonia by Mez. The whole genus consists of 17 species, 11 of which are endemic in the Hawaiian Islands; of the remaining 6, 5 are found in New Zealand and one in Norfolk Island. Originally only four Hawaiian species were known and are described in Hillebrand's Flora of the Hawaiian Islands. Since then 4 were added by Mez, and 3 distinct new species and 3 new varieties by the writer. H. Léveillé described 10 new species of which 6 are now synonyms; one of his species, *Suttonia molokaiensis*, is a small leaved form of *Sideroxylon sandwicense*. As the description of the remaining ones is so vague, and material of them not in the writer's possession, they are very dubious and are here ignored.

KEY TO THE SPECIES.

Leaves tomentose underneath.
- Branches glabrous, leaves 65 mm..... **S. Kauaiensis**
- Branches covered with ferruginous tomentum, leaves 100 mm or more **S. Wawraea**

Leaves glabrous.
- Leaves thin, without marginal nerve, petals markedly punctate..... **S. Lanaiensis**
- Leaves large 210 mm, elongate elliptical, petiolate, chartaceous.... **S. Fernseei**
- Leaves succulent, spathulate, 75 mm, petiole margined..... **S. spathulata**

Leaves dark, chartaceous, pale veined, not punctate; drupe very small 3 mm, spheroidal	**S. volcanica**
Leaves ovate to suborbicular, glaucous, margins revolute, style distinct	**S. Knudsenii**
Leaves thick coriaceous, 100 mm long or more, reticulate, cuneate at the base	**S. Lessertiana**
Leaves coriaceous, small, 24 mm, emarginate at the apex	**S. Sandwicensis**
Leaves elliptical-oblong, petiolate, 50 mm long, strongly reticulate.	**S. Hillebrandii**
Leaves sessile, very narrow, lanceolate, apex caudate, acuminate..	**S. lanceolata**

Suttonia kauaiensis (Hbd.) Mez.

SUTTONIA KAUAIENSIS (Hbd.) Mez Das Pflzenreich 9. IV. 236. (1902) 335;—Pax in Engl. et Prantl Pflzfam. IV. 1. (1908) 278.—**Myrsine kauaiensis** Hbd. Fl. Haw. Isl. (1888) 280;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 227.—Heller in Minnes. Bot. Stud. IX. (1897) 873.

A small tree 12 m in height; branches slender, glabrous; leaves pilose when young, glabrate when old, on petioles of 4-15 mm, oblong or oblong-lanceolate, shortly and obscurely acuminate at the apex or somewhat obtuse, reticulate on both sides, the adult leaves densely set with blackish minute dots; inflorescence of 1-5-7 flowers, bracts linear, 2-2.5 mm, the slender pedicels 5.7 mm, glabrous or pilose; flowers 3 mm long; sepals connate one-third their length, often covered with long hair at the dorsal side, ovate; petals elliptical, subrotundate at the apex, with elongate, brownish, or shortly linear dots; stamens with large, ovate-elliptical, somewhat acuminate anthers, slightly papillose; ovary glabrous, ovoid, style short and thick, stigma obtuse, very obscurely 5-angular; drupe globose, 4 mm.

This species was first collected by V. Knudsen (no. 191) of Kauai. It grows in the outskirts of the forests of Halemanu and Kaholuamano on Kauai. Specimens which evidently belong to this species were collected by the writer in the type locality (Halemanu) flowering (no. 1567) Febr. 14, 1909; and in Milolii gorge (no. 2355) Febr. 26, 1909. In this latter form the young leaves are membraneous and puberulous; without flower or fruit.

The typical *Suttonia kauaiensis* was collected in the forests of Kaholuamano, at an elevation of 3800 feet, flowering March, 1909, (no. 2359). The pedicels are glabrous, as well as the flowers, with the exception of the ciliate margin of sepals and petals; the leaves are subemarginate at the base.

Suttonia Wawraea Mez.

SUTTONIA WAWRAEA Mez Das Pflzreich 9. IV. 236. (1902) 335.—**Myrsine Gaudichaudii** var. **hirsuta** Wawra in Flora (1874) 524.—**Myrsine Kauaiensis** var. *β* **hirsuta** Hbd. in Fl. Haw. Isl. (1888) 281; Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 227.

A small tree or shrub; young branches densely and shortly covered with a turbid brown-ferruginous tomentum; leaves on petioles of 4 mm, elliptical or obovate-elliptical, somewhat obtuse at the apex, 8-16 cm long, 40-60 mm wide, the medium nerve covered with an appressed reddish tomentum, the under side of the young leaves with a scattered pubescence of the same color, prominently reticulate on both sides, the upper side glabrous, punctulate, with transparent dots; flowers 6-10, 14 mm long, pedicels densely tomentose 5-7 mm long; flowers densely tomentose, sepals connate at the base one-fourth their length, ovate, somewhat acute, with the margins very densely willous-ciliate; petals linear, anthers barbellate at the apex; stigma in the female flowers echinate-capitulate; drupe dark bluish, glaucous, globose 8 mm in diameter, crowned by the persistent stigma; seeds globose, many-ribbed, 6 mm in diameter, endocarp thin, papery.

This exceedingly interesting and handsome species, which is undoubtedly very closely related to *S. Kauaiensis,* occurs only in the very dense forest of the interior of Kauai, often bordering the extensive bogs. It is quite conspicuous on account of its dark green leaves which are dark reddish pubescent underneath, and also for its fruits, which are blackish blue with glaucous hue. It rarely attains a height of more than 12 feet and is often shrubby; the writer collected it on the borders of the bog Kauluwehi, elevation 4300 feet, in the heart of the Kauai forests, fruiting October, 1911, (no. 10229); and flowering, Kaholuamano forests (no. 2362), March 3-10, 1909; (no. 5956) fruiting from the tabular summit of Kauai Sept. 4, 1909. Abbe Faurie flowering March, 1910, (no. 424).

Suttonia lanaiensis (Hbd.) Mez.

SUTTONIA LANAIENSIS (Hbd.) Mez Das Pflzenreich 9. IV. 326. (1902) 336.—**Myrsine Lanaiensis** Hbd. Fl. Haw. Isl. (1888) 281.—Del Cast. Fl. Ins. Mar. Pac. VII. (1892) 227.

A small tree, glabrous throughout, the bark of the rather stiff branches covered with lenticels; leaves on petioles of 4-18 mm, elliptical, or obovate-oblong, shortly acute at the base, moderately acuminate at the apex, pale, dull, membraneous to chartaceous, minutely dotted above, very obscurely so underneath, 85 mm or more long, 40-60 mm wide, flowers rameal and in the axils of leaves, flowers usually 5-8 or even more, pedicels 5-6 mm, slender, glabrous; flowers 3 mm long; sepals almost free, ovate to suborbicular, with the margins papillose-fimbriate; petals elliptico-lanceolate, subacute, dotted with black roundish dots or lines; anthers ovate, subacute, the apex papillulose; ovary ovoid, narrowed toward the apex, glabrous, style none, stigma large, pulvinate; drupe globose, depressed 5-6 mm in diam. reddish, with chartaceous putamen, 1-seeded, with the rudiments of 2 or three ovules; embryo arcuately curved in horny albumen.

This handsome species, which has hitherto been thought to be peculiar to the Island of Lanai, has also been collected on the eastern part of Maui in open dry gulches back of Makawao at an elevation of 2500 feet, where it reaches a height of 30 feet.

It is exceedingly common on the Island of Lanai in the open dry gulches, such as Kaiholena, Mahana and Koele, where it is a small tree, and quite conspicuous on account of its pale, graceful foliage, which has always a pinkish tint. It is associated with *Rauwolfia sandwicensis, Xanthoxylum hawaiiense* var. *β., Pisonia sandwicensis,* and many others.

It is collected by the writer on Lanai, flowering July 27, 1910, (no. 8027); and flowering and fruiting Sept., 1910, (no. 8533) in a gulch above Makawao, Island of Maui.

Var. coriacea Rock var. nov.

A tree with stout and robust branches; leaves thick coriaceous, ovate-oblong, somewhat shining above, copper colored on both sides, dull underneath, prominently veined, very minutely punctate above, subacute or slightly emarginate at the apex, somewhat acute at the base, slightly contracted on puberulous stout petioles of 10-12 mm; flowers 8, on stout pedicels of 6 mm, glabrous, otherwise as in the species; fruit not seen.

Of this variety only one tree was observed in the xerophylous forest on the western end of Lanai, called Kaa, where a remnant of what must have been

once an interesting forest is still to be found. The tree was at once conspicuous by its thick leathery bronze colored leaves; it was just beginning to flower. It is associated with *Osmanthus sandwicensis, Xylosma Hillebrandii,* and *Maba sandwicensis.* From a distance the tree looked almost exactly like a Sideroxylon or Chrysophyllum. Collected flowering July 27, 1910, (no. 8078), type in the Herbarium of the College of Hawaii.

Suttonia Fernseei Mez.

SUTTONIA FERNSEEI Mez. in Das Pflzenreich 9. IV. 236. (1902) 336.—**Myrsine Gaudichaudii** var. **grandifolia** Wawra in Flora (1874) 524.

Branches very thick, at the very apex beset with minute ferruginous scales; leaves on petioles of 7 mm or more, elongate and narrowly elliptical, acute at the base, shortly contracted, 210 mm or more long, 65 mm broad, membranaceous to chartaceous, somewhat shining, reticulate; flowers 5-8, 12 mm or more long, pedicels slender, glabrous, 8 mm; flowers 3 mm long, glabrous; sepals connate one-third their length, the lobes triangular, with the margins densely ciliate, petals acute, very obscurely marked with lines; anthers of the female flowers little reduced, acute; ovary glabrous, with a sessile capitate stigma.

This species named by Mez in honor of Wawra, Ritter von Fernsee, was collected by the latter on the Island of Kauai (no. 2019). It is not known to the writer. It may, however, be identical with an exceedingly large Suttonia tree with a trunk of 2 feet in diameter, and very large leaves, found at Opaiwela near Kaholuamano, Kauai. Owing to the size of the tree it was impossible to secure specimens. The writer did not meet with any other tree of this sort, and was assured by Mr. Francis Gay of Kauai, who is more familiar with the Kauai forests than any other man, that the one in question is the only one known to him in the surrounding forests.

On the Koolau range on the Island of Oahu, in the mountains of Punaluu, the writer collected specimens of a Suttonia (no. 473) but without flower or fruit, whose leaves answer well Mez's description of *S. Fernseei,* and it is here doubtfully referred to that species. Among the numerous duplicates of the various Suttonia, the writer found a sheet numbered 2364 collected at Kaholuamano, Kauai, March, 1909, but without flower or fruit; it must however be referred to *S. Fernseei,* as the leaves answer the description.

Suttonia spathulata Rock sp. nov.

Kolea.

A small tree 6-8 m high, glabrous throughout; branches stiff, more or less ascending; leaves decidedly spathulate, bluntly acute at the apex or rounded, thick fleshy, rather succulent, on short margined petioles of 5-8 mm, or often subsessile, dark green above, light underneath, petioles reddish, veins quite inconspicuous, sparingly punctate with minute black dots, 5-7.5 cm long, 2-3 cm wide; branchlets densely flowered their whole length, (flowers unknown); fruits usually 4-6 in a cluster on pedicels of 10 mm, bracts broad, triangular; pedicels and the persistent ovate sepals glabrous, the latter with slightly fimbriate margins; fruit globose, black, 6 mm in diameter, crowned by the stigma.

This rather striking species is a small tree of 15-20 feet or little more, and is peculiar to Mt. Haleakala, Maui, where it grows on the northwest slope at an elevation of 6500 feet in the gulches back of the extinct crater of Puunianiau,

associated with *Dodonaea eriocarpa, Argyroxiphium virescens, Raillardia platyphylla, Santalum Haleakalae, Geranium arboreum,* and others.

It was collected by the writer fruiting on Oct. 11, 1910. The type is number 8591 in the Herbarium of the College of Hawaii.

It is at once distinguished from other Suttonia by its small spathulate, very thick leaves, and branchlets, which are densely covered with the rather large fruits. In the dry specimens the leaves turn pale and the fruits yellowish.

Suttonia volcanica Rock sp. nov.

Kolea.

A small tree 4-5 m high, with slender branches, glabrous throughout; leaves dark green, very prominently and pale veined, midrib red, pale underneath, not dotted, thin chartaceous, shining above, dull underneath, ovate-oblong, bluntly acuminate or acute, or slightly obtuse, rounded at the base, 5-10 cm long, 2-4.5 cm wide, on somewhat margined petioles of 6-8 mm; the slender branchlets densely covered with mature fruits; (flowers unknown); fruits 2-8 in a cluster on very slender glabrous pedicels of 6-8 mm; bracts reddish-brown, dentiform to linear, the persistent calyx parted two-third its length into 5-7 triangular lobes of 1 mm, with slightly ciliate margins; fruit subglobose or rather spheroidal, black when mature, very small for a Suttonia, 3-4 mm in diameter, glabrous, crowned by the stigma.

This species is remarkable for its very small fruits, which are densely clustered around the slender branchlets, and for its leaves, which are chartaceous, thin, and prominently veined, but not punctate. It was found by the writer on the great central plain between Mauna Loa and Mt. Hualalai on Hawaii on the cinder slopes of a crater called Puuokeanue, at an elevation of 5300 feet in company with *Solanum incompletum, Santalum Freycinetianum,* and *Raillardia* sp. It was collected fruiting Feb. 13, 1912. The type is no. 10230 in the Herbarium of the College of Hawaii.

Var. **lavarum** Rock var. nov.

Leaves elliptical-oblong, to oblong-lanceolate, of the same texture and venation as the species, obscurely acute, or obtuse, slightly contracted at the base, dark green above, dull and lighter underneath, not punctate, 6-12 cm long, 2-3.5 cm wide, on black petioles 10-15 mm, inflorescence in fascicles, mainly in leaf-axils and also along the branches but not very numerous; inflorescence of 8 flowers, on slender pedicels 4-7 mm, bracts as in the species; calyx parted one-half its length into 5-7 ovate rounded lobes with ciliate margins; petals pubescent with ciliate-fimbriate margins, densely punctate with rather large black dots; anthers sagittate, with pubescent apex; ovary globose, with sessile capitate stigma; fruits as in the species, little larger.

The variety *lavarum* occurs on the southern slopes of Mt. Haleakala, Maui, on the *aa* lava fields of Auahi, on the land of Kahikinui, an exceedingly dry locality at an elevation of 2000 feet. It was collected by the writer flowering and fruiting November, 1910. The type is number 8678 in the College of Hawaii Herbarium.

It is a small tree and quite distinct from *Suttonia Lessertiana* and its numerous variations, which occur at little higher elevation in the same locality. In texture and venation of leaf, shape and size of fruit, as well as general aspect, it is almost identical with *Suttonia volcanica* from Mauna Loa, Hawaii, of which it is here made a variety.

PLATE 149.

SUTTONIA LESSERTIANA (A. DC.) Mez.
Kolea.
Flowering branch, from a tall tree found in the rain forests of Naalehu, Kau, Hawaii; one-half natural size.

Suttonia Knudsenii Rock sp. nov.

A small tree or shrub, branches tortuose, glabrous; leaves ovate to obovate, or suborbicular, glabrous on both sides, venation prominent, reticulated, the margins revolute, quite opaque, sparingly punctate underneath, dark green, with glaucous hue, shining above, dull beneath, quite chartaceous, 4.5-7 cm long, 3-4.5 cm wide, on petioles of 2-4 mm; inflorescence fasciculated at intervals of 15 mm along the slender branchlets and in the axils of the leaves, of 3-12 flowers, puberulous, pedicels of 2-2.5 mm, the bracts 1 mm, triangular, with ciliate margins; calyx 2 mm, parted more than half its length into acute lobes, densely punctate, with fimbriate margins, corolla twice as long as the calyx, ornamented with dark dots, anthers oblong, puberulous at the apex, ovary ovoid, with distinct style; fruit unknown.

This exceedingly handsome species is peculiar to the Island of Kauai and is only found in the forests of Halemanu, in the interior swampy woods; it is distinguished from the other Suttonias by its thin leaves which are ovate to suborbicular and are of a glaucous color, and in the very shortly pedicellate red flowers. It is a striking species and is here named for Mr. Augustus Knudsen, of Waiawa, Kauai, to whom the writer is greatly indebted for extended hospitality and facilities for collecting in the mountains of Kauai. The type is number 2337 in the College of Hawaii Herbarium. Collected February 14-26, 1909, Halemanu, Kauai, flowering.

A form with somewhat smaller leaves, which are acute at the apex instead of rounded, and more elliptical in outline, must be referred here as forma *elliptica* fm. nov. (no. 1661), flowering, February, 1909, Halemanu, Kauai.

Suttonia Hillebrandii Mez.

Kolea.

SUTTONIA HILLEBRANDII Mez Das Pflzenreich 9. IV. 236. (1908) 337.

Branches entirely glabrous, leaves on petioles of about 3 mm, acute at the base, shortly contracted, quite acuminate at the apex, rarely somewhat obtuse, about 50 mm long, 20 mm broad, not punctate; inflorescence 5 or more flowered, 10 mm long, pedicels slender, glabrous, 7 mm long sepals 1/3 connate, the lobes ovate somewhat acute, the margins remotely dentate and ciliate, lineate; ovary globose, stigma thick capituliform.

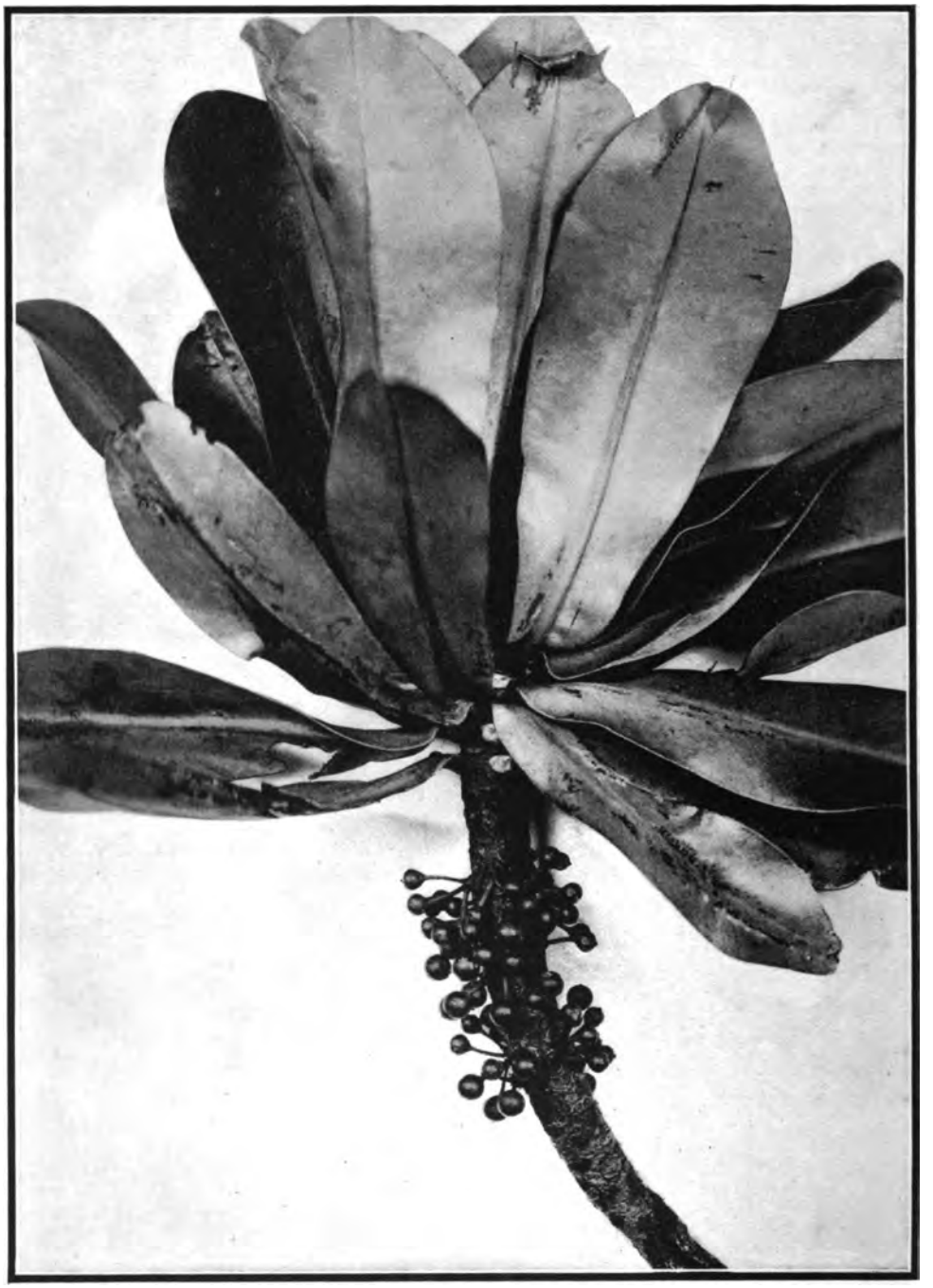
This species, which is not known to the writer, was collected by Wawra on the Island of Kauai, evidently at Halemanu. There are several forms found on the Island of Oahu which are certainly referable to this species; some of them are varieties.

On the Island of Oahu in the Koolau range, Mountains of Waikane, the writer collected specimens of a tree which is a good variety and may be described as follows:

Var. **emarginata** Rock var. nov.

A small tree; leaves lanceolate oblong, glabrous throughout, chartaceous, 3.5 to 8 cm long, 12 to 15 mm wide, contracting at the base into a slightly margined petiole of 2 to 3 mm, veins prominent; intramarginal nerve continuous and very close to the edge, rounded at the apex and always emarginate; dark green above, lighter beneath; inflorescence in the axils of the leaves and along the branchlets, 3 to 8 flowered, pedicels slender, puberulous, as are the petals, which are sparingly punctulate with reddish dots or even lined; stamens oblong, little shorter than the petals; ovary ovoid, style distinct; fruits large, black, 8 to 9 mm in diameter.

PLATE 150.



SUTTONIA LESSERTIANA (A. DC.) Mez.
Kolea.
Fruiting branch from a stunted tree found on open exposed ridges on Mt. Konahuanui, Oahu; about one-half natural size.

In Niu Valley, Oahu, occurs a small tree which belongs to this variety. In specimens from the latter locality the fruits are densely clustered along the branchlets, especially on defoliate ones, making them appear like axillary racemes.

Collected flowering (no. 1217)) January 23, 1909, Waikane Mts., Oahu, and Niu Valley, fruiting Aug. 22, 1909 (no. 4807), and Feb. 8, 1913, fruiting (no. 10232), same locality.

Suttonia Lessertiana (A. DC.) Mez.

Kolea.

(Plates 149, 150, 151.)

SUTTONIA LESSERTIANA (A.DC.) Mez Das Pflzenreich 9. IV. 236. (1902) 336;—Pax in Engl. et Prantl Pflzfam. Nachtr. IV. 1. (1908) 278.—Brigham Ka Hana Kapa in Mem. B. P. Bish. Mus. (1911) 148. fig. 89.—**Myrsine Lessertiana** A. DC. in Ann. Sc. Nat. 2. Ser. XVI. (1841) 85 et in DC. Prodr. VIII. (1844) 96;—Gray in Proc. Am. Acad. V. (1862) 331;—Seem. Fl. Vit. (1866) 149;—Mann in Proc. Am. Acad. VII. (1866) 188;—Hbd. Fl. Haw. Isl. (1888) 279;—Del Cast. Ill. Ins. Mar. Pac. VII. (1892) 227;—Heller in Minnes. Bot. Stud. IX. (1897) 874.—**Myrsine Gaudichaudii** Wawra (non DC.) in Flora (1874) 523;—Gray l. c. 331; Seem. l. c.;—Mann l. c. 188;—Hbd. l. c. 280;—Heller l. c. 873.—**Myrsine Fauriei** Lévl. in Fedde Repert. X. 10-14. (1911) 154.—**Suttonia Fauriei** Lévl. in Fedde Repert. X. 24-26. (1912) 373.—**Suttonia cuneata** Lévl. et Faurie in Fedde Repert. X. 27-29. (1912) 443;—**Suttonia pukooensis** Lévl. l. c. 444.

Branches thick or very thick, quite glabrous, old ones verrucous; leaves very shortly petioled or often broadly sessile, broad or narrow elliptical, or elliptical-lanceolate or obovate, somewhat obtuse at both ends or rounded at the apex, often acute at the base, of variable length and width, coriaceous, the adult leaves densely and minutely punctulate above with black dots, the veins little prominent and connected by a straight marginal nerve; flowers in the axils of the oldest leaves and all along the branchlets and on projecting spurs of the bare branches, in fascicles of 3 to 7 or more, pedicels slender, glabrous, 5 to 6 mm with flowers, and longer with fruits; flowers 3 to 3.5 mm long, glabrous, sepals shortly (1/5) united at the base, lobes 5 to 7 ovate somewhat acute, the margins very shortly fimbriate; petals broadly elliptical twice the length of the calyx, yellowish with reddish dots, apex obtuse, the margin papillose; stamens little shorter than the petals, anthers ovate, apex papillulose, emarginate at the base; ovary ovoid-conical, stigma sessile or on a short style, capitate, fimbriate or 5-laciniate on the fruit; drupe globose, reddish or black, 4 to 6 mm with chartaceous pyrena.

This species is one of the most variable ones in the genus, and that to such an extent that hardly two trees are alike. The leaves are the most variable part of the plant; also shape and branching habit vary greatly. It certainly is a graceful tree in the rain forests of Oahu and Hawaii, as well as on the other islands of the Hawaiian group. Should one undertake to describe all the various forms as new species, as H. Léveillé did, one would certainly be naming individuals, and swell the synonyms of *Suttonia Lessertiana*, into which most of H. Léveillé species have wandered to remain there forever; the remaining ones are synonyms of *S. sandwicensis*.

As already stated the species occurs on all the islands of the group in many forms which are too numerous to cite, but have been incorporated in the description to some extent. The trees reach often a height of 60 feet or so, with a trunk of one to two feet in diameter, and clothed in a gray bark which

PLATE 151.

SUTTONIA LESSERTIANA (A. DC.) Mez.
Kolea Tree.
Growing in the Kipuka Puaulu, near the Volcano of Kilauea, Hawaii. elevation 4000 feet.

is either smooth or covered with lenticels; when cut into, a red sap exudes very freely, which was employed by the natives of by-gone days for dyeing the tapa or paper cloth. The wood is quite handsome, of a pink color and mottled throughout. It is not very hard, but was used by the natives for house posts and beams; it takes a fine polish and could be employed for cabinet work as it can be easily worked. The biggest trees the writer observed on the Island of Hawaii on the slopes of Mauna Kea and Mauna Loa, as well as in Waihou forest on the flanks of Mt. Hualalai. It favors an elevation of from 3000-4000 feet, but descends lower on Oahu, though higher on Hawaii. It grows in the rain forests, though its best development is attained in the more open park-like forests situated on the above mentioned mountains.

On the Island of Lanai occurs a tree which must be referred to *S. Lessertiana*, but from which it differs in the decidedly ovate fruits, or even elongate-ovate, and is here named forma *ovicarpa* fm. nov. Collected in Mahana Valley, Lanai, fruiting Aug. 1st, 1910; no. 8102.

Suttonia sandwicensis (A. DC.) Mez.

Kolea laulii.

(Plate 152.)

SUTTONIA SANDWICENSIS (A. DC.) Mez Das Pflanzenreich 9. IV. 236. (1902) 336.—**Myrsine sandwicensis** A. DC. in Ann. Sc. Nat. 2. Ser. XVI. (1841) 85 et in DC. Prodr. VIII. (1844) 96;—Gray Proc. Am. Ac. V. (1862) 331;—Seem. Fl. Vit. (1866) 149;—Mann Proc. Am. Ac. VII. (1867) 188;—Wawra in Flora (1874) 523?;—Hbd. Fl. Haw. Isl. (1888) 281;—Pax in Engl. et Prantl Pflzfam. IV. 1. (1889) 92;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 227;—Heller in Minnes. Bot. Stud. Bull. IX. (1897) 874 (not Myrsine lanceolate).—**Myrsine Vanioti** Lévl. in Fedde Repert. X. 10/14. (1911) 157.—**Myrsine sandwicensis** var. **mauiensis** Lévl. l. c. 157.—**M. sandwicensis** var. **punctata** Lévl. l. c. 157.—**Suttonia mauiensis** (Lévl.) Lévl. in Fedde Repert. X. 27/29 444.—**S. punctata** (Lévl.) Lévl. l. c. 144, identical with Myrsine sandwicensis DC. var. β denticulata Hbd. l. c.

A small tree or shrub of myrtillaceous habit, with the young branches somewhat tomentulose, or in Kauai specimens covered with a rufous tomentum, leaves on petioles of up to 3 mm, obovate or lanceolate-obovate, acute at the base, emarginate at the apex, 14 to 24 mm long, 6 to 10 mm broad, coriaceous, with hidden veins, quite opaque, rugose underneath, glabrous, the young leaves often densely punctulate with reddish dots; inflorescence of 3 to 7 flowers, on not protruding gemmae, the pedicels 4 to 6 mm; flowers 2 to 2.5 mm long; sepals little connate, ovate, the margins papillulose-ciliate; petals elliptical-lanceolate, acute, scarcely twice as long as the sepals, yellowish or reddish, with reddish-brown streaks; stamens only half as long as the corolla, anthers shortly acuminate at the apex; ovary ovoid, gabrous, stigma subsessile, large, capitate-pulvinate; drupe black or bluish aud glaucous, globose or ovoid, 3 to 5 mm in diameter.

This very handsome species is usually found as a shrub, but also as a tree, especially in the forest of the southern slopes of Mauna Loa at an elevation of 5500 feet, where it attains a height of 25 feet. It is quite conspicuous in the woods on account of its small foliage which is less than an inch long, dark green above and pale underneath. It occurs on all the islands of the group and is more or less uniform, with the exception of on Kauai, where it is quite

PLATE 152.

SUTTONIA SANDWICENSIS (A. DC.) Mez.
Kolea Laulii.
Flowering branch, about one-half natural size.

variable. It is plentiful in different forms in the forests of Halemanu, above Waimea, Kauai, where it is a small tree or shrub.

It is not found at low elevations where *S. Lessertiana* abounds, but is more or less restricted to the higher levels, that is between 3000-5500 feet, or occasionally even higher. To this species are referred Léveillé's numerous new species, which are not even forms of *S. sandwicensis*. His *S. punctata* is identical with Hillebrand's var. *β. denticulata* a low shrub, which occurs on the high plateau of Kauai in open bogs, or often also in the swampy forests. The writer had at his disposal co-types of Léveillé's plants, which were kindly loaned to him by the Brothers of the Catholic school of Hilo, to whom Abbé Faurie sent one set of his duplicates. With the help of these plants the writer was enabled to straighten out Léveillé's species, which could not have been done satisfactorily with Léveillé's short description only.

Var. **apodocarpa** (Lévl.) Rock.

Suttonia apodocarpa Lévl. et Faurie in Fedde Repertor. X. 27/29 (1912) 44.

Leaves linear, indistinctly multipunctate, 1 to 2 cm long, 2 to 5 mm wide, acuminate glabrous, rugulose, with revolute margin, subpetiolate, long attenuate, fruits usually single or 2 to 4 in a cluster, on very short pedicels, (according to Léveillé sessile, but his specimen at my disposal bears neither flower nor fruit) globose, 3 to 4 mm, crowned by the capitate stigma. Abbé Faurie's number is 446, coll. Waimea, Kauai, Febr., 1910.

The writer's own material of this plant, which is not specifically distinct from *S. sandwicensis*, but is a variety, was collected on the central plateau of Kauai in September, 1909, fruiting no. 5605. Hillebrand's var. *β.denticulata* occurs also in that locality, flowering and fruiting no. 4967, Sept., 1909, and Oct., 1911.

Suttonia lanceolata (Wawra) Rock.

Kolea.

Myrsine sandwicensis var. **lanceolata** Wawra in Flora (1874) 526.—**Myrsine lanceolata** Heller in Minnes. Bot. Bull. IX. (1897) 873, not **M. angustifolia,** Heller —**Suttonia angustifolia** Mez Das Pflzenreich 9. IV. 236. (1902) 337.

Branches slender, glabrous, nodose, dark reddish brown, foliate only at the apex; leaves, linear-lanceolate, dark green above, pale underneath, caudate-acuminate at the apex, acute at the base, sessile or subsessile, minutely reticulate underneath, minutely punctulate above, with black dots, 40 to 65 mm long, 5 to 8 mm wide; flowers single or two in the axils of the leaves on short pedicels of 2 mm; flowers 3 mm, glabrous, sepals ovate, subacute, sparingly punctate, half the length of the corolla; petals oblong, subacute, sparingly punctate, with a reddish thickened margin, stamens the height of the ovary, which is less than half the length of the petals, anthers acute, glabrous, ovary conical with a sessile capitate stigma; drupes usually on the naked branchlets, bluish-black, glaucous, 8 mm in diameter.

This very distinct species is peculiar to the high mountains of Kauai, and is not uncommon at the summit of Kauai, Mt. Waialeale, elevation 5200 feet, where it grows as a small tree 15 feet or more in height in the open boggy country, in company with *Labordea Waialealae, Pelea Waialealae, Dubautia paleata, Tetraplasandra Waialealae, Lobelia Kauaiensis,* and others. It is an exceedingly

handsome species on account of its beautiful delicate foliage. Lower down, in the great bogs of Lehua makanoe and Kauluwehi (4500 feet) it is a shrub 8 feet in height.

Collected by the writer on September 24, 1909, fruiting (no. 4958), on the summit of Waialeale, Kauai, and flowering and fruiting October 20, 1911, (no. 8887), Mt. Waialeale, Kauai.

SAPOTACEAE.

The family Sapotaceae, which consists of about 445 species distributed in more than 31 genera, occurs in the tropics of the whole world, but is absent in Europe and extra-tropical Asia. In the Hawaiian Islands two genera are represented: Chrysophyllum with a single species, and Sideroxylon with four distinct species and several varieties, all of which are peculiar to these Islands. The Sapotaceae are characterized mainly by their milky sap, and regular cyclic construction of their flowers. All Sapotaceae are woody plants with entire leaves, save in a single exception.

KEY TO THE GENERA.

Corolla 8 to 10 lobed, without staminodia, fruit small, black, olive shaped. ..... **Chrysophyllum**
Corolla 5 lobed, with staminodia, fruit large, globose or ovate..... **Sideroxylon**

CHRYSOPHYLLUM L.

Calyx with 5, rarely 6 to 7 imbricate lobes. Corolla with campanulate or short cylindrical tube of 5, rarely 6 to 7, occasionally, as in the Hawaiian species, 8 to 10 imbricate segments. Stamens as many as segments in the corolla, filaments filiform; anthers short, ovoid, opening outside or laterally, occasionally abortive. Ovary 5 to 10 celled, pubescent. Style short, with small capitate stigma. Berry rarely more than one-celled, and with several compressed seeds; usually with one ovate or olive shaped seed, testa opaque, shining. Cotyledons thin, foliaceous.—Milky trees with alternate ovate or lanceolate leaves, without stipules. Flowers usually small, whitish or yellowish, shortly stipitate in axillary fascicles.

The genus Chrysophyllum, with its 70 species, is mainly tropical and is most numerous in species in tropical America.

In Hawaii the genus is represented by a single species, *Ch. Polynesicum* Hbd., which is peculiar to these Islands, and inhabits the dry regions on the leeward sides, but is by no means common.

Chrysophyllum Polynesicum Hbd.

Keahi.

CHRYSOPHYLLUM POLYNESICUM Hbd. Fl. Haw. Isl. (1888) 277;—Engler in Engl. et Prantl Pflzfam. IV. 1. (1890) 149.—**Isonandra polynesica** Benth. et Hook. Gen. Pl. II. (1876) 658;—Del. Cast. Ill. Fl. Ins. Mar. Pacif. VII. (1892) 229.

Branches stiff, cinereous; young leaves and inflorescence rusty-tomentose, leaves scattering, oblong or obovate 5 to 10 cm long, 5.5 to 5 cm wide, on petioles of 12 to 25 mm, rounded or emarginate at the apex, thick coriaceous, glabrate with age; flowers axillary on prominent nodes, 3 to 6 in a cluster, on pedicels of 4 to 6 mm, which are bracteate at the

base; calyx persistent, coriaceous, deeply 4 to 5 parted; corolla little longer 4 to 5 mm, urceolate, divided into twice as many lobes as the calyx; staminodia none; stamens inserted at the base of the corolla, as many as lobes; ovary hairy 4 to 5 celled; style angular; fruit a somewhat fleshy black shining olive-shaped berry with a thin fibrous endocarp, about 16 mm long, 1- rarely 2-seeded, the single seed ovoid, with thick, bony, shining, pale brown testa; hilum obliquely basal, leaving a broad roundish deep scar; embryo axillary, cotyledons oblong, obtuse, radicle very short, inferior.

The *Keahi* is a medium-sized milky tree with a roundish crown, and rough drooping branches. The leaves resemble somewhat those of the Sapota pear, or more so the *Alaa* (*Sideroxylon sandwicense*), and is hardly distinguishable from it when without fruit or flower.

The flowers are borne all along the branchlets and very densely. It is a very prolifically bearing tree and can be found loaded with the black, olive-shaped shining fruits during the months of May to August. It inhabits the very dry regions on the leeward sides of most of the islands, and is very common on Lanai, where it grows in company with *Sideroxylon sandwicense, S. spathulatum,* the leaves of which look all very much alike and when not in fruit are exceedingly difficult to distinguish. On Molokai it is also common, as well as on the Island of Maui on the slopes of Haleakala, district of Kahikinui, while it has so far not been found on Hawaii. Together with Sideroxylon, Nothocestrum, Suttonia, Osmanthus, Reynoldsia, Gardenia, Antidesma, *Bobea Hookeri,* and Rauwolfia, it forms the typical dry forest at the lower elevation on Mt. Haleakala, on the lava fields of Auahi.

The *Keahi* is peculiar to the Hawaiian Islands. As far as can be ascertained, the natives made no use of this tree, though the wood is quite hard and durable, while the fruits are not edible.

SIDEROXYLON L.

Flowers occasionally polygamous; calyx lobes 5 to 6, imbricate; corolla broad-campanulate, with short or longer tube and 5 to 6 obtuse or acute segments. Staminodia 5 to 6, petaloid, or only scale-like to filiform. Stamens 5 to 6, with short or long filaments and ovate to lanceolate anthers. Ovary glabrous or pubescent, 5 to 2 celled. Style short or long, with small stigma. Berry ovoid to globose, usually small or often large, with thin pericarp, with 5 to 2 seeds, more often one-seeded. Seeds with shining hard testa and elongate linear hilum; albuminous. Cotyledons broad, flat.—Trees with usually coriaceous leaves, with and without stipules, and small sessile or peduncled flowers.

A genus of over 100 species, occurring in the tropical and subtropical regions of the old and new world. In the Hawaiian Islands the genus is represented by several species usually growing in the dry districts on the lee sides on the various islands. Originally only two species were known from Hawaii, to which the writer had added two new ones.

What has been said of the polymorphism of the genus Pittosporum in Hawaii, holds also good for the genus Sideroxylon.

The tremendous variations which we find in the species growing in Hawaii make it indeed difficult to separate all these forms satisfactorily. The fruits of the Hawaiian Sideroxyla are of various shapes and colors, the largest fruits

PLATE 153.

SIDEROXYLON SANDWICENSE (Gray) Benth. and Hook.
Alaa.
Showing fruiting branch, about two-third natural size.

occurring in *S. rhynchospermum* Rock. They are ovoid and of a deep purplish black color. The fruits of *S. sandwicense* (Gray) B. & H. are pear-shaped to ovoid and also black and long peduncled, while those of *S. auahiense* Rock and its varieties on Hawaii are bright citron yellow, globose to top-shaped and sessile. The writer has collected large material of this genus from numerous localities. That *S. auahiense* is a good species is brought out by the fact that the latter grows in company with *S. sandwicense* with black ovoid fruits on the lava fields of Auahi, Maui, and nothing is more in contrast than to see these two species growing side by side, especially when loaded with respectively the bright yellow and the black fruits. On the slopes of Haleakala, back of Makawao, the writer collected specimens of a tree with large cone shaped, whitish-gray fruits, whose seeds differ decidedly from all the other Hawaiian species, while in the same locality only 50 yards off grew the typical *S. sandwicense.*

On Molokai occurs a very small-leaved species, which was unfortunately not in fruit, perhaps a form of *S. spathulatum* Hillebr. from Lanai. On the latter island the writer collected the largest leaved Sideroxylon with long pear-shaped black fruits. Another form was in flower only, the latter being of exceedingly large size compared with the other Hawaiian Sideroxyla. All the specimens collected by the writer on Kauai are one seeded, while those from the other islands are all five seeded, save a few exceptions.

The Hawaiian species of Sideroxylon may be arranged as follows:

KEY TO THE SPECIES.

Flowers 2 to 4, in clusters, pedicellate.
  Fruits globose ovoid to obovate, purplish black.
    Seeds thick, rounded at both ends..... **S. sandwicense**
    Seeds thin flat, beaked at both ends..... **S. rhynchospermum**
Flowers single and sessile.
  Fruits globose citron or orange yellow.
    Seeds as in **S. sandwicense** but smaller..... **S. auahiense**
Flowers 2 to 3, pedicellate.
  Fruits conical, brownish yellow.
    Seeds small, linear-elongate, dull..... **S. spathulatum**
Flowers single, pedicellate.
  Fruits large conical, grayish-white.
    Seeds elliptical elongate, dull; radicle long, protruding..... **S. Ceresolii**

Sideroxylon sandwicense (Gray) Benth. & Hook.

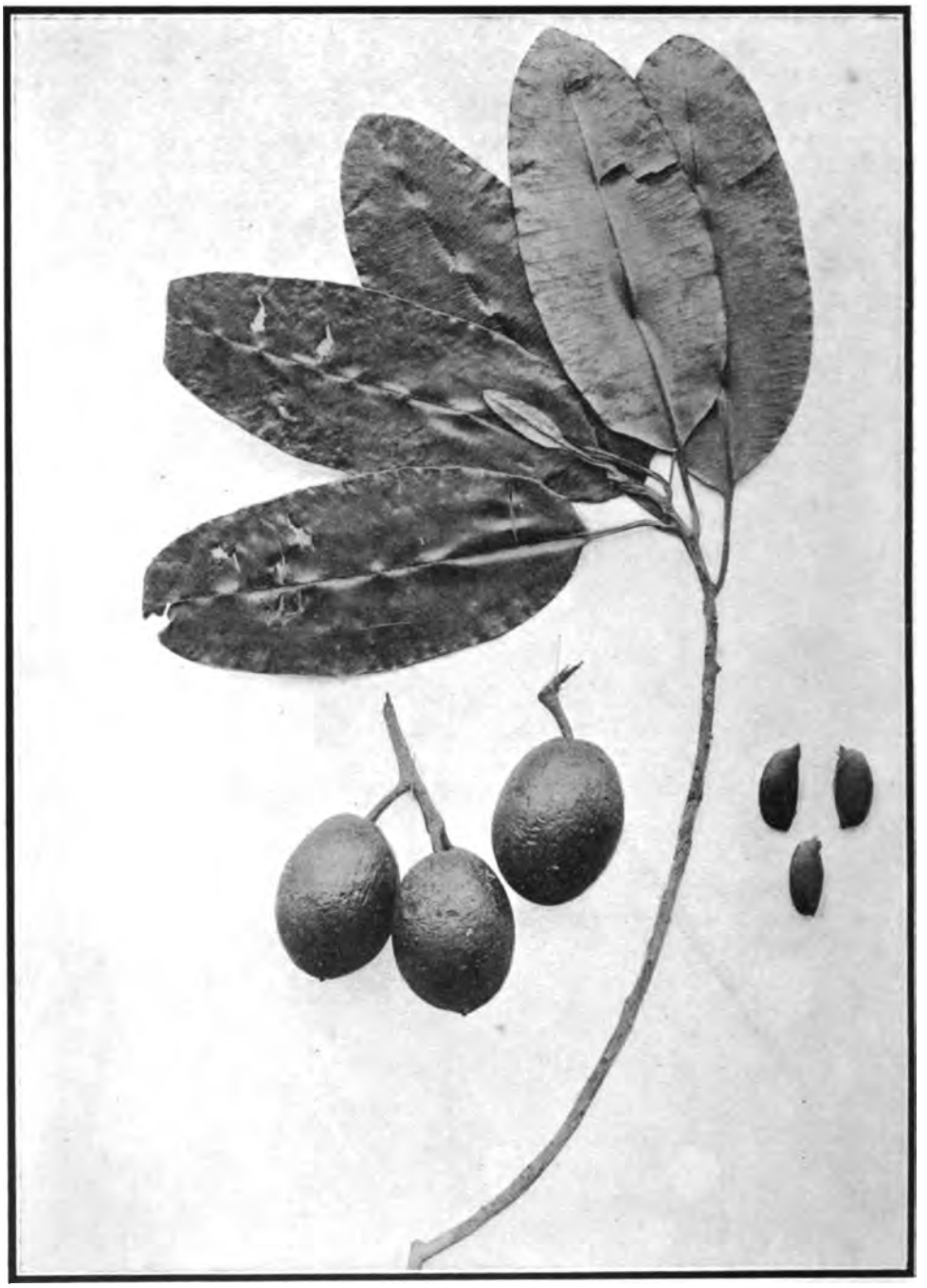
Alaa or *Aulu, Kaulu* according to Hillebrand.

(Plate 153.)

SIDEROXYLON SANDWICENSE (Gray) Benth. & Hook. Gen. Pl. II. (1876) 655;—Hbd. Fl. Haw. Isl. (1888)) 276;—Engl. in Engl. et Prantl Pflzfam. IV. I. (1890) 144. fig. 77, L (Sect. VIII., in Nachtr. Sect. IX.);—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 288.—**Sapota Sandwicensis** A. Gray in Proc. Am. Ac. V. (1862) 328;—H. Mann Proc. Am. Ac. VII. (1867) 188;—Wawra in Flora (1875) Addenda 252.

Leaves coriaceous, obovate-oblong, on petioles of 2.5 to 3.5 cm, equally rounded at both ends, or contracted at the base, quite entire, old leaves glabrous on both faces, often clothed with a brownish pubescence underneath, shining above, veins prominent straight

PLATE 154.



SIDEROXYLON RHYNCHOSPERMUM Rock.
Alaa.
Showing fruiting branch and seeds; about one-half natural size.

and close, connected by an intra-marginal nerve; flowers in clusters of 2 to 4 on tomentose pedicels of about 20 mm; calyx 5 lobed, (3 int. 2 ext.) broadly ovate, covered with a rusty brown tomentum, the two inner only pubescent on the exposed parts; corolla glabrous, slightly longer than the calyx, parted to little beyond the middle into 5 obtuse broad lobes, 6 mm, includ. the corolla tube; staminodia linear in front of the sinus; stamens inserted at the base of each lobe, perfectly glabrous, anthers sagittate, opening laterally, included; ovary conical densely hirsute with long stiff hair, 5-celled with one ascending ovule in each cell; style short, grooved at the apex; berry globose, or pear-shaped, to obovate, black, 3 cm in diameter, or 3 to 4.5 cm when obovate or ovate, rather dry, 5 to 1 seeded, each seed enclosed in a thin chartaceous pyrena, 20 mm long, 8 mm thick when single, more or less compressed when many, the crustaceous testa yellowish brown and shining, the elongate scar of the raphe occupying nearly the whole central angle; cotyledons nearly as long and broad as the albumen, the minute radicle inferior.

The *Alaa* is a fine tree of often 50 feet in height and is conspicuous in the forest by its leaves, which are of bronze to reddish brown color underneath, due to a hairiness of that color. It is usually found in the dry districts of nearly all the islands, and is especially common on Lanai in the valleys of Kaiholena and Mahana. On Maui big trees can be found above Makawao, in the gulches of the north-western slopes of Mt. Haleakala, as well as at Auahi, on the south side of the said mountain. On Hawaii this species is wanting, but the genus is represented by another species, *S. auahiense* var. *aurantium* Rock, with globose orange colored sessile fruits. The natives employed the milky sap as a bird glue. Hillebrand remarks in his Flora that the fruit of this tree is rarely met with perhaps on account of dimorphism in the flower. This the writer cannot verify, as all the trees found by him bore fruit in abundance, with the exception of on Kauai, where none of the trees bore perfect fruits, but were all abortive and consequently of very small size. The fruits are not always globose, but are quite often ovate, obovate and even long pear-shaped and of a black color. It inhabits mainly the dry districts, but can also be found along the Manoa Valley trail and Tantalus on Oahu, as well as at Kahuku, Waialua, and the Waianae range.

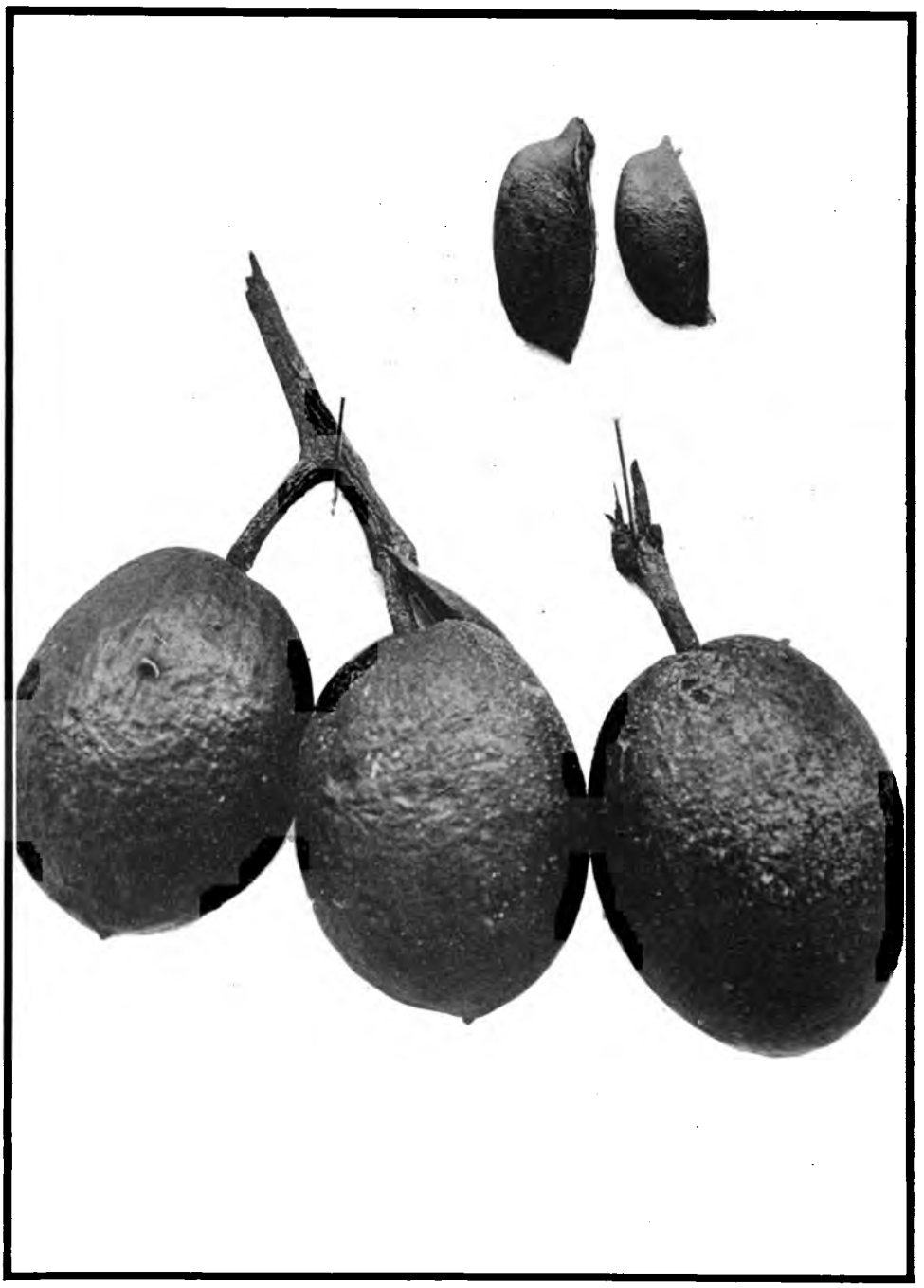
Hillebrand records a variety *β. auratum* with leaves and calyx, as well as corolla, densely ferruginous. The flowers are also generally single. Collected by Hillebrand on the dry forehills of Molokai and Lanai. From the latter islands the writer collected material which he must refer to this variety, though the flowers are not always single but often two in each leaf axil. Rock, Lanai, Kaiholena Valley, July, 1910. No. 8064.

Sideroxylon Ceresolii Rock spec. nov.

Leaves perfectly glabrous when old, chartaceous, (not thick leathery) obovate-oblong, bluntly acuminate, gradually tapering into a margined petiole of 2.5 to 3 cm; fruits single in the axils of the leaves, on peduncles of 5 mm, berry ovoid, acuminate at the apex, grayish-white in color, very soft and fleshy, 4 cm long, 2.5 cm wide, yellowish inside, 5-seeded, seeds elliptical-elongate, acute at both ends but not beaked, or somewhat obtuse, thin flat, dull brown, mottled, 24 mm long, 10 mm wide at the middle, testa rather thin, the raphe not quite as long as the ventral angle; cotyledons as broad as the albumen but only 2/3 its length, the inferior radicle 8 mm long, protruding half its length.

Collected on the Island of Maui in Waihou gulch on the northwestern slope of Mt. Haleakala, elevation 3000 feet, in company with my friend, Dr. P. Cere-

PLATE 155.



SIDEROXYLON RHYNCHOSPERMUM Rock.
Alaa.
Showing fruits and seeds about natural size.

sole, after whom the tree is named. Rock & Ceresole, March, 1912; type in College of Hawaii Herbarium, No. 10150.

A medium-sized tree 20 to 30 feet in height with straight ascending branches. The fruit and seeds of this species differ very materially from all other known Hawaiian Sideroxyla.

Sideroxylon rhynchospermum Rock.

Alaa.

(Plates 154, 155.)

SIDEROXYLON RHYNCHOSPERMUM Rock in Torrey Bot. Cl. Bull. Vol. 37, 6. (1910) 295, fig. 2 & 3 a. b. et Report Hawn. Bd. Com. Agr. & For. (1911) 84, pl. 21.

A tree 10 to 20 m high, dividing freely into ascending branches; bark brownish, with shallow, narrow longitudinal corrugations about 3 mm thick, trunk up to 45 cm in diam. four feet from the ground; leaves coriaceous, obovate oblong 14 to 18 cm x 4.5 to 8 cm, on petioles 2.5 to 3 cm, alternate, exstipulate, quite glabrous with age, some pubescence remaining on the sides and angles of midrib and veins, especially on the lower surface, shining above, dull beneath, midrib prominent, with lateral veins leaving midrib at wide angles, parallel and connected with a continuous intra-marginal nerve; young leaves densely covered with appressed brown hair on both surfaces; flowers in cluster 2 or 3 on tomentose pedicels 12 to 20 mm long; calyx 5 parted to near the base, lobes acute, 3 to 5 mm; corolla light yellow, longer than the calyx, 4 to 5 parted to the base, lobes acute; staminodia half as long linear; stamens 5, inserted at the base of the corolla, glabrous, anthers ovate, the cells confluent at the apex, opening laterally; ovary hirsute, 5-celled, style short; fruit a purplish black plum-like berry 4.5 to 5.5 cm long, 3.5 cm wide, rather fleshy, 3 to 5 seeded; seeds enclosed in a papery pyrena 25 to 30 mm x 12 to 14 mm, perfectly flat, about 3 mm thick, beaked at both ends of the ventral angle, which is occupied by the scar of the raphe, the crustaceous testa thin, of a light brown color.

This rather handsome tree was first collected by Dr. H. L. Lyon in the woods of Nahiku, on the north-eastern slopes of Mt. Haleakala, Maui, at an elevation of 1300 feet. The species differs from the other Hawaiian Sideroxyla in the large black ovoid fruits and mainly in the very flat thin-beaked seeds. It grows in the rain forest of Nahiku, where precipitation is exceedingly heavy; while most of the other Hawaiian Sideroxyla are peculiar to the dry regions. When the writer visited the forests of Nahiku in the year 1911, the trees were neither in flower nor in fruit. The trees are not very abundant, but only individual trees could be seen scattered through the forest.

Sideroxylon auahiense Rock.

Alaa.

SIDEROXYLON AUAHIENSE Rock Coll. Haw. Publ. Bot. Bull. 1. (1911) 18. pl. 5.

Leaves coriaceous, pale green, glabrous on both sides when old, shining above, covered with a gray silvery tomentum when young, elliptical oblong, bluntly acuminate or rounded, 8 to 12 cm long, 4 to 6 cm wide, on petioles of 3 to 4 cm, veins parallel leaving midrib at wide angles of about 80°; flowers single, rarely two in the axils of the alternate leaves, calyx hirsute, 5 parted to near the base, the lobes rounded, corolla lobes 5, obtuse, staminodia shorter than the lobes, 5, triangular; stamens wanting in the female flowers; ovary hirsute with a dense circle of long reddish hair at its base, 5-celled; style short conical; berry sessile or subsessile, pale citron yellow, with a grayish hue, rather globose with the apex drawn out into a short acumen; 3.5 to 4.5 cm in diam., bright yellow inside, quite fleshy; seeds 20 mm long, 10 mm wide, enclosed in a thin papery pyrena, the thick hard testa pale yellow, with reddish spots, shining; the scar of the raphe shorter than the ventral angle; cotyledons broad, the minute radicle inferior.

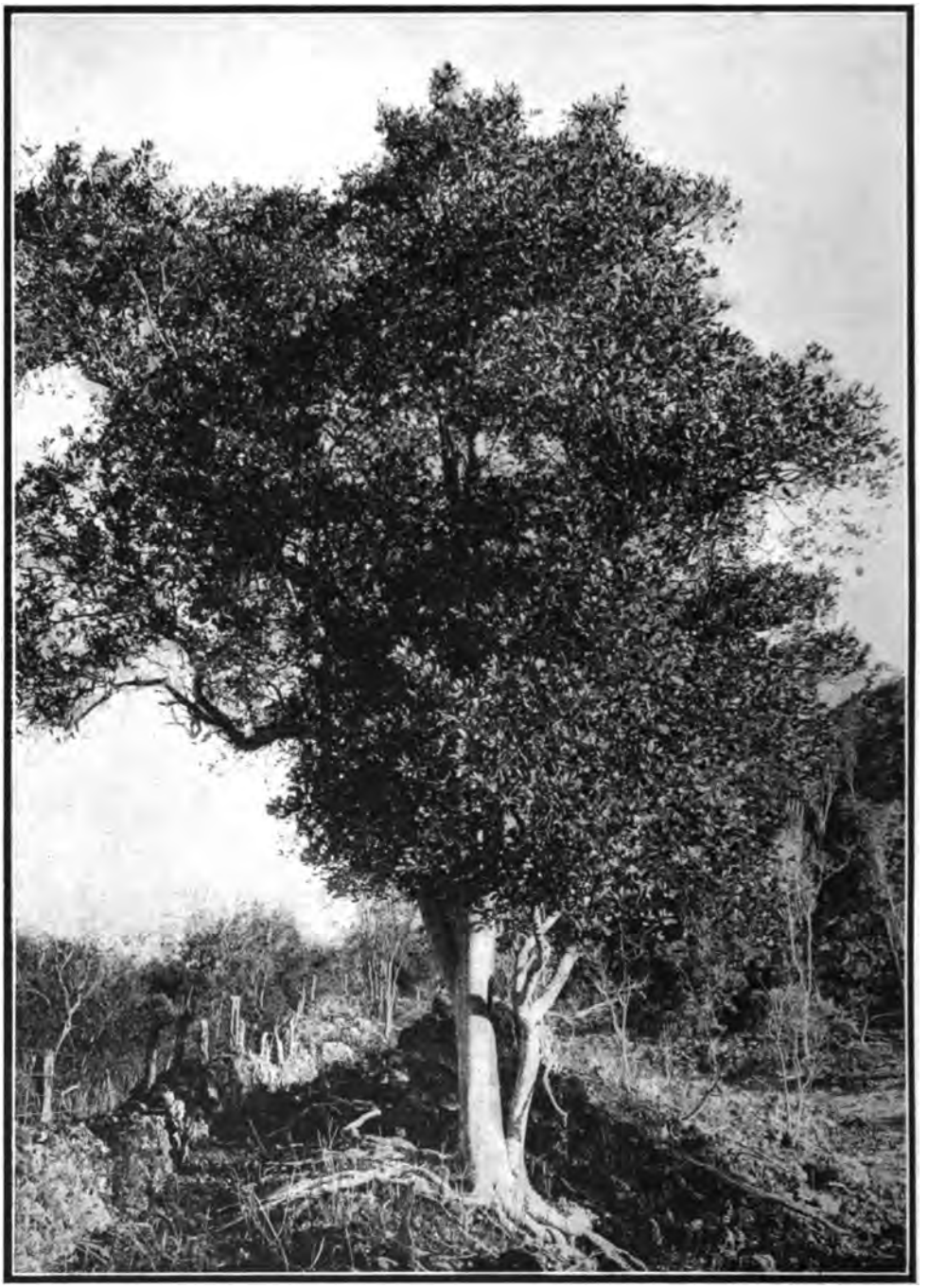
PLATE 156.

SIDEROXYLON AUAHIENSE var. **AURANTIUM** Rock var. nov.
Alaa.
Showing fruiting branch with mature fruits; specimen from Kapua, South Kona.
Less than one-half natural size.

PLATE 157.

SIDEROXYLON AUAHIENSE var. **AURANTIUM** Rock var. nov.
Alaa.
Fruiting branch pinned against trunk of tree, showing thick scaly bark. Growing on the lava fields of Puuwaawaa, North Kona, Hawaii.

PLATE 158.



SIDEROXYLON AUAHIENSE var. **AURANTIUM** Rock var. nov.
Alaa Tree.
Growing at Puuwaawaa, on the lava fields of Mt. Hualalai, North Kona, Hawaii.

This species, which is a tree 25 to 30 feet high, has a rather broad round crown, and pale glaucous, terete, glabrous branches. The tree differs from *S. sandwicense* mainly in its pale yellow sessile fruits, in its single unisexual flowers, and very pale glabrous foliage. It was discovered by the writer during the month of November, 1910, on the Island of Maui, southern slopes of Mt. Haleakala, on the lava fields of Auahi, district of Kahikinui, elevation 3000 feet. It grows in company with *Alectryon macrococcus, Pelea multiflora, Pterotropia dipyrena* and *Sideroxylon sandwicense,* as well as with another Sideroxylon with perfectly globose, orange-colored fruits which are smaller than in the species in question, and may be described as follows:

Var. **aurantium** Rock var. nov.
(Plates 156, 157, 158.)

Leaves elliptical-ovate to linear-oblong, acuminate or rounded at the apex, covered with a bronze-colored tomentum underneath, pale green and dull above; flowers single; fruits perfectly sessile deep orange-colored, globose, 2 to 2.5 cm in diam., one to five seeded, seeds smaller than in the species, enclosed in a thick pergameneous pyrena.

This variety is a medium-sized tree, of different habit than the species, with straight ascending branches. The biggest tree the writer observed on the lava fields of Puuwaawaa, North Kona, Hawaii, with trunks of nearly two feet in diameter, and clothed in a thick gray very rough bark, while the younger trees have a smooth grayish-white bark. The variety occurs on the Island of Hawaii in North and South Kona, as well as at Auahi, Maui, and can be distinguished at a glance from the species, even at a distance.

SIDEROXYLON SPATHULATUM Hbd. Fl. Haw. Isl. (1888) 277;—Engl. in Engl. et Prantl Pflzfam. IV. i. (1890) 144;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 228;—Rock Coll. Haw. Publ. Bot. Bull. 1. (1911) 20.—**Sapota sandwicensis** var. β Gray Proc. Am. Acad. V. (1862) 328.

A small stiff-branched tree or shrub 4 to 5 m in height; leaves spathulate or elliptico-oblong, bluntly acuminate, contracting into a margined petiole of 12 to 18 mm, rusty-tomentose underneath, thick coriaceous, with the veins little prominent; flowers single or in clusters of 2 to 3, on short pedicels of 2 to 4 mm; calyx and corolla rusty-tomentose 4 mm high, their lobes somewhat acute; stamens inserted at the middle of the corolla, at the base of the lobes, the short filaments slightly reflected, not hairy below, the anthers apiculate; staminodia broad, half the width of the lobes; ovary hairy, with short style; berry dark orange colored and glabrous when mature, covered with a rufous tomentum when young, 3.5 cm long, by little over 2 cm wide, conical in outline, with an acuminate apex, 5-seeded, each seed enclosed in a membraneous yellow pyrena, 20 mm long, 7 mm wide, rounded at both ends, grayish-brown, rather dull, linear elongate, cotyledons nearly as long and broad as the albumen, radicle about 3 mm long and superior, fruit flesh light yellow.

This species is quite common on the Island of Lanai in the valleys of Kaiholena and Mahana, as well as on the windward side toward Halepalaua, and in the Kaa forest. It grows in company with *Chrysophyllum polynesicum, Bobea Hookeri, Osmanthus sandwicensis,* etc. The writer met with this same species on the southern slopes of Mt. Haleakala, on the lava fields of Auahi, at an elevation of 2000, near the government road, in company with *Reynoldsia sandwicensis, Antidesma pulvinatum,* etc.

Var. β **densiflorum** Hbd.

Leaves large 7.5 cm long, generally glabrous when old; flowers in clusters of 4 to 6 in the axils of the upper closely set leaves, on pedicels of 4 mm, completely covering the end of the branch.

Hillebrand records this variety from the leeward slopes of Mt. Kaala of the Waianae range on Oahu. The plant is not known to the author, but he collected specimens of another variety, coming rather close to this one, on Molokai, near Kapulo'u below Kamoku camp in the rather dry district, in company with *Myoporum sandwicense*, *Ochrosia sandwicensis*, and *Nothocestrum latifolium*. It may be described as follows:

Var. **molokaiense** (Lévl.) Rock comb. nov.

Myrsine molokaiensis Levl. in Fedde Rep. Spec. nov, regn. veg. X. 10-14 (1911) 154 et **Suttonia molokaiensis** Levl. nov. nom. in Fedde, l. c. X. 24-26 (1912) 373.

Leaves elliptical oblong, dark green, glabrous above, with a fine silvery pubescence underneath, young leaves yellowish pubescent; flowers either single or 4 to 6 in the axils of the upper leaves, often very densely flowered, on pedicels of 10 to 12 mm, whole inflorescence of a golden yellow, the glabrous petals longer than the calyx, staminodia petaloid, ovary densely hirsute with distinct style; fruit subglobose, beaked, resembling the fruit of *S. spathulatum*.

In Abbé Faurie's collection, which I have at hand, is a plant numbered 435 and labelled "*Myrsine molokaiensis* Levl. sp. nov. Molokai, Kamolo 1000 m. leg. Faurie Junio 1910." The plant is at a first glance recognizable as a Sideroxylon and is identical with my number 6154 *Sideroxylon spathulatum* var. *molokaiense* Rock.

At first the writer could not believe that such a gross error could be committed, but after reading the most incomplete description by Léveillé, which says: "Affinis *M. sandwicensis* DC. a quo secernitur foliis supra atro-viridibus, subtus incanis vel incano-tomentosis," it can be no other plant than Faurie's specimen marked 435. Faurie's specimen is in fruit, but quite immature.

The material collected by the writer came from almost the identical locality where Faurie collected his plants, but a little more toward the west. However, one cannot depend very well on Faurie's exactness in citing localities, as can be seen in Léveillé's publication, who places Hilo on the Island of Maui and Mt. Haleakala on a different island than Maui. Some plants are simply marked: Sandwich. It is indeed very regrettable that the material of Abbé Faurie (which is often beyond recognition) fell in the hands of H. Léveillé, whose ambition seems to be to bring the number of his new species up to 1000. A goodly number of his new species are European weeds which have been imported by the cattle estates with grass seeds, and have become scattered over the mountains in the pasture lands which he calls *in herbidis;* may it be said that in these vast meadows not even a native grass can be found, still less herbaceous native plants, which have been crowded out by imported grasses and such weeds which Léveillé describes now as new species, and thus would change the whole endemic aspect of our most interesting flora.

EBENACEAE.

The family Ebenaceae is almost exclusively tropical and subtropical, inhabiting especially the eastern hemisphere. They have reached their best development in the East Indies and the Malayan Archipelago. In the Hawaiian Islands the family is represented by the genus Maba only. The family is closely related to the Symplocaceae, from which it however differs in the superior ovary and the unisexual flowers.

MABA J. R. et G. Forster.

Flowers usually 3- rarely 3-6-fid. Calyx enlarged with fruit. Male flowers: Stamens 3 to several, usually 9; filaments free or united to 2 to 3; anthers elongate, opening laterally. Ovary 3- or 6-celled, with 6 ovules. Style 3-fid or 3 single styles. Fruit usually an ovate or globose, glabrous or pubescent 1 to 6 seeded berry.—Trees or shrubs with alternate, simple and entire leaves. Flowers solitary or in short axillary cymes.

The genus Maba consists of about 63 species and is distributed over the same regions as the family with the exception of South Africa. In the Hawaiian Islands only two species and one variety are to be found. One of the two species, *Maba Hillebrandii* Seem., is endemic, while *Maba sandwicensis* occurs also in Fiji.

KEY TO THE SPECIES.

Leaves pale green, smooth on both faces, calycine lobes obtuse..... **M. sandwicensis**
Leaves dark green, wrinkled on the upper face, calycine lobes acute... **M. Hillebrandii**

Maba sandwicensis A. DC.

Lama.

(Plates 159, 160.)

MABA SANDWICENSIS A. DC. Prodr. VIII. (1844) 242;—A. Gray Proc. Am. Acad. V. (1862) 327;—Mann Proc. Am. Acad. VII. (1867) 188;—Wawra in Flora (1873) 59;—Hbd. Fl. Haw. Isl. (188) 274.—Gurke in Engl. et Prantl Pflzfam. IV. 1. (1891) 160;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VII. (1892) 230.—**Ebenus sandwicensis** O. Ktze. Rev. Gen. Pl. II. (1891) 408.

Leaves distichous, coriaceous, with hidden veins, pale green, elliptical, or, ovate-oblong 3.5 to 5 cm long, 1.5 to 2.5 cm wide, on petioles of 4 to 6 mm, shortly acuminate, entire glabrous, but silky haired when young; flowers single, rarely the male in clusters of 2 to 5, the very short peduncle covered with about 6 small, ovate-obtuse, deciduous bracts; calyx coriaceous, silky with oppressed hair, 4 to 5 mm, shortly 3 to 4 fid with obtuse lobes, corolla coriaceous, 5 to 6 mm, densely hairy in the upper half, 3-toothed, the lobules blunt, and sinistrorsely convolute in the bud; male flowers, stamens free, 12 to 18, around the hirsute rudiments of an ovary, 1/3 the length of the corolla, glabrous, anthers short, oblong, as long as the filaments; female flowers without stamens, the ovary hairy; style very short 3-rayed; fruit dry or somewhat fleshy; 18 mm high, pubescent when young, 3-celled, with 1 seed in each cell, but generally one-seeded when mature; seeds oblong with thin testa and smooth albumen; cotyledons half the length of the radicle, complanate, oblong, obtuse.

The *Lama* is a beautiful medium sized tree reaching a height of 20 to 40 feet. The leaves are thick, leathery, dull green and are arranged alternately in opposite rows, making the little branchlets resemble pinnate leaves.

PLATE 159.

MABA SANDWICENSIS DC.
Lama.
Fruiting branch, typical Oahu specimen; one-half natural size.

The *Lama* inhabits the wet as well as the dry regions on all the islands of the group. The small leaved form occurs on the Koolau range of Oahu, as in Manoa Valley and Niu as well as all along toward Kahuku. Back of Hilo on Hawaii it is a very common tree, reaching a height of 40 feet; in this latter locality it is quite common in company with Straussia, Metrosideros, etc., following immediately the Pandanus forest. The trunk of the *Lama* is vested in a black rather smooth bark, but in old trees the bark becomes rough and scaly, forming irregular squares of a dark gray color. The tree is common on all the islands of the group, but especially so in the dry districts, where it forms often pure stands, as in the low lands of Kapua in South Kona where the writer met with the finest trees with perfectly straight trunks of a foot in diameter. It grows in company with *Aleurites Moluccana, Pittosporum Hosmeri* var. *longifolia,* and *Antidesma pulvinatum.* The berries, which are of a reddish yellow color when mature, are quite palatable and are eaten by the natives and birds. The trees fruit prolifically during the late winter months, especially in the month of February, when the trees are loaded with the bright colored fruits.

The wood is very hard, close grained, and of a rich reddish brown color when old; it was employed in building houses for the gods. A block of *Lama* wood was always placed upon the *Kuahu,* altar, in the temple of the goddess of the sacred Hula dance, Laka, which latter personality it represented. This uncarved block was wrapped in choice yellow tapa, scented with turmeric and was set conspicuously upon the altar.* The wood was also used in making sacred inclosures for other tabu purposes.

A variety β Hbd. with ovate or ovate oblong, larger leaves, which are broadly rounded at the base, and pubescent underneath, occurs on the lava flows and on the leeward sides of the islands in general, but always in dry situations. On Kauai the variety has the largest leaves 10 to 12.5 cm x 5 to 5.5 cm.

Maba Hillebrandii Seem.

MABA HILLEBRANDII Seem. in Flora Vitiensis (1866) 151;—H. Mann l. c.;—Hillebr. Fl. Hw. Isl. (1888) 275;—Gurke in Engl. et Prantl Natürl. Pflzfam. l. c.;—Del Cast l. c.—**Ebenus Hillebrandii** O. Ktze. Rev. Gen. Pl. II. (1891) 408.

Leaves oblong, 8 to 12 cm long, 3.5 to 6 cm wide, on petioles of 4 mm, obtuse or bluntly acute, contracted, rounded or truncate or even emarginate at the base, glabrous, dark green, coriaceous, smooth on the lower face, but deeply rugose on the upper by a close and fine areolar network; bracts and calyx glabrous, coriaceous, the latter 3-fid almost to the middle with broad triangular acute lobes; corolla 7 mm, hairy, shortly 3-toothed; stamens 9, short, glabrous, with pointed anthers; fruit obovoid, about 2 cm long and 15 to 18 mm in diameter, pubescent at the apex only.

This species, which is quite different from the *lama,* is endemic in the Hawaiian Islands and is peculiar to Oahu, where it can be found in the hills of

* Emerson, Unwritten Literature of Hawaii.

PLATE 160.

MABA SANDWICENSIS DC. var. β. Hbd.
Lama.
Fruiting branch pinned to trunk of tree. Growing on the lava fields of Kapua, S. Kona, Hawaii; elevation 1500 feet.

Kahuku and Waialua; the writer met with it in Niu Valley where it is quite plentiful at an elevation of 2000 feet. Hillebrand records it also from Wailupe Valley.

OLEACEAE.

The family Oleaceae, which consists of about 370 to 390 species, inhabits the temperate, subtropical and tropical regions of the earth, especially in East India, where some of the genera like Jasminum and others are rich in species. Only about 12 species belonging to this family occur in Europe; in Polynesia and Australia about 26; in America and Africa each about 46 species. In the Hawaiian Islands the family is represented by the genus Osmanthus with a single species.

OSMANTHUS Lour.

Flowers hermaphrodite, polygamous or dioecious, calyx short, 4 toothed or 4 lobed. Tube of corolla short. Stamens 2, rarely 4, with short filaments inserted on the tube of the corolla and enclosed by the same. Anthers laterally dehiscing. Style short. Stigma small, entire or 2-lobed.—Shrubs or trees with evergreen leaves. The small flowers are arranged on axillary simple or compound racemes.

The genus Osmanthus with its 10 species is distributed in South Asia, East Asia, Polynesia and North America, with one species—*Osmanthus sandwicensis* (A. Gray) Knobl.—in the Hawaiian Islands.

Osmanthus sandwicensis (A. Gray) Knobl.

Pua or *Olopua.*

(Plates 161, 162, 163.)

OSMANTHUS SANDWICENSIS (A. Gray) Knobl. in Bot. Centralbl. LXI (1895) 82, et in Engl. et Prantl Pflzfam. IV. 2. (1895) 9.—**Olea sandwicensis** A. Gray Proc. Am. Acad. V. (1862) 331;—H. Mann Proc. Am. Acad. VII (1867) 197;—Wawra in Flora (1874) 548;—Hbd. Fl. Haw. Isl. (1888) 301;—inclus. var. β Hbd. from Kauai;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII (1892) 231;—Heller Pl. Haw. Isl. (1897) 876.

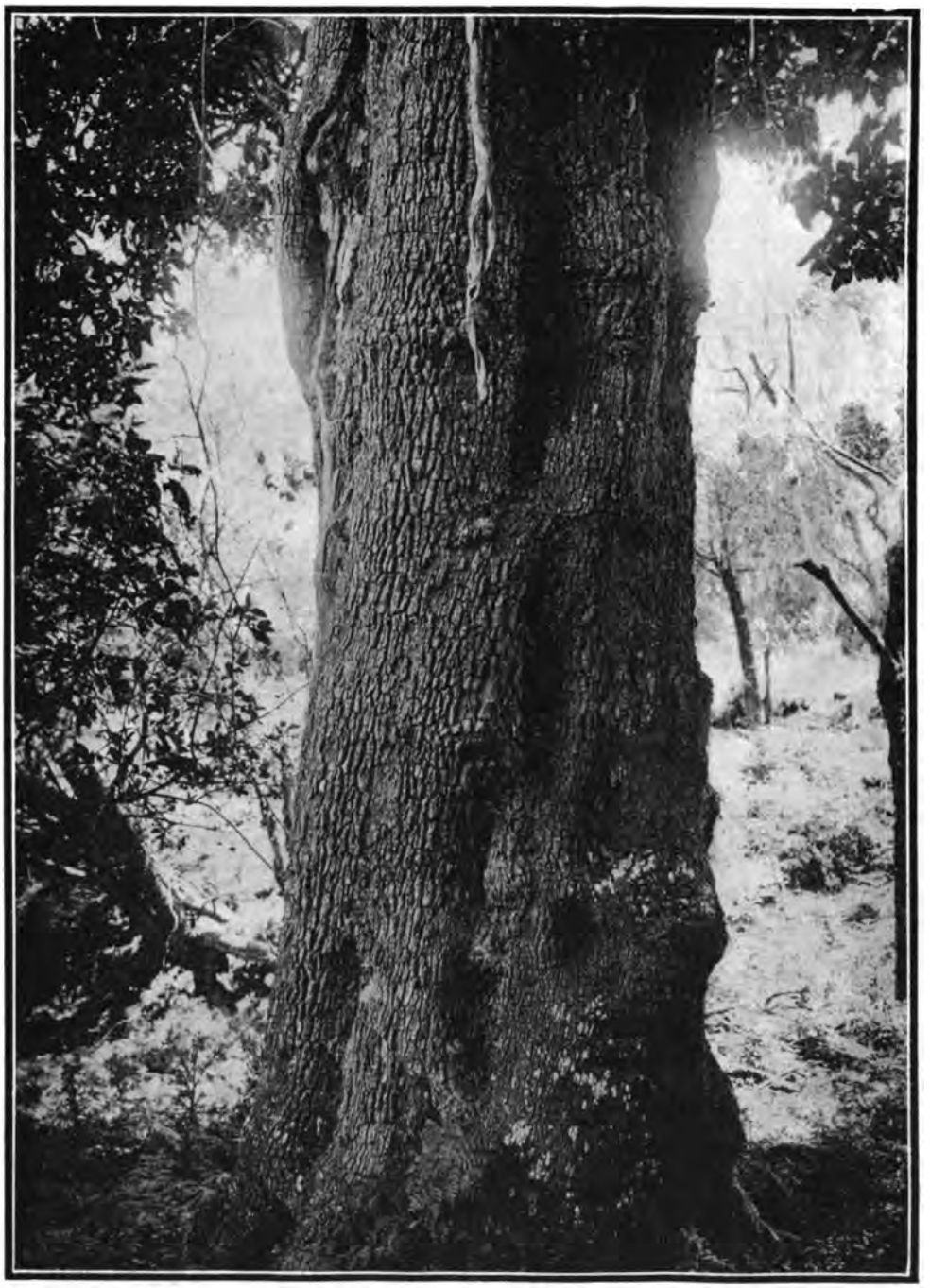
A large tree often 20 m high, quite glabrous; leaves pale underneath, darker above, coriaceous elliptico-oblong or lanceolate acute, or acuminate or obtuse, 7 to 15 cm long, 2.5 to 7 cm wide, on petioles of about 12 mm; racemes axillary tomentose, short; flowers hermaphrodite; calyx obtusely 4-toothed; corolla about 4 mm, pale yellow, rotate, deeply 4 parted; anthers always 4, alternate with the lobes of the corolla and as long as the latter (in the writer's specimens) sessile on the short tube, oblong obtuse; ovary conical, elongate, stigma subsessile, 2-lobed; drupe ovoid, peaked or obtuse, 12 to 22 mm long, bluish-black, when mature rather dry, but the exocarp somewhat fleshy and staining, with an osseous putamen and a single seed; embryo straight in the axis of horny albumen, the obtuse cotyledons as long as the superior radicle.

The *Pua* or *Olopua* is one of the most common Hawaiian trees, but rarely inhabiting the rain forests or even their outskirts. It is more confined to the lower forest zone, especially on the leeward sides of all the islands, and is usually the predominating tree on the lava fields of Hawaii. The *Pua,* like all Hawaiian trees, is very variable and only a trained eye can at first glance decide if it is the *Pua* or not. The leaves are often very large and again very small, as in the Molokai specimens, which have elliptical lanceolate leaves, while those of

PLATE 161.

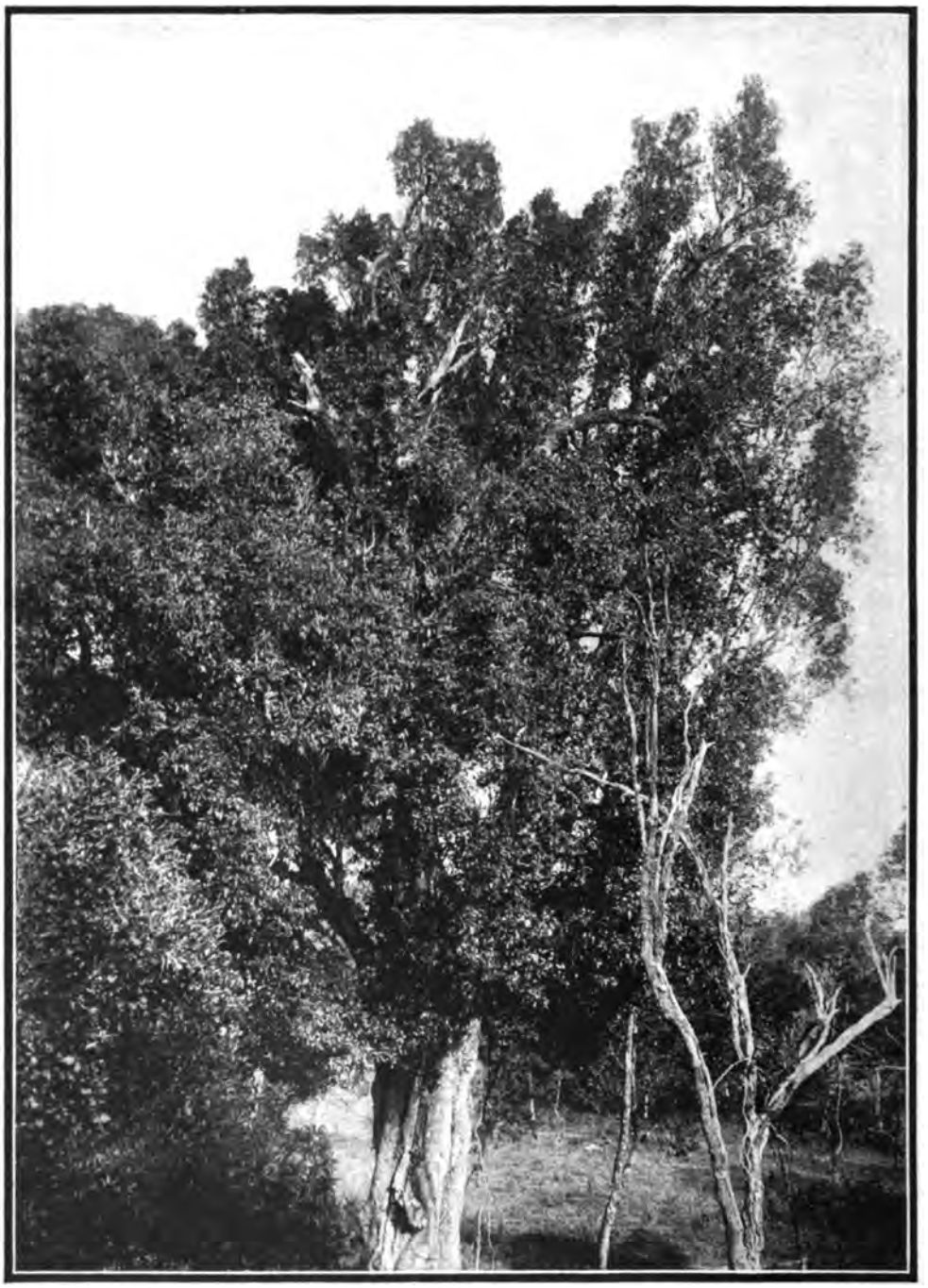
OSMANTHUS SANDWICENSIS (Gray) Knobl.
Pua or **Olopua.**
Fruiting branch, less than one-third natural size.

PLATE 162.



OSMANTHUS SANDWICENSIS (Gray) Knobl.
Pua or **Olopua.**
Trunk of tree showing roughness of bark; about 3 feet in diameter. Growing in Kipuka Puaulu near Kilauea Volcano, Hawaii; elevation 4000 feet.

PLATE 163.



OSMANTHUS SANDWICENSIS (Gray) Knobl.
Pua or **Olopua.**
One of the biggest pua trees in the islands, growing in the Kipuka Puaulu near Kilauea Volcano, Hawaii; height of tree about 60 feet.

Kauai are exceedingly large and oblong acuminate. It flowers usually in March in certain localities, but the writer found the trees in South Kona on the lava fields of Kapua loaded with the ripe bluish fruits during the month of January. It is a graceful tree and reaches often a height of 60 feet, with a trunk of 3 feet in diameter; the bark is thick and very corrugated, often divided into oblong scales. It occurs on all the islands of the group, especially on the dry leesides from 600 to 4000 feet elevation. On Kauai it grows in the great Waimea Canyon and at Halemanu, as well as Milolii and in Kopiwai forest, where the writer met with handsome specimens. The biggest tree the writer saw in the Kipuka Puaulu on the edge of an old *aa* lava flow near the Volcano Kilauea, on the slopes of Mauna Loa, elevation 4000 feet.

The wood of the *Pua* is extremely hard, close grained and very durable; it is of a dark brownish color with blackish streaks, exceedingly heavy and takes a most excellent polish. The wood was often used by the natives for various purposes such as adze-handles. In helping to shape the fish hooks, the *Pua* wood was used, as well as the rough *pahoehoe* lava rock, as rasps.

LOGANIACEAE.

The family Loganiaceae, with its 31 genera and more than 370 species, is decidedly tropical; only few representatives are found outside the tropics, and only two genera are found distributed in the tropics of the whole world, while the remaining ones are restricted to certain regions. In the Hawaiian Islands only one genus (Labordia) of this family occurs, which is endemic.

LABORDIA Gaud.

Flowers hermaphrodite or unisexual, pentamerous. Calycine lobes large, lanceolate or foliaceous, occasionally unequal. Corolla distinctly tubular, with narrow, lanceolate contorted lobes. Stamens with short filaments and enclosed linear anthers. Ovary 2 to 3 celled, with cylindrical style and elongate clavate stigma; ovules many. Fruit a capsule. Seeds ovoid or ellipsoidal imbedded in an orange colored or greenish pulp; with fleshy albumen. Embryo straight with short cotyledons and longer radicle.—Small trees or shrubs; stipules sheathing. Inflorescence a terminal cyme, corymbiform or paniculate, sometimes reduced to a single flower.

The genus Labordia consists of numerous species, and is endemic to the Hawaiian Islands. Only a few become trees, while the majority of them are shrubs inhabiting the middle forest zone along stream beds or in swampy grounds in dense shades up to an elevation of over 5000 feet. Only one or two occur on the forehills of the dry districts at the outskirts of the forests, as for example in Mahana Valley on Lanai. The native name of nearly all the species is *Kamakahala*. The majority of the species have green flowers, while some have orange colored thick fleshy corollas.

H. Baillon in his treatise on the tribe of Labordia remarks that in his opinion the Genus Labordia cannot be sustained. He goes on to say that owing to the imbricate and more often twisted corolla the genus should rather be classified under the family Apocynaceae than Loganiaceae. "The existence of stipules

PLATE 164.

LABORDIA MEMBRANACEA Mann.
Fruiting specimen; from the mountains back of Honolulu. One-half natural size.

between the leaves would be the only characteristic which might separate them from the former family, had it not been demonstrated that too much value altogether has been attached to the presence or absence of these organs, etc." Owing to limited space it is here impossible fully to discuss this interesting question. A definite settlement in regard to the nomenclature of our Hawaiian Labordia will have to be deferred until the future. The writer possesses numerous new species of Labordiae and complete material of those already known, which will be worked up after the writer's return from Europe, where he will have opportunity to compare his specimens with the types in the various Herbaria of Europe. Only after then can a satisfactory treatise on this difficult group be published.

KEY TO THE SPECIES.

Corolla yellow.
- Flowers single, enclosed within the foliaceous calyx lobes.
  - Capsule small crested..... **L. molokaiana**
- Flowers several in a sessile cyme.
  - Capsule 40 mm long, not crested..... **L. membranacea**
  - Capsule 5 mm high, three valved, minutely pedunculate..... **L. sessilis**

Corolla greenish.
- Flowers in a paniculate cyme..... **L. tinifolia**

There are undoubtedly several more Labordia which become trees, but owing to the general chaos in which this genus is at present, it was decided by the writer to limit the number of arborescent species to be described to four, as the diagnosis of the latter is fairly certain.

Labordia Molokaiana H. Baillon.
Kamakahala.

LABORDIA MOLOKAIANA H. Baillon in Bull. Soc. Linn. Paris, I. (1880) n. 30. 240;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 237.—**Labordia lophocarpa** Hbd. Fl. Haw. Isl. (1888) 289;—Solereder in Engl. et Prantl Pflzfam. IV. 2. (1892) 32.

A tree 10 m high, glabrous, the younger branches fleshy, slender, and sharply ridged or angular; stipular sheath large, emarginate laterally; leaves elliptical or obovate-oblong, 4 to 10.5 cm long, 2.5 to 3 cm wide, shortly acuminate, suddenly narrowing into a petiole of 4 to 12 mm, thin chartaceous, dark underneath when dry, pale even whitish when fresh, and somewhat fleshy in texture, glabrous or distantly hispidulous; inflorescence a single terminal flower on a puberulous pedicel of 4 to 10 mm; bractlets lanceolate or spathulate, 12 mm; calyx as long as the corolla, the lobes 14 to 20 mm, divided into 4 to 5 broad foliaceous sepals, shortly acuminate, 9 to 11 nerved; corolla deep yellow, enclosed in the calyx, glabrous outside, puberulous inside, the broad tube 10 to 12 mm long; style 4 mm, shorter than the broad clavate stigma; capsule 12 to 14 mm high, 2 to 3 valved, the valves broadly winged at the back, above, with the wings rounded and generally not confluent at the apex.

In regard to the nomenclature of this species there seems to be some doubt whether it is Hillebrand's *Labordia lophocarpa* or Gaudichaud's *L. fagraeoidea*, but to the writer's mind it must be identical with the former. However, the question cannot be decided definitely until material has been examined on which Baillon based his description. Baillon states in regard to *L. Molokaiana* as follows:* "The *L. Molokaiana* gathered on Molokai by Mr. J. Remy (no. 363)

* Translated from the original.

PLATE 165.

LABORDIA TINIFOLIA Gray.
Kamakahala.
Fruiting branch, photographed from an herbarium specimen; two-thirds natural size.

which has much narrower, lanceolate and longer petioled leaves, with less closer internodes, is perhaps but another variety of *L. fagraeoidea.* Their inflorescences are contracted and pauciflorous, and the divisions of their corollas are linear."

In the writer's opinion the plant is quite distinct from Gaudichaud's *L. fagraeoidea.*

The species Labordia are certainly very badly confused, earlier authors, as Mann, giving only three or four line descriptions which may be applied to several variable species, have later been enlarged upon by other authors simply taking for granted that their specimens are referable to either the one or the other, increased the confusion rather than clearing matters up. Until type-material of all the previous authors has been examined and compared, a satisfactory treatise on this difficult genus cannot be undertaken.

L. Molokaiana occurs on Molokai principally, where it was collected by the writer at the pali of Wailua in the dense rain forest, at an elevation of 3000 feet. The specimens agree exactly with Hillebrand's description of *L. lophocarpa,* which is a synonym of the former (flowering and fruiting no. 7044, April 15, 1910). Hillebrand enumerates two varieties, *pluriflora* and *phyllocalyx* which may be distinct species.

Labordia membranacea Mann.

Kamakahala.

(Plate 164.)

LABORDIA MEMBRANACEA Mann in Proc. Am. Acad. VII. (1867) 197.—Wawra in Flora (1872) 516;—Hbd. Fl. Haw. Isl. (1888) 291;—Solereder in Engl. et Prantl Pflzfam. IV. 2 (1892) 32;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VII. (1892) 237.

Branches thick, fleshy, pubescent with short dark brown hair, terete, or slightly angled; leaves broadly ovate, shortly acuminate, (not membraneous when fresh) rather fleshy, succulent, pale underneath, dark green and shining or somewhat dull above, petioles thick fleshy, midrib thick, prominent, veins transparent; interpetiolar stipules very short, rounded or truncate; inflorescence terminal, a three-flowered cyme, subsessile or sessile in the axis of the uppermost leaflets, with two linear bracts at the base; peduncles terete fleshy, alternately bracteolate, bracteole, linear subulate; calyx divided nearly to the base into five linear acute segments 1.5 cm long, hirsute with blackish hairlets as is the whole inflorescence; corolla pale yellow, the long slender tube urceolate, about 2 cm long, the lobes (5) reflexed, about 2/3 the length of the tube, acuminate; anthers sessile at the throat of the tube, between the sinuses of the corolla-lobes, slightly exserted; ovary two-celled, oblong-conical, about 1 cm high, style short about 2 mm, stigma large, clavate 5 mm long, 2.5 mm thick, slightly notched or grooved at the apex. Capsule two-valved, very large 40 mm long, 18 mm broad, conical-oblong, the valves not ridged at the back.

Mann describes a small tree from the mountains behind Honolulu under *Labordia membranacea,* though very briefly. The writer found numerous trees which will have to be referred to Mann's species. Like all Labordiae it is somewhat variable. It is however easily distinguished, by the large oblong leaves and exceedingly large capsules. The writer has enlarged upon Mann's description. The flowers of this species are hermaphrodite. It occurs in the dense rain forests of the main range of Oahu, especially between Manoa and Mt. Olympus trail, where it is a small tree 10 to 18 feet in height.

Labordia sessilis Gray.

LABORDIA SESSILIS Gray in Proc. Am. Acad. IV. (1860) 323;—H. Baillon Bull. Mens. Soc. Linn. Paris. I. (1880)240.—**L. fagraeoidea** Hbd. Fl. Haw. Isl. (1888) in part.

Leaves subsessile, thick leathery, oblong, or lanceolate oblong, acute at the apex, cuneate at the base, 7.5 cm to 12.5 cm long, pale underneath, veins transparent, stipules united, tubular, long; sepals oblong-lanceolate, capsules 5 mm high, minutely pedunculate or sessile in the axis of the last leaves within the stipules, three-valved.

This species which is certainly distinct from *L. fagraeoidea,* is a tree often 35 to 40 feet in height, but occasionally a shrub, and occurs only in the rain forests of Oahu, on the main range. It is especially common in Manoa Valley at an elevation of 2500 feet. It can easily be recognized by its oblong-lanceolate pale green foliage and transparent venation. The capsules are exceedingly small and hidden in the stipules.

Labordia tinifolia Gray.
(Plate 165.)

LABORDIA TINIFOLIA Gray in Proc. Am. Acad. IV. (1860) 322;—Mann in Proc. Am. Acad. VII. (1867) 197.—Wawra in Flora (1872) 515;—Baill. in Bull. Mens. Soc. Linn. Paris. (1880) 238-240;—Hbd. Fl. Haw. Isl. (1888) 292;—Solereder in Engl. et Prantl IV. 2. (1892) 32;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 237;—Heller Pl. Haw. Isl. (1897) 877.

A small tree 6 to 8 m high, with slender and pale terete branches; leaves elliptical or obovate or ovate-oblong, 5 to 10 cm long, 18 to 37 mm wide, on petioles of 4 to 12 mm, acute or acuminate at both ends, or obtuse at the apex, chartaceous glabrous; flowers many in a paniculate cyme 3.5 to 10 cm in length, with a peduncle of 12 to 30 mm in length, the ultimate pedicels 6 to 18 mm, subequal; bractlets subulate; calyx 3 mm, divided beyond the middle into 5 triangular acute lobes; corolla greenish, very slender, salver-shaped, the tube 6 to 8 mm, glabrous, but pubescent within, the lobes about one-third as long; capsules globose, short, ovoid, or obovoid somewhat obtuse or acute, 8 to 12 mm long, slightly sulcate, 2 valved or very rarely 3-valved, the valves rounded at the back.

This species is a small tree of 15 to 20 feet or more in height and occurs on Kauai, Maui, Lanai, Molokai, and according to Hillebrand also on Oahu; as it is found on these various islands at different altitudes it is somewhat variable. The trunks of the trees are straight, especially in the specimens from the forests above Makawao (no. 8616). The bark resembles very much that of the *Aalii, Dodonaea viscosa,* or that of *Styphelia tameiameia.* It is of a dark brown color, and is closely and deeply corrugated, the furrows are not straight, but seem to encircle the trunk, somewhat cork-screw fashion. The peduncle varies considerably in length, as do also the leaves in size. On Lanai the tree was observed on the dry forehills of Mahana and Kaiholena Valleys, (no. 8000 and no. 8099). On West Maui it grows above Kaanapali at 2000 feet elevation (no. 8169). It is typical of the drier regions and hardly ever ascends into the rain forest. It comes very close to *L. triflora* Hbd. and seems to differ from the latter in not having cordate and subsessile leaves. On Kauai, along the trail to Opaiwela stream near Kaholumano it grows as a shrub; the leaves are larger and the capsules ovoid, acute.

APOCYNACEAE.

The family Apocynaceae consists of about 1000 species, the larger number of which belong to the tropics. Of its 133 genera only five are represented in the Hawaiian Islands, three of which have arborescent species. One genus (Pteralyxia K. Sch.) is endemic, with a single species. The largest number of Apocynaceae are climbing shrubs, while erect shrubs or trees are not as numerous. In these Islands we have only one climbing plant of this family, the well-known *Maile* of the natives, *Alyxia olivaeformis* Gaud., while the remaining ones are trees, with the exception of the cultivated *Vinca rosea*, which has also become naturalized, having escaped from cultivation. Annuals are not known in this family. Of interest and usefulness is the milky sap which nearly all members of this family possess, as it contains caoutchouc. Not a few of the species of Apocynaceae are extremely poisonous, and undoubtedly these strong poisonous substances are to be found in the milky sap.

KEY TO THE GENERA.

Discus wanting.
- Endocarp winged, drupe always 1-celled, large, bright red..... 1. **Pteralyxia**
- Endocarp compressed, deeply furrowed underneath, drupe 2-celled, large, yellow. ..... 3. **Ochrosia**

Discus present.
- Leaves whorled, drupe smooth, small, black, obcordate..... 2. **Rauwolfia**

PTERALYXIA K. Sch.

Calyx deeply 2-parted, with almost free, imbricate lobes, glandless. Corolla tubular, without scales at the constricted throat, and short obtuse sinistrorse lobes. Stamens inserted below the throat, ovate-lanceolate, acute. Discus absent. Ovary superior, with 2 pendulous ovules in each cell. Style filiform, with subglobose, thickened stigma, which is shortly 2-lobed. Drupe dry, obovate, bright red. Putamen with 2 large winged lateral angles and 2 sharp middle-crests. Seeds large (3 to 3.5 cm long, and 1 to 1.5 cm in diam.), with ruminate albumen.

A Hawaiian genus with a single arborescent species, peculiar to the Island of Oahu. The species was first described by Hillebrand in the genus Vallesia as *V. macrocarpa* Hbd. According to K. Schumann the plant is nearest related to the genus Alyxia.

Pteralyxia macrocarpa (Hbd.) K. Sch.

Kaulu.

PTERALYXIA MACROCARPA (Hbd.) K. Schum. in Engl. et Prantl Pflzfam. IV. 2. (1895) 151.—**Vallesia macrocarpa** Hbd. Fl. Haw. Isl. (1888) 297;— Del Cast. Ill. Fl. Ins. Mar. Pacif. VII. (1892) 232.

A small tree with short and thick diverging branches and very tenacious milky sap; leaves obovate or obovate-oblong, on petioles of about 5 cm; rounded at the apex, coriaceous, pale, glabrous, veins prominent, strictly parallel; cymes contracted, 6 to 12 flowered, terminal, sessile on short leafy spurs or branches, pedicels very short, with squamaceous bractlets; calyx 2 mm, lobes obtuse short; corolla pale yellow, tube 6 to 8 mm, lobes 2 to 3 mm; stamens with very short filaments, anthers acute; style nearly the length of the tube; drupes dry, 5 cm long. 2.5 cm or more wide, bright red; seed elliptical, 36 mm long, 16 mm broad and 12 mm deep, pointed at both ends; albumen deeply wrinkled by transverse sinuous folds; embryo axile, straight, nearly as long as the albumen, the linear oblong fleshy cotyledons about as long as the inferior radicle and scarcely broader.

PLATE 166.

RAUWOLFIA SANDWICENSIS A. DC.
Hao.
Fruiting branch photographed from an herbarium specimen. About one-half natural size.

This most interesting species is a small tree 15 to 25 feet in height and resembles somewhat the *Alaa* or *Sideroxylon sandwicense*. The native name of this rather rare tree is *Kaulu*, according to Hillebrand. The locality for the tree is Oahu, Nuuanu Valley, and Makaleha Valley of the Waianae range. In the latter place the tree was observed by C. N. Forbes and also by a student of the College of Hawaii, but has not been collected by the writer. The tree seems to be conspicuous on account of its bright red double fruits.

RAUWOLFIA Linn.

Calyx small, deeply 5-cleft, with obtuse or acute, imbricate lobes, glandless. Corolla salver-shaped, cylindrical, constricted at the scaleless throat, tube dilated at the place of insertion of the stamens, lobes sinistrorse. Stamens small, with obtuse or acute anthers, inserted at the middle of the tube or higher. Discus cup-shaped, truncate or lobed. Ovaries 2, superior, entirely free, or connate, at the base; ovules paired in each cell, pendulous; style filiform, with a short cylindrical stigma with a membraneous ring at the base. Drupes distinct, frequently connate at the base, obcordate, with crustaceous putamen. Seeds with uniform albumen.—Glabrous rarely tomentose trees or shrubs with usually opposite or whorled leaves. Flowers small in compound often umbellate cymes, at first terminal.

The genus Rauwolfia consists of about 45 species, which occur in the tropics of the old and new world. In the Hawaiian Islands only one species is represented. The Hawaiian species has often been confused with *Ochrosia parviflora* (Forst.) DC. and has even been described twice by De Candolle, once as *Ochrosia sandwicensis*, which now stands as a synonym.

Rauwolfia sandwicensis A. DC.

Hao.

(Plate 166.)

RAUWOLFIA SANDWICENSIS A. DC. Prodr. VIII. (1844) 339;—H. Mann Proc. Am. Acad. VII. (1867) 197;—Wawra in Flora (1874) 367;—Hbd. Fl. Haw. Isl. (1888) 295;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 232;—K. Schum. in Engl. et Prantl Pflzfam. IV. 2. (1895) 153;—Heller Plants Haw. Isl. (1897) 878.—**Cerbera parviflora** Hook. et Arn. (not Forst.) Bot. Beech. (1832) 90.—**Ochrosia sandwicensis** A. DC. Prodr. VIII. (1844) 357 (not Gray).

Leaves 5 in a whorl, elliptico oblong, acuminate at both ends, pale chartaceous, on petioles of 1.5 to 3 cm (in all of the writer's material and not 2 to 3 mm as given in Hillebrand), with 5 to 12 stipitate glands in each axilla; flowers crowded into 4 umbellately compound cymes of the same length or longer than the petioles, at first terminal then axillary; the common peduncle 1 to 3.5 cm, pedicels about 2 mm; calyx 5 mm, parted to near the base into 5 oblong obtuse lobes; tube of the yellowish-green corolla 8 mm, scantily hairy inside, dilated below the constricted throat, the lobes 3 mm; anthers subsessile, sagittate, shortly exserted; discus small, annular or 5 lobed; ovules 4 in each carpel; drupe compressed. obcordate, deeply emarginate at the top, 8 to 12 mm in height and more in width, fleshy, black when mature; albumen scanty, radicle terete, superior.

The *Hao* is a medium-sized tree with milky sap. When growing in localities with rich soil and occasional rainfall it develops a straight trunk 6 to 12 inches in diameter and a total height of sometimes over 20 feet. When growing on the rough *aa* lava flows on the leeward sides of the Islands, as on Auahi, Maui, on the southern slopes of Mt. Haleakala, it is a more or less stunted shrub.

It resembles the *Holei* very much and when not in flower or fruit is not often easily distinguished from it. The leaves are of a lighter green than the *Holei* and not quite as thick in texture; it differs mainly from it in its small black fruits which are obcordate.

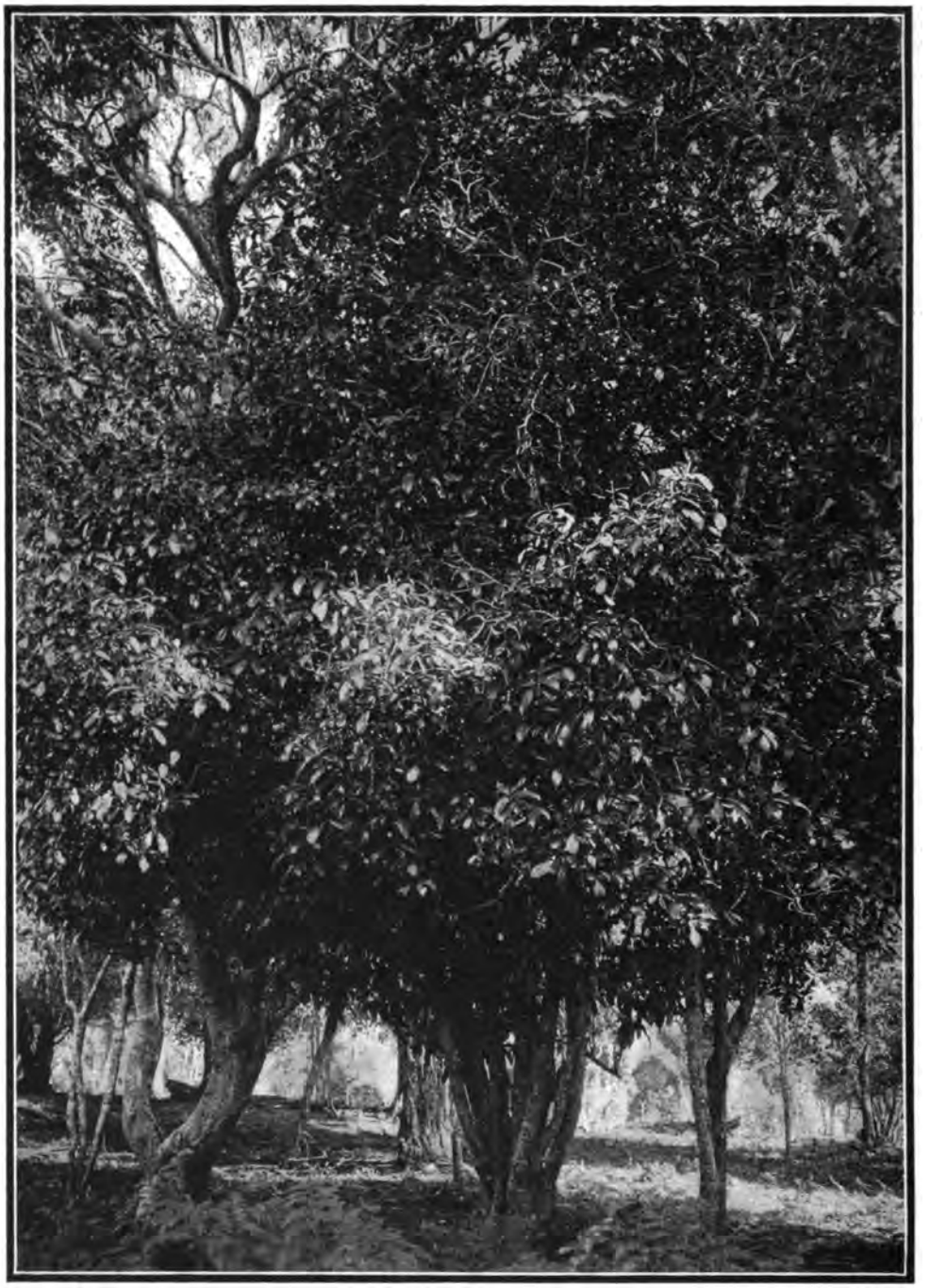
PLATE 167.

OCHROSIA SANDWICENSIS A. Gray.
Holei.
Showing fruiting branch about one-half natural size.

PLATE 168.

OCHROSIA SANDWICENSIS A. Gray.
Holei.
Growing in the Kipuka Puaulu, near the Volcano Kilauea, Hawaii; elevation 4000 feet.

PLATE 169.



OCHROSIA SANDWICENSIS A. Gray.
Holei Tree.
In the Kipuka Puaulu, Kilauea Volcano, Hawaii.

It inhabits the dry regions on the leeward sides of all the islands at an elevation of about 2000 feet. On Lanai, in the valleys of Kaiholena and Mahana, it develops a straight trunk; the branches are somewhat stiff and densely studded with leaf-scars. It associates with *Reynoldsia sandwicensis*, Pittosporum, Antidesma, and other trees peculiar to the dry regions. On Oahu it is more or less shrubby, sepecially so in Niu Valley and on Tantalus, while on Kauai big trees may be found above Makaweli.

The wood of the *Hao* is of medium strength, fairly close grained, and dark yellowish in color. It is never used for firewood, as the natives claim that the smoke is poisonous. As it burns to ashes and leaves no charcoal, it was never employed by the natives for the production of the latter. It is called the Hawaiian Ironwood on account of its durability.

OCHROSIA Juss.

Calyx small, deeply 5-cleft, with imbricate obtuse lobes, glandless. Corolla salver-shaped, with cylindrical tube which is dilated at the point of the insertion of the stamens, and is constricted at the glabrous throat, lobes dextrorse. Stamens oblong lanceolate, with acute anthers. Discus wanting, or very indistinct, short, annular. Ovary superior with few ovules in each cell arranged in two rows. Carpels frequently connate at the base. Drupes in pairs or through abortion single, diverging, rather dry, united at the base or free, with thin exocarp and woody endocarp which is dorsally compressed and deeply furrowed on the ventral side. Seeds few, three for the most in a double drupe. Trees with whorled coriaceous leaves, which are narrowly parallel-veined; flowers of medium size and often very fragrant, arranged in cymes from the axils of the uppermost leaves.

The genus Ochrosia supposedly consists of 13 to 15 species, and extends from the Mascarene Islands, through Malaysia and tropical Australia into Polynesia. Only one species, *Ochrosia parviflora* (Forst.) Hemsl., is widely distributed over the Pacific Islands. *Ochrosia sandwicensis*, one of the Hawaiian species, together with the New Caledonian *Ochrosia elliptica*, comes very near to *Ochrosia oppositifolia* (*O. borbonica*) and may only be a variety of the latter.

Ochrosia sandwicensis Gray.

Holei.

(Plates 167, 168, 169.)

OCHROSIA SANDWICENSIS Gray (not DC.) Proc. Am. Acad. V. (1862) 333;—H. Mann Proc. Am. Acad. VII. (1867) 197;—Wawra in Flora (1874) 366;—Hbd. Fl. Haw. Isl. (1888) 296;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 234;—K. Schum. in Engl. et Prantl Pflzfam. IV. 2. (1895) 156;—Brigham in Ka Hana Kapa (1911) 154, fig. 2, (the plant figured in Dr. Brigham's work is not *Ochrosia sandwicensis*, but *Xylosma Hillebrandii* Wawra).

Leaves 3 to 4 in a whorl, elongate oblong, on petioles of about 15 to 25 mm, shortly acuminate, chartaceous, shining above, the close and faint nerves parallel and at almost right angles to the midrib, and united by a distinct intramarginal nerve; cymes compound, 10 to 16 cm long, divaricately branching, the angular peduncle about 3 cm, the lateral pedicels about 3 to 4 mm, the medium flower subsessile; bracteoles short, ovate to dentiform; calyx 2 to 7 mm with acute lanceolate teeth or lobes, corolla yellowish to cream colored, quite fragrant, hairy inside, dilated below the throat, lobes linear oblong, equal, stamens inserted above the middle, with short hairy filaments and elongate included

anthers; stigma included, clavate; drupes dry, yellow when mature, ellipsoid or ovoid-elongate; seeds 1 on each side of the placenta and peltately attached to it; testa thin, chartaceous; albumen hard and fleshy; embryo axillary; radicle superior, as long as the cotyledons.

The *Holei* is a small milky tree, or sometimes shrub reaching a height of 10 to 25 feet, having long drooping branches. The trunk usually divides a few feet above the ground or has a single bole of eight inches in diameter vested in a brownish smooth bark. It is conspicuous in the forest by its oblong dark green leaves, which are arranged in whorls, and by its large light yellow to orange colored double fruits, which are suspended on long terminal or axillary peduncles. The flowers are yellowish and very fragrant.

The *Holei,* which has become rather scarce, inhabits the dry districts on the leeward side of the islands, and is only abundant on the Island of Maui, at an elevation of 2500 feet, back of Makawao, slopes of Haleakala, and on the lava fields of Auahi. On Hawaii several trees can be found in Puaulu, on the land of Keauhou, three miles from the Volcano of Kilauea, at an elevation of 4000 feet, as well as on the lava fields of Puuwaawaa, slopes of Hualalai.

The *Holei* is endemic to the Hawaiian Islands. The natives knew how to extract a yellow dye from the bark and roots, wherewith to stain their tapa or paper clothing. The wood of the *Holei* is hard, fine grained and of a dark yellowish brown color.

Hillebrand's var. β., which he describes as:

"Leaves opposite 7-9 in. x 2½-3 in., on petioles of 1-1½ in., coriaceous, with prominent nerves. Cymes densely flowered," has been raised to specific rank by K. Schumann under the name:

Ochrosia compta K. Schum.

Holei.

OCHROSIA COMPTA K. Schum. in Engl. et Prantl Pflzfam. IV. 2. (1895) 156.—**O. sandwicensis** var. β. Hbd. Fl. Haw. Isl. (1888) 297.

Leaves coriaceous, flowers in contracted dense inflorescences.

This is all the description given by Schumann in Engler & Prantl Natürliche Pflanzenfamilien. The writer has never met with this plant, but desires to express the opinion that it is a rather doubtful species and perhaps only a form of *Ochrosia sandwicensis.* Especially when Schumann himself thinks *O. sandwicensis* to be only a form of *O. oppositifolia,* a species occurring in Madagascar, Mauritius, Java and Singapore.

BORRAGINACEAE.

The family Borraginaceae is distributed over the temperate and tropical regions of both worlds. The main center of distribution lies in the Mediterranean region. Pacific North America, especially California, is the second main center

with numerous endemic species. Of most of the species of Cordia, Brazil as well as the rest of tropical South America possesses by far the majority.

In Hawaii 3 genera are represented, of which only the genus Cordia has a single cosmopolitan species which attains the size of a tree.

CORDIA Linn.

Calyx tubular or campanulate, 3 to 5 toothed, or split at the apex; after flowering often enlarged. Corolla funnel or salver shaped, with 4 to many, but usually 5, rarely imbricate lobes. Stamens as many as corolla lobes, inserted in the tube. Style usually prolonged, twice bifid, with a capitate or clavate stigma. Ovules erect. Drupe surrounded or more or less enclosed by the persistent calyx, 4-celled of which usually only one contains a developed seed. Seed with very scanty albumen and irregularly folded, thick or more often very broad thin and fan-shaped folded cotyledons, and short superior radicle.—Trees or shrubs with alternate, often almost opposite, petiolate, entire or serrate leaves. Flowers usually white or dark orange yellow, arranged in expanded or contracted cymes.

The genus Cordia consists of about 230 species distributed in the warmer regions of both hemispheres, especially in tropical America. In the Hawaiian Islands only the cosmopolitan *Cordia subcordata* Lam. (*Kou*) is represented.

Cordia subcordata Lam.
Kou.

CORDIA SUBCORDATA Lam. Ill. I. (1791) no. 1899;—Cham. in Linnaea IV (1829) 474;—Endl. Fl. Suds. (1836) no. 1212;—DC. Prodr. IX. (1845) 477;—Pancher in Cuzent Tahiti (1860) 235;—Seem. Fl. Viti (1866) 168, t. 34;—H. Mann Proc. Am. Acad. VII. (1867) 194;—Nadeaud Enum. Pl. Tahit. (1873) no. 375;—Wawra in Flora (1874);—Sinclair Indig. Flowers Haw. Isl. (1885) pl. 7;—Hbd. Fl. Haw. Isl. (1888) 321;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 240, et Fl. Polyn. Franc. (1893) 128.—**C. Sebestana** Forst. Prodr. (1786) 108 (non Linn.);—Soland. Prim. Fl. Ins. Pacif. (ined.) 235, et in Parkins Draw. of Tahit. Pl. t. 29 (ined.) cf. Seem.) Endl. l. c. no. 1208;—**C. orientalis** Roem. et Schult. Syst. IV (1819) 449;—Guill. Zephyr. Tait. (1836-1837) n. 239.

Leaves ovate or subcordate 12.5 to 15 cm long, 8 to 10 cm wide, on petioles of 2.5 to 3 cm or more, acuminate, entire or wavy, glabrous excepting slight tomentose patches or streaks in the axils of the principal veins; flowers in short terminal or lateral subracemose panicles; calyx coriaceous, broadly and irregularly 3 to 5 toothed; corolla orange colored, its tube little longer than the calyx, with rotund, broadly expanded limb, 5 to 7 lobed; drupe ovate, submucronate, enclosed within the calyx.

The *Kou*, which is indigenous in the Hawaiian Islands, though presumably brought here by the Hawaiians centuries ago, can only be found along the seashore here and there. Nowadays it is exceedingly scarce, but in times gone by it was rather plentiful, and much planted by the Hawaiians near their dwellings or grass huts. The wood of the *Kou* was much sought for, on account of its beautiful grain, for calabashes or poi bowls, spittoons, etc. It is a tree 30 to 50 feet in height and had trunks of sometimes three feet in diameter.

Today trees are never larger than 15 to 20 feet, with trunks only a few inches in diameter. The writer observed it growing wild on the Island of Lanai, along the beach near Manele, and also on Maui near the lava fields beyond Makena, together with the Algaroba (*Prosopis juliflora*), which has taken possession of the country there, being on the leeside of Mt. Haleakala.

PLATE 170.

NOTHOCESTRUM BREVIFLORUM Gray.
Aiea.
Flowering branch, reduced one-half.

The *Kou*, whose Tahitian name is *Tou*, and is known in Samoa and Fiji as *Tou* or *Hauanave* and *Nawanawa* respectively, ranges all the way from the Hawaiian Islands to Madagascar, the Moluccas, and tropical New Holland.

The wood is used by the Samoans for rafts, and the fruits for paste for their tapa clothing. The wood, which is much prized by the natives, is rather soft but durable.

SOLANACEAE.

The family Solanaceae is distributed over the tropical and temperate regions of the old and new world. The center of distribution is in Central and South America. In the Hawaiian Islands the family has one endemic genus which is closely related to a genus occurring in Brazil, but is not known from any other part of the world. Of the genus Solanum six species are also peculiar to these islands, but only one is a tree.

KEY TO THE GENERA.

Corolla salver-shaped, 4 lobed, anthers sessile..... **Nothocestrum**
Corolla rotate, 5-lobed, anthers connivent..... **Solanum**

NOTHOCESTRUM Gray.

Calyx campanulate, 4-dentate or the teeth almost bilabiate. Corolla silky, salver-shaped, 4-lobed, the lobes ovate, valvate and folded in the bud. Anthers 4, sessile below the throat, linear, acute, the cells opening inward and lengthwise. Ovary globose to ovoid, 2-celled; ovules many. Style very short with a 2-lobed stigma. Fruit a berry. Seeds reniform, suspended from a funicle, the testa chartaceous and pitted. Embryo peripherical, curved around a fleshy albumen; the thick clavate radicle longer than the cylindrical cotyledons.—Soft wooded trees or shrubs with single or fasciculate, greenish-yellow, inconspicuous flowers.

The genus Nothocestrum consists of 4 species and is peculiar to the Hawaiian Islands, where all of its species are known by the name *Aiea*. The genus Nothocestrum is closest related to the genus Athenaea Sendtn. which possesses about 14 species peculiar to Brazil. The Hawaiian genus differs from the latter mainly in the tetramerous flowers which are salver-shaped, and besides in the calyx, which does not become enlarged at the maturity of the fruit, as is the case in Athenaea.

KEY TO THE SPECIES.

Flowers single, rarely 2 or 3; berry longate..... **N. longifolium**
Flowers several on short axillary spurs; berry globose.
  Tube of corolla enclosed in the calyx.
    Leaves elliptical-oblong; fruit enclosed in the calyx..... **N. breviflorum**
  Tube of corolla longer than the calyx.
    Leaves ovate or ovate-oblong, often sinuate; calyx remains open with fruit . . . . . **N. latifolium**
    Leaves ovate-cordate; fruit not closed over by calyx..... **N. subcordatum**

PLATE 171.

NOTHOCESTRUM BREVIFLORUM Gray.
Aiea Tree.
Injured trunk of Aiea tree, growing on the lava fields of Puuwaawaa, North Kona, Hawaii; elevation 2400 feet.

Nothocestrum longifolium Gray.

Aiea.

NOTHOCESTRUM LONGIFOLIUM Gray, in Proc. Am. Acad. VI. (1862) 48;—Seem. Flora Vit. (1866) 173;—Mann in Proc. Am. Acad. VII. (1867) 191;—Wawra in Flora (1873) 62;—Hbd. Fl. Haw. Isl. (1888) 308;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VII. (1892) 249.

A small tree or shrub with slender ascending branches, quite glabrous; leaves thin membraneous, lanceolate or elliptical-oblong, acuminate at both ends or occasionally only acute or somewhat obtuse, 10 to 20 cm long, 3.5 to 8.5 cm wide, on petioles of 8 to 20 mm; flowers axillary, usually single, but not uncommonly 2 or 3, on pedicels of 8 to 30 mm; calyx tubular, 8 to 12 mm with flowers, 14 to 16 mm with fruit, glabrous, sharply or obtusely, always unevenly, 4-toothed; corolla pale yellow, the tube not longer than the calyx, the lobes of variable size, narrowly margined, glabrous when open, silky pubescent when in the bud, but with a remnant of pubescence on the back of the petals when open; anthers partly exserted; stigma clavate, included in the tube; berry elongate or fusiform, 12 to 20 mm long, orange-colored, rather fleshy, included in the calyx or exserted beyond.

This rather slender species is more often a shrub than a tree, and is peculiar to the rain forests on all the islands of the group. It usually sends out thin slender stems which do not branch, reaching a height of 7-10 feet, bearing leaf whorls at the ends, or it is a regular shrub with long and slender branches. Occasionally it is a tree 15-20 feet high. As such it was observed and collected by the writer in the Kipuku Puaulu, near the Volcano Kilauea on Hawaii at an elevation of over 4000 feet. This is the only record where it was not found in the rain forest proper. It is not uncommon on Oahu, on the Koolau range, and can be collected in the mountains back of Honolulu.

A variety *β brevifolium* Hbd. occurs in the mountains of Kauai, where it was collected by the writer along Opaiwela stream in the forests of Kaholuamano.

Nothocestrum breviflorum Gray.

Aiea.

(Plates 170, 171.)

NOTHOCESTRUM BREVIFLORUM Gray in Proc. Am. Acad. VI. (1866) 49;—Seem. Flora Vit. (1866) 173;—Mann Proc. Am. Acad. VII. (1867) 191;—Hbd. Fl. Haw. Isl. (1888) 308;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 248.

A stout tree about 10 to 12 m high; branches stiff, ascending; leaves oblong or elliptical-oblong, 5 to 12 cm long, 3 to 6 cm wide, on petioles of 3 to 5 cm, acute or obtuse on both ends, thin chartaceous, tomentose underneath, flowers many, clustered on short axillary spurs, the pedicels 4 to 10 mm, calyx campanulate with flowers, globose with fruit and closed over it, dentate, almost bilabiate; corolla greenish yellow, tube enclosed in the calyx, lobes with yellowish, coarse pubescence outside, with the exception of the margins which are glabrous, glabrous inside; anthers not protruding, linear, acute, glabrous; ovary ovoid, style short; berry globose or oblong, orange-red, 6 to 8 mm, or more long.

The *Aica* of Hawaii is a medium sized tree, 30-35 feet high, with a trunk of often 1½ feet in diameter; the bark is perfectly smooth and of a chocolate brown or grayish color; the wood is soft and whitish-green, and full of sap. It is peculiar to the Island of Hawaii, where it occurs in the dry districts especially on the *aa* lava flows of North Kona, at Puuwaawaa on the slopes of Mt. Hualalai, where it is exceedingly common. In that locality the writer met with the biggest trees. The trunks, owing to their softness are easily damaged and often

PLATE 172.

NOTHOCESTRUM LATIFOLIUM Gray.
Aiea Tree.
Fruiting branch pinned against trunk of tree. Growing on the lava fields of Auahi, East Maui.

eaten out by thirsty cattle, and are often covered with peculiar looking scars, and covered with knobs, increasing the ungainly appearance of the tree. It may be said here that none of the species of Nothocestrum (*Aiea* trees) deserves any claim to beauty; in fact they are the most ugly trees which the Hawaiian Islands possess. In the forests of Naalehu, southern slopes of Mauna Loa, Hawaii, the writer met with a form of this species, which owing to the fact that it grew in a wetter forest had a somewhat different aspect. The fruits were more or less oblong instead of globose, but agreed otherwise well with *N. breviflorum*. Collected fruiting June, 1909, North Kona, Hawaii, (no. 3552); and flowering and fruiting Jan. 15, 1912, in Hilea forests, Kau, Hawaii, (no. 10016).

The tree is usually found at an elevation of between 2000-2500 feet.

Nothocestrum latifolium Gray.

Aiea.

(Plates 172, 173.)

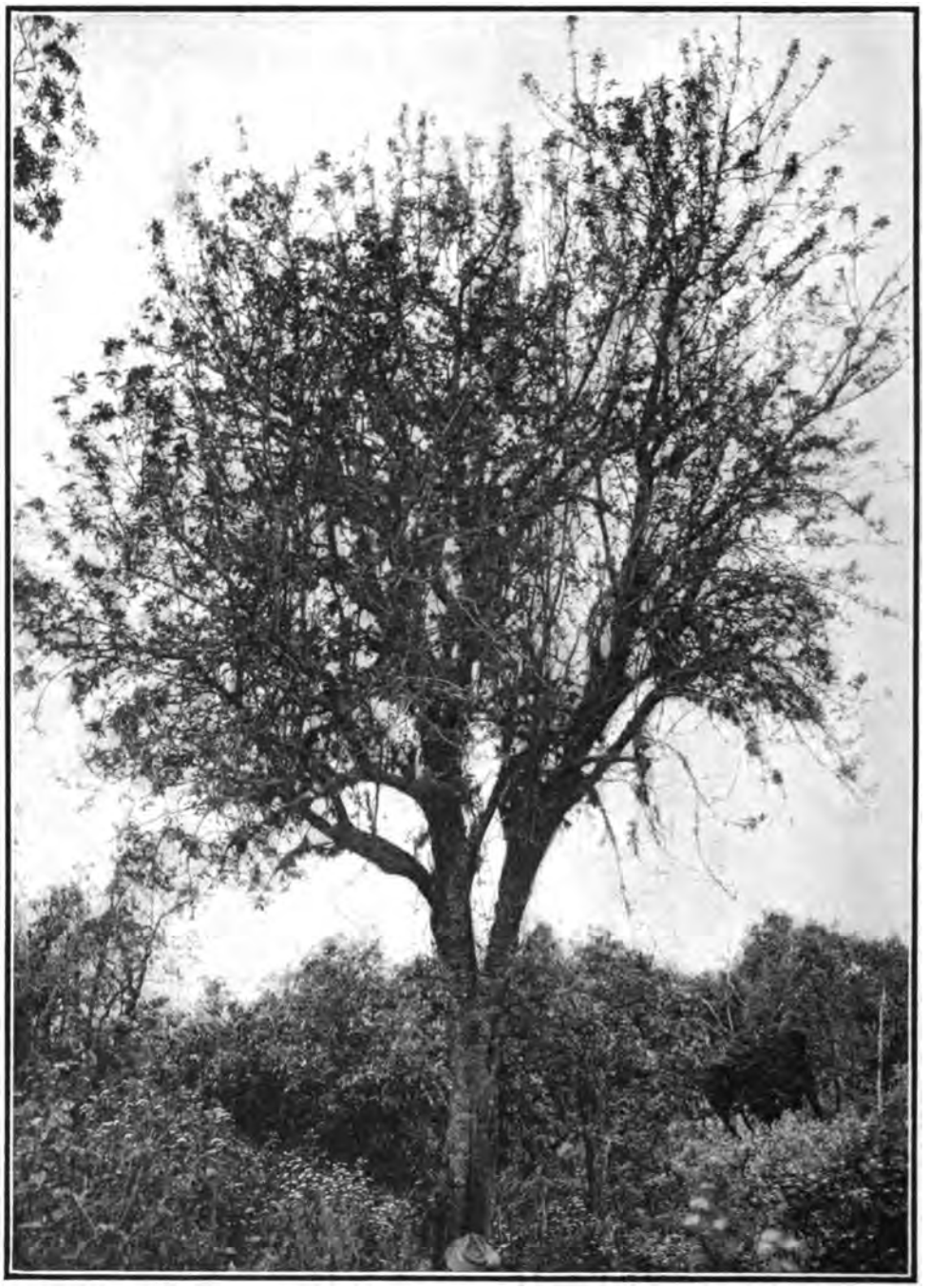
NOTHOCESTRUM LATIFOLIUM Gray in Proc. Am. Acad. VI. (1862) 48;—Seem. Flora Vit. (1866) 173;—Mann Proc. Am. Acad. VII. (1867) 191;—Wawra in Flora (1873) 62;—Hbd. Fl. Haw. Isl. (1888) 308;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VII. (1892) 249;—Heller in Minnes. Bot. Stud. Bull. IX. (1897) 885.

A small tree; branches rigid, ascending; leaves broad ovate, or obovate-oblong, or suborbicular (Lanai spec.) entire or with very shallow sinuses, acute or obtuse and often rounded at the apex, covered with an ochraceous tomentum when young, puberulous at a later age, of somewhat thick texture when fresh, thin chartaceous in dried specimens, pellucid, 4 to 12 cm long, 3 to 7 cm wide, on petioles of 10 to 50 mm; flowers clustered on short spurs, the pedicels 4 to 18 mm, calyx urceolate, about 6 mm, truncate, at length globose, tomentose or glabrate, open with fruit; corolla greenish-yellow, silky, the tube twice as long as the calyx, the lobes less than half its length; anthers protruding, somewhat shorter than in the foregoing species; ovary globose, style as long as tube, berry globose 4 to 6 mm, whitish.

This species of *Aiea* occurs on all the islands of the group with the exception of Hawaii. Like the former it prefers the dry forehills on the leeward sides as well as *aa* lava fields. It is one of the most common and ungainly looking trees on the Island of Lanai, where it can be found in the Kaa desert, the most western point of Lanai. It is taller than any other tree in that locality and can be recognized from a distance by its long stiff ascending branches, which are only slightly foliate; on Molokai it is common at Mapulo'u in the dry canyons and rocky situation 2000 feet above Kaunakakai, where it associates with Sideroxylon, *Acacia Koaia, Myoporum sandwicense,* and other trees; collected March 22, 1910, Mapulo'u, Molokai, no. 6155 fruiting; flowering at Mauna Lei, Lanai, July 26, 1910, (no. 8082).

On the Island of Maui, on the southern slopes of Haleakala on the lava fields of Auahi, land of Kahikinui, occurs a variety enumerated as β by Hillebrand in his Flora. During the winter months, especially in the month of November, the trees are adorned with large dark green foliage hiding the ugly gnarled stiff branches, while in the month of March they are either bare or with only very scanty foliage.

PLATE 173.



NOTHOCESTRUM LATIFOLIUM Gray.
Aiea Tree.
Growing on the aa lava fields of Auahi, Haleakala, East Maui; elevation 2600 feet.

The leaves are large with sinuate margins, subcordate at the base, densely tomentose, dark green with pale venation; inflorescence also covered with a dirty yellowish pubescence; otherwise as in the species. At the same locality occurs, however, also the species with entire leaves or just a slight indication of a wavy margin.

The tree illustrated was photographed when the foliage was scanty.

The wood of this, as well as of the other species, is soft and of a green color; it was used by the natives in the olden days for finishing off canoes. The reddish yellow berries are sometimes eaten.

Nothocestrum subcordatum Mann.

Aiea.

NOTHOCESTRUM SUBCORDATUM Mann Proc. Am. Acad. VII. (1867) 191;—Wawra in Flora (1873) 62;—Hbd. Fl. Haw. Isl. (1888) 309;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 249.

A medium sized tree about 10 m high; leaves ovate or cordate, 7.5 to 12.5 cm long, 5 to 10 cm wide, on petioles of 3 to 4.5 cm, bluntly acuminate, thick coriaceous, glabrous; flowers clustered, but often only a single one developed, on pedicels of 4 to 5 mm; calyx 4 to 8 mm, glabrous, campanulate with flowers, globose with fruit but not closed over it; corolla exserted, silky yellow, its tube 8 to 10 mm, the limb half as long and 4 to 5 lobed; berry globose.

This species, which is undoubtedly closely related to *N. latifolium*, if at all distinct from it, occurs in the ravines of Mt. Kaala of the Waianae range, and in the Valley of Wailupe, at the eastern end of Oahu. It is not known to the writer. Wawra collected it at Halemanu on Kauai, (no. 2140).

SOLANUM L.

Calyx 5 to 10 toothed or lobed, only rarely enlarged with fruit. Corolla rotate or broad campanulate, 5-lobed. Filaments very short, inserted at the base of the corolla; anthers oblong or linear, erect and connivent in a cone round the style, opening at the apex by 1 to 2 pores. Berry globose or elongate.—Herbs, shrubs or trees, prostrate, erect, or climbing, with entire or lobed leaves. Flowers in umbellate cymes or racemes, or often a corymbose panicle, rarely single. Corolla white, yellow, purple, blue or red.

This genus, which numbers more than 900 species, is distributed over the tropical and temperate parts of the whole globe; the largest number of species occurs however in South America. The Hawaiian Islands possess 6 endemic species of which only the one here described is a tree, the remaining five being shrubs. Besides the six endemic species quite a number of species are cultivated for ornamental purposes, and a few are weeds along the roadside, as the nightshade (*Popolo*) etc. To this genus also belongs the Potato, *Solanum tuberosum* L., and the Egg plant, *S. Melongena.*

Solanum Carterianum Rock sp. nov.

Puananahonua.

A medium sized or small tree 5 to 7 m high, with very few stiff branches, straight trunk of 15 to 20 cm in diameter, vested in a grayish smooth bark; branches covered

PLATE 174.

MYOPORUM SANDWICENSIS (A.DC.) Gray.
Naio or **Bastard Sandalwood.**
Flowering and fruiting branch, less than one-half natural size.

throughout with a pale yellow to cinereous, long, stellate pubescence; leaves pale green and velvety tomentose above, densely covered beneath, especially on the veins and midrib, with a stellate pale tomentum, as well as the petioles, which are 20 to 30 mm long, elliptical-oblong, long acuminate at the apex, shortly contracted at the base, acute, chartaceous, entire, 12 to 25 cm long, 3.5 to 7 cm wide; inflorescence a terminal corymb, when fully developed 15 cm long, standing erect on a common stiff peduncle of 8 cm, densely covered with a long stellate woolly tomentum, calyx densely tomentose, divided to the middle into ovate acute lobes of 4 mm length, corolla parted two thirds its length into ovate-oblong acute lobes, which are of a blue color, and glabrous inside, but densely tomentose outside, with a prominent median nerve; stamens on short filaments, anthers pale, short, oblong, not attenuate, broader at the apex than at the base, 2.5 mm long, with two ovoid apical pores; ovary villous, style long protruding, 6 mm, hairy; berry globose, black covered with a short stellate pubescence when young, 10 to 12 mm in diameter on pedicels of 6 mm; the peduncle and pedicels woody and thick, when with fruit.

This most remarkable species was discovered by the writer on the Island of Oahu in the lower forests near Waiahole, at the entrance of Waianu Valley, on January 22, 1909; only a single tree was seen, for which an old native gave the name as *Puananahonua*. He remarked that he knew of the tree when he was a boy, and that his parents used the fruits for medicinal purposes.

This is the only species of Hawaiian Solanum which becomes a tree, all the rest of them being shrubs. It is remarkable for its large entire leaves, but mainly for its terminal woody corymbose inflorescence which reaches a length over 15 cm; also for the bright blue corolla, and long filiform style.

It is named in honor of Ex-Governor George R. Carter, who made the publication of this volume possible.

Collected at Waianu, Oahu, flowering and fruiting, January 22, 1909, (no. 1191), type in the College of Hawaii Herbarium.

MYOPORACEAE.

The main regions of the distribution of this family are situated in Australia and in the neighboring islands. Only a few out of the 102 species are found outside of Australia, one each in China and Japan, one in Mauritius, one in South and West Africa, and another species in the West Indies. Here in the Hawaiian Islands we have also only one species represented. The family consists only of 4 genera, nearly all Australian.

MYOPORUM Banks et Sol.

Calyx 5-lobed, unchanged at maturity of the fruit. Corolla with short tube sub campanulate, or with longer tube and funnel shaped, actinomorphous. Stamens 4, two large, rarely 5. Ovary 2 to 10 celled; and as many seeded. Trees or shrubs or bushes with erect and prostrate stems. Flowers single or fasciculate in the leaf-axils.

The genus numbers about 25 species, which are divided into 5 sections. It is distributed over Australia, China, Japan, Mauritius and the Hawaiian Islands with a single species which comes under section II. Polycoelium.

The only useful species of Myoporum are *M. platycarpum* R. Br., the sandal or sugar tree or dog wood of the Australians, which exudes a sort of manna, and

PLATE 175.

MYOPORUM SANDWICENSE (A.DC.) Gray.
Naio.
Trunk of large tree showing peculiar scaly bark, more than two feet in diameter; growing in forest above Makawao, Maui; elevation 2500 feet.

also a resin which is used as sealing wax. and the Hawaiian species, *M. sandwicense* (DC.) A. Gray, or *Naio* or Bastard Sandalwood, used as a substitute for the true sandalwood after the exhaustion of the latter.

Myoporum Sandwicense (DC.) A. Gray.

Naio or Bastard Sandalwood.

(Plates 174, 175, 176.)

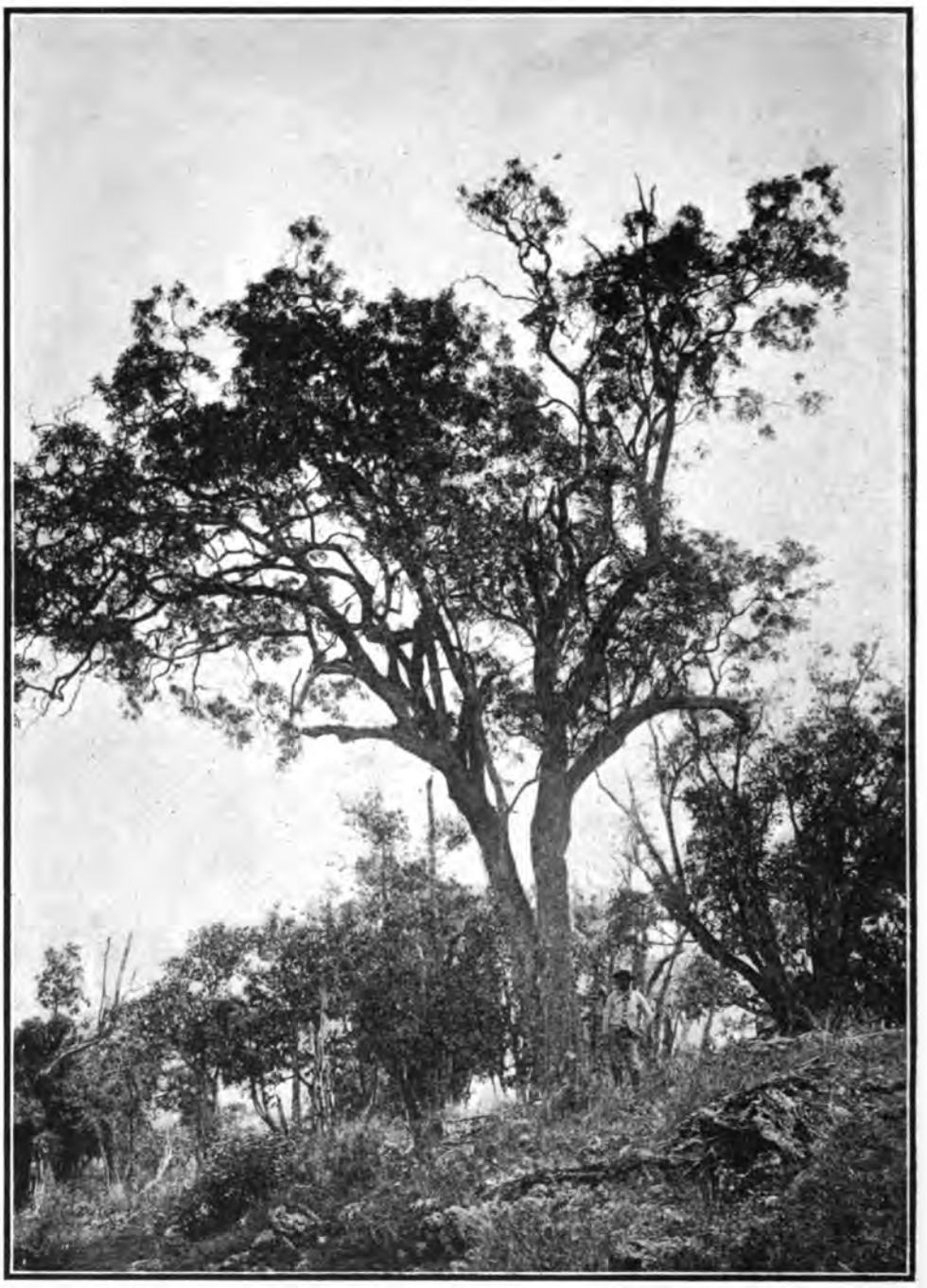
MYOPORUM SANDWICENSIS (DC.) A. Gray in Proc. Am. Acad. VI. (1866) 53;—H. Mann. in Proc. Am. Acad. VII (1867) 194;—Wawra in Flora (1874);—Hbd. Fl. Haw. Isl. (1888) 339;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VII. (1892) 258;—v. Wettstein in Engl. et Prantl Pflzfam. IV. 3. 1. (1895) 360;—Heller Pl. Haw. Isl. (1897) 892.—**Polycoelium sandwicense** A. DC. Prodr. XI. (1847) 706.—**Myoporum tenuifolium** Hook. et Arn. in Bot. Beech. (1832) 93.

Leaves crowded towards the ends of the branches, alternate, elliptico lanceolate or oblong lanceolate, very acute, or acuminate, chartaceous, or fleshy when growing at the sea-shore or even at low elevations (300 feet) 6 to 15 cm long, 1 to 5 cm wide on petioles of about 1 cm or less, acute at both ends, entire, or serrate in the specimens from Mt. Hualalai, North Kona, Hawaii, the young leaves very viscous in all specimens; flowers in clusters of 5 to 8, white or deep pink colored, on pedicels of 8 mm; calyx 1 to 3 mm. parted to the base into ovate-lanceolate acute lobes; corolla campanulate 5 to 8 mm. cleft to the middle into 5 to 6 or rarely 7 obovate lobes; stamens as many as lobes, shorter than the latter, all alike, or two little exceeding the others; style short, flattened, incurved near the apex; stigma truncate. Drupe dry or somewhat fleshy and white globose or ovate, about 2 mm in diameter, crowned by the style, ribbed when dry; embryo cylindrical cotyledons as long as the radicle.

On the Island of Molokai is a very narrow leaved form, with linear lanceolate very acuminate leaves, which are viscous; and with small pink flowers. It grows on all the islands of the group, from high elevations down to near or at the sea-shore, where it forms globose tussocks with salty fleshy leaves.

The *Naio* or Bastard Sandalwood is a very handsome tree which reaches a considerable size. Its thick bark is of a dark gray color and deeply irregularly corrugated. It inhabits all the islands of the group and according to Hillebrand is supposed to reach its best development on the high mountains of Hawaii, Mauna Kea and Mauna Loa, up to 10,000 feet elevation, which, however, is not the case. Next to *Ohia* and *Koa*, it is one of our most common forest trees, growing at all elevations from sea level, where it is a small shrub 2 feet high, up to 10,000 feet. On the Island of Maui, in the dry forest back of Makawao (elevation 2500 feet), as well as at Auahi, southern slopes of Haleakala, it attains its greatest height and diameter of trunk; trees of 50 to 60 feet with trunks of more than 3 feet in diameter are not uncommon. It prefers the leeward sides of the islands, especially the *aa* lava fields, regions with very little rainfall, as well as the high mountains of Mauna Kea, Mauna Loa, Hualalai and Haleakala, where it forms the upper forest zone together with the *Mamani* (*Sophora chrysophylla*), Raillardia, Coprosma, and Styphelia, reaching a height of about 20 feet, and withstanding heavy frosts. At the lower levels it is associated with the *Maua, Holei, Aalii, Kauila, Uhiuhi*, etc. Hillebrand in his flora says that it is wanting on Molokai. The writer, however, found it very abundant above Kaunakakai, on the open dry ridges at Mapulou, where it grew together with *Koaia* and *Alaa*. The tree is glabrous throughout, has from narrow lance-

PLATE 176.



MYOPORUM SANDWICENSE (A.DC.) Gray.
Naio, Bastard Sandalwood.
A large Naio tree, growing on the lava fields of Auahi, southern slopes of Haleakala, Maui; elevation 2600 feet.

olate to obovate pointed glossy leaves which are crowded at the ends of the branches. The flowers, which are of a white or pink color, are borne all along the slender branches and are quite fragrant.

The dark yellowish green wood becomes very fragrant on drying and resembles the odor of true Sandalwood. After the supply of the latter became exhausted in the islands, it was shipped to China as a substitute. The *Naio* is peculiar to this archipelago, though undoubtedly it must have originated either from Australia or New Zealand, the home of most of the Myoporums.

Dead trees or old trunks are called *Aaka* by the natives.

RUBIACEAE.

The family Rubiaceae with its 4500 or more species and about 350 genera is a decidedly tropical one. The distribution of its species over Africa, Asia and America is rather even. Polynesia possesses also a large number of species. In the Hawaiian Islands this family is represented by 13 genera of which 4, (Straussia, Bobea, Gouldia and Kadua) are endemic. Eight of the 13 genera have arborescent species while the remaining 5 have shrubby or also herbaceous species only, and are therefore here omitted. A large contingent of the Hawaiian Flora is made up of this family which is the largest next to (Lobelioideae) Campanulaceae and Rutaceae. The family is easily distinguished by its opposite leaves and interpetiolar stipules.

KEY TO THE GENERA.

Ovules many in each cell.
- Ovary 2- rarely 3-4 celled.
  - Fruit a bluish-black, indehiscent fleshy berry..... **Gouldia**
- Ovary 1-celled.
  - Fruit larger globose or pyriform, succulent or dry, crowned with the calycine limb . . . . **Gardenia**

Ovules one in each cell.
- Flowers hermaphrodite or polygamous.
  - Ovary 2 to 10-celled.
    - Flowers greenish, the corolla-lobes imbricate in the bud..... **Bobea**
  - Ovary 2-celled.
    - Flowers white fragrant, the corolla lobes valvate..... **Plectronia**
    - Flowers white small, rotate..... **Straussia**
    - Flowers larger, white funnel-shaped, drupe crowned by the long calycine limb..... **Psychotria**
  - Ovary 4-celled.
    - Flowers in globose heads; drupes united into a fleshy compound fruit..... **Morinda**
- Flowers dioecious, stigma bifid to the base, anthers 4 to 11..... **Coprosma**

GOULDIA Gray.

Calyx short, cup-shaped, 4-toothed. Corolla salver-shaped, coriaceous, with 4 thick, fleshy lobes and glabrous throat. Stamens 4. inserted in the tube or throat. Ovary 2-celled; style with 2 filiform branches. Fruit a berry with 2 drupaceous divisions, bisulcate.—Shrubs or small trees with coriaceous leaves and short interpetiolar, caducous stipules.

PLATE 177.

GOULDIA AXILLARIS Wawra.
Manono.
Fruiting branch; reduced.

The genus Gouldia is strictly Hawaiian, and consists of a goodly number of ill-defined species, most of which are shrubs, only very few becoming trees. As they are at present in a mixup, and difficult to determine without type material, it is thought wise to mention only these few.

KEY TO THE SPECIES.

Panicles axillary and short, leaves pubescent underneath..... **G. axillaris**
Panicles terminal, large, loose..... **G. elongata**

Gouldia axillaris Wawra.

Manono.

(Plate 177.)

GOULDIA AXILLARIS Wawra in Flora (1874) 397;—Hbd. Fl. Haw. Isl. (1888) 170;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VI. (1890) 189.—**G. sandwicensis** var. **hirtella** Gray Proc. Am. Ac. IV. (1860) 310, in part.

Branches angular, solid, densely and evenly foliose throughout, coarsely pubescent; leaves on petioles of 4 to 12 mm, elliptical, obovate-oblong or lanceolate, 5 to 15 cm long, 1.5 to 5 cm wide, more or less acuminate, contracted or rounded at the base, bluish-green when fresh, membraneous to chartaceous, with not very distinct nerves, coarsely but sparingly pubescent underneath; stipules 6 mm; panicles numerous, pubescent, short, 2.5 to 5 cm long, in the axils of mostly older leaves or on the naked branches, with slender peduncles of 4 to 12 mm; the lowest bracts 6 to 12 mm or foliaceous; corolla puberulous, small; anthers subexserted; berry pale blue or blackish, 3 to 4 mm in diameter; seeds 20 to 22 on each placenta.

This species is a small tree about 20 to 25 feet high, and is very variable. It occurs practically on all the islands of the group in the rain or middle forest zone at an elevation of about 3000 feet. Specimens from South Kona, in the forests back of the lava fields of Kapua, Hawaii, have exceedingly large fruits, and larger panicles all along the branches, as well as terminal; collected fruiting February, 1912, (no. 10030). Other numbers in the Herbarium of the College of Hawaii are 3706 from Hualalai, Hawaii; 7016 from Maunahui, Molokai; 8535 from Mt. Haleakala, Maui.

Gouldia elongata Heller.

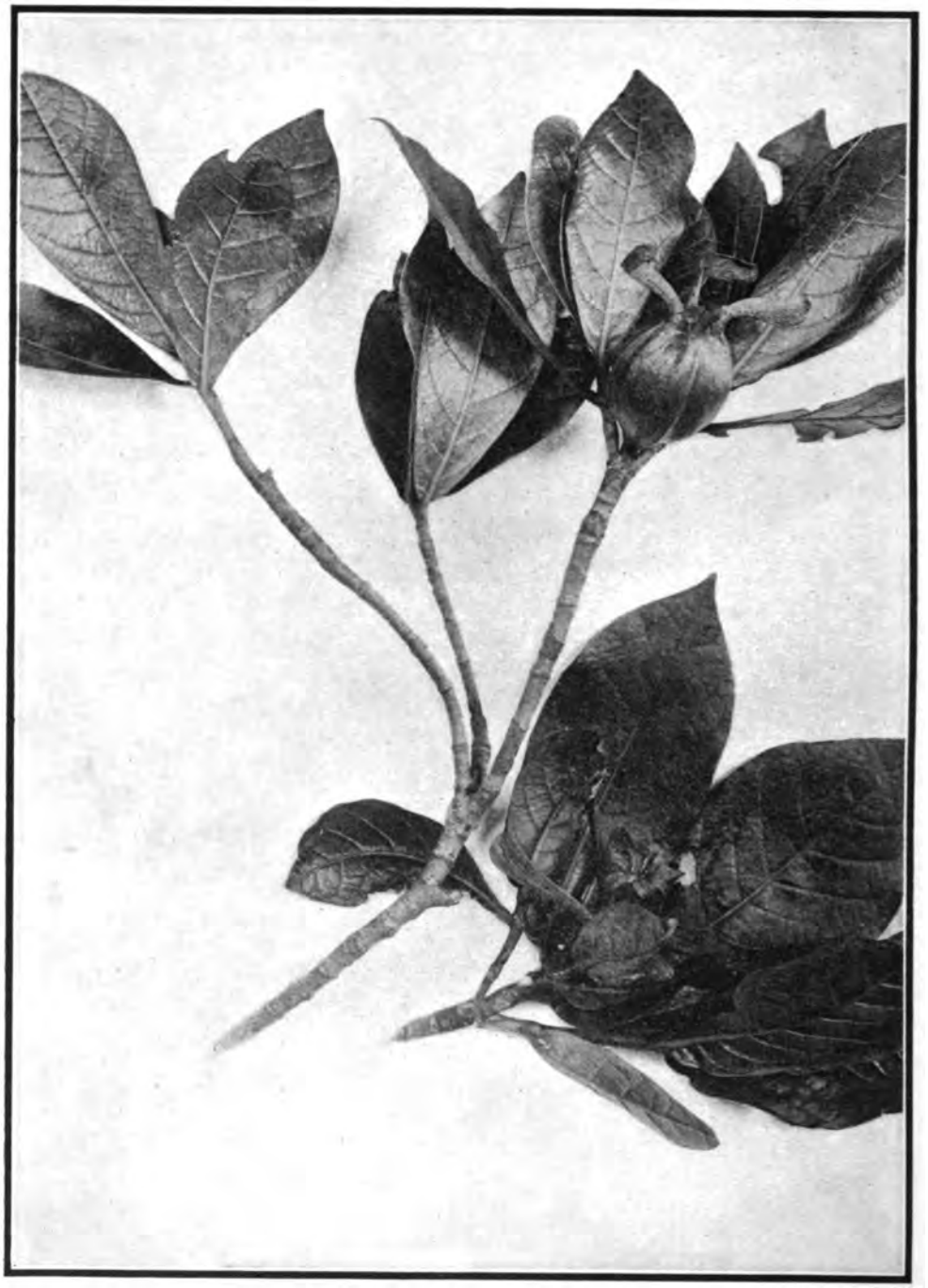
Manono.

GOULDIA ELONGATA Heller in Minnes. Bot. Stud. Bull. IX. (1897) 897.—**G. terminalis** Hbd. Fl. Haw. Isl. (1888) 169 in part.

Branches subherbaceous near the ends, drooping, slender, four-angled, glabrous throughout; or the young leaves finely puberulous underneath; bark gray, smooth; leaves elliptical-lanceolate, slightly more contracted at the apex than at the base; 5 to 7.5 cm long, 3 cm or more wide, entire, midrib prominent, impressed above, on short petioles about 2 cm; panicles terminal or occasionally axillary, pyramidal, very large and loose; pedicels slender; berries small, 2 mm in diameter, bluish.

This *Manono* is usually a shrub, but it was also observed as a tree in the forests of Kaholuamano, Kauai. Plants occur on Maui (no. 8531) which would be referable to this species, but differ to some extent, as in the contracted panicle, which comes closer to *G. sambucina.* The latter is also a small tree described by Heller. It occurs in the forests of Kaholuamano, Kauai. The leaves of this latter species are very wide and thick coriaceous.

PLATE 178.



GARDENIA REMYI Mann.
Nanu or **Nau.**
Flowering and fruiting branch; reduced.

GARDENIA Ellis.

Calyx usually tubular and truncate, toothed or lobed, persistent. Corolla salver-shaped, campanulate, or funnel-shaped with cylindrical tube; lobes occasionally more than 5. Stamens 5 to 11, inserted in the throat, enclosed or shortly protruding. Ovary 1-celled, with 2-several parietal placentas; style often with clavate stigma protruding. Fruit coriaceous or succulent, often irregularly opening, smooth or ribbed, globose or pyriform.—Shrubs or trees with chartaceous or coriaceous leaves, and interpetiolar, often connate and sheathing stipules. Flowers occasionally very large, terminal or axillary, white, yellow or purple.

The genus consists of about 70 species which are distributed over tropical Africa, Asia and Australia. About 10 species have been described from the Pacific isles, two of which are peculiar to Hawaii, while the remaining ones occur in Tahiti (1), Fiji (6) and in Samoa (1).

KEY TO THE SPECIES.

Branches not glutinous, fruit globose..... **G. Brighami**
Branches glutinous, fruit quadrangular, pyriform..... **G. Remyi**

Gardenia Brighami Mann.

Nau.

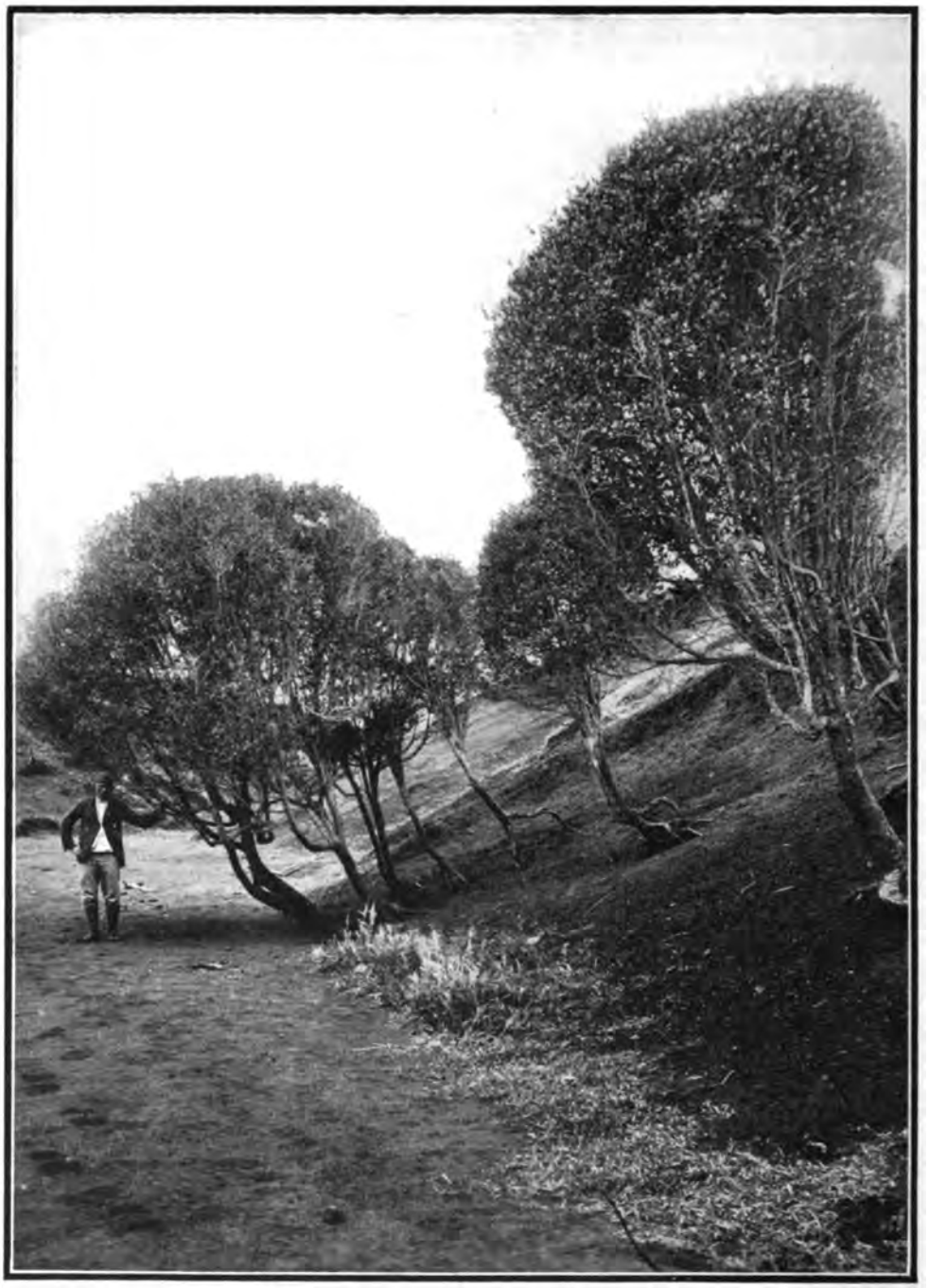
GARDENIA BRIGHAMI Mann in Proc. Am. Acad. VII. (1867) 171;—Hbd. Fl. Haw. Isl. (1888) 171;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 191;—Brigham Ka Hana Kapa in Mem. B. P. B. Mus. III. (1911) 146.

Branches dichotomous, densely foliose, scarcely glutinous at the ends; leaves on short petioles of 4 mm, ovate, shortly acuminate, chartaceous, with prominent straight nerves, shining above, papillose and puberulous when young; stipules triangular or truncate; flowers single, terminal, subsessile; calyx tube shortly produced above the ovary, 10 mm long, 4 lobed; anthers subsessile, linear, their apices exserted; style as long as the tube (14 to 18 mm), the two clavate branches nearly half its length; fruit globose, with 4 faint lines, about 2.5 cm in diameter, coriaceous, indehiscent, tipped with the contracted limb of the calyx, 1-celled, with 4 (or 3 or 5) parietal placentas projecting about 4 mm from the pergameneous endocarp; seeds many in a yellowish pulp, horizontal, flattened, obtusely 3 or more angled.

The *Nau* is a small tree, reaching a height of 15 to 18 feet, or is even smaller when it is a shrub. It has a trunk 6 to 8 inches in diameter and is vested in a smooth or slightly roughened bark. The flowers are of a beautiful white and very fragrant and would be worthy of cultivation on that account. During the month of March the trees are usually loaded with the globose fruits, which turn black when mature. Hillebrand remarks that the fruits do not open on the tree, though the writer saw them split into several divisions on most of the trees on Molokai.

The *Nau* is peculiar to the very dry districts on the leeward sides of the islands, and is especially common on Molokai, where it forms the remnants of the dry forest on the slopes of Mauna Loa which forms the west end of that Island. The trees on Molokai are taller than on the other islands. It associates with the *Keahi, Chrysophyllum polynesicum, Kokia drynarioides, Reynoldsia sandwicensis, Xylosma Hillebrandii, Nototrichium sandwicense*, etc. On Lanai it is also very common in the Valleys of Mahana and Kaiholena, as well as on the slopes of the Kaa desert, where it can be found with some of the above mentioned trees and also with *Bobea sandwicensis, Nothocestrum* sp., *Osmanthus*

PLATE 179.



PLECTRONIA ODORATA (Forst.) F. v. M.
Walahee or **Alahee Trees.**
Growing on the extreme western end of Molokai.

sandwicensis, various Sideroxylons and others. On Hawaii the writer found a small tree on the lava fields of Puuwaawaa, elevation 2000 feet, North Kona, while on Oahu it is recorded from Nuuanu and the dry forehills of Makaleha. The wood of the *Nau* is whitish yellow. The yellow pulp of the fruit was employed in dyeing *tapa*, or *kapa*, yellow.

Gardenia Remyi Mann.

Nanu or *Nau*.

(Plate 178.)

GARDENIA REMYI Mann in Proc. Am. Acad. VII. (1867) 171;—Hbd. Fl. Haw. Isl. (1888) 172;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 191;—Brigham Ka Hana Kapa Mem. B. P. B. Mus. III. (1911) 146. fig. 88.

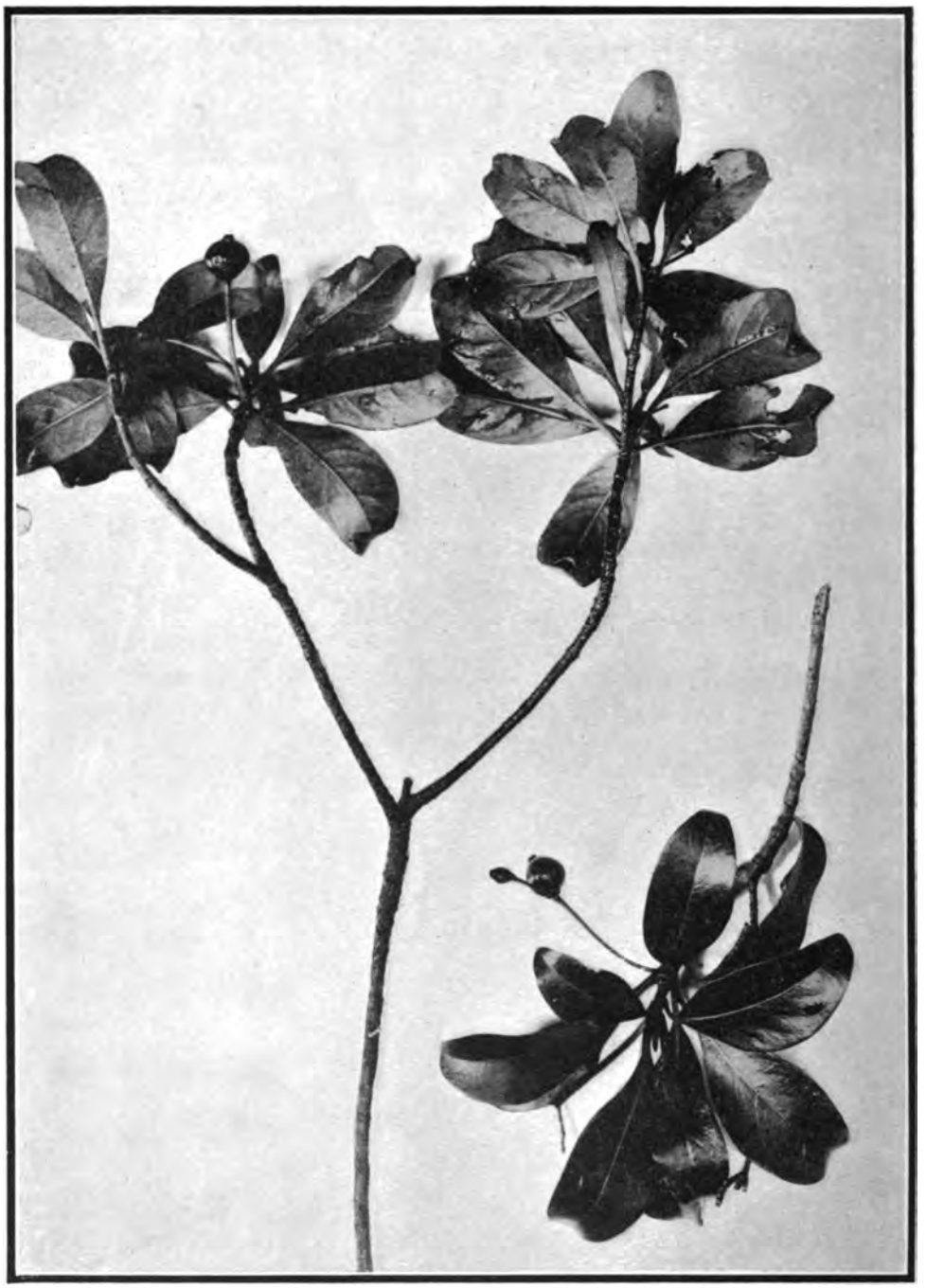
Leaves obovate oblong, 10 to 22.5 cm long, 5 to 10 cm wide on petioles of 4 to 8 mm, shortly acuminate, contracted at the base, chartaceous, papillose underneath, prominently nerved; stipules truncate and sheathing, flowers terminal, single, sessile; calyx-tube angular, 18 mm long with 4 to 5 lobes which are falciform, and dilated toward the obtuse apex, net-veined, spreading with the plane vertical about 3 to 5 cm long, equalling or exceeding the corolla; corolla white, the tube 2.5 cm, the 7 to 8 obovate-oblong suberect lobes about 20 mm long, narrowed at the base and separated by broad sinuses; anthers enclosed; fruit 4 to 5-angled, pyriform, 3.5 to 5 cm, the permanent calyx-lobes surrounding a disc 6 to 8 mm in diameter.

The *Nanu* or *Nau*, unlike the afore described, is a tall tree reaching a height of 20 to 40 feet with a rather large broad crown. The branches are more or less horizontal in large trees; the trunk is short. The leaves which are larger than in the foregoing species are light green and covered as with a layer of varnish due to a glutinous substance which exudes from the young shoots. The large sweet-scented flowers are terminal and single and have no flower stalk. The fruit, which is quadrangular, is crowned by four wings, which are the persistent lobes of the calyx, a characteristic which is absent in the other Hawaiian *Nau*.

The *Nanu* or *Nau* may be found on the slopes of Tantalus and especially in Palolo Valley on Oahu, where it is a smaller tree, while on Molokai back of Kaluaha large trees can be found in company with *Acacia Koa (Koa), Bobea elatior, Straussia Kaduana*, etc. It grows on the leeward sides of some of the islands and also in the rain forests on the windward sides, as for example on Maui, where it is scattered between the valleys of Waikamoi and Honomanu on the northern slope of Haleakala, where the rainfall is exceedingly large, as well as on Kauai in the forests of Hanalei. Like the former it is endemic to the Hawaiian Islands; both species were discovered by Horace Mann and also described by him in his "Enumeration of Hawaiian Plants"; the former he named in honor of his companion, Prof. Wm. T. Brigham, the latter for the French Botanist Jules Remy.

The glutinous leaf buds were used by the natives as a cement, and the yellow fruit-pulp for dyeing purposes.

PLATE 180.



BOBEA ELATIOR Gaud.
Ahakea.
Fruiting branch; reduced.

PLECTRONIA Linn.

Calyx short, cup-shaped, truncate or 4 to 5 toothed. Tube of corolla short or prolonged, corolla funnel shaped or campanulate, with obtuse or acute lobes. Stamens 4 to 5, inserted near the throat. Ovary 2-celled; style with thickened, obtuse, capitate stigma. Drupe 2-seeded, one cell often abortive.—Shrubs or trees, occasionally climbers, armed or unarmed, with coriaceous leaves and interpetiolar stipules. Flowers small in fascicles or corymbose cymes.

A genus of more than 80 species distributed over the warmer or hottest regions of the old world, with the exception of Europe. In the Hawaiian Islands we have only one species, the *Walahee* or *Alahee*, distributed however over the South Pacific Islands.

Plectronia odorata (Forst.) F. v. M.

Walahee or *Alahee.*

(Plate 178.)

PLECTRONIA ODORATA Forst. F. v. Muell. .....? Hbd. Fl. Haw. Isl. (1888) 175;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 194;—K. Schum. in Engl. et Prantl Pflzfam. IV. 4. (1891) 92;—Heller Pl. Haw. Isl. (1897) 902.—**Coffea odorata** Forst. Prodr. (1786) no. 94.—**Ixora odorata** Sprengl. Syst. veg. I. (1825) 409.—**Canthium lucidum** H. et A. Bot. Beech. (1832) 65;—Mann Proc. Am. Acad. VII. (1867) 169;—Wawra in Flora (1874) 298.—**Myonima umbellatum** Hook. et Arn. Bot. Beech. (1832) 86.—**Pavetta dubia** Endl. Fl. Suds. (1836) 176. no. 1296.—**Canthium odoratum** Seem. Fl. Vit. (1866) 132.

Leaves elliptical-oblong, acuminate or somewhat obtuse, dark green, glossy above, paler beneath; stipules mucronate; flowers white, fragrant in cymose corymbs 2.5 to 3.5 cm long; calyx 2 mm, dentate; corolla 6 mm long, 4 to 5 fid, pilose at the insertion of the stamens, the latter exserted; style little longer, glabrous, stigma short ovoid or rather the 2 thick lobes co-adnate; drupe obovoid, compressed, black and juicy when mature, emarginate, grooved on each side, 8x10 mm, 2-celled. Seed incurved.

The *Walahee* or *Alahee* is a shrub or small tree reaching a maximum height of 20 feet. It has a round crown, bright green, very glossy leaves; the white fragrant flowers add to the beauty of the little tree during the summer months.

It inhabits the dry regions of the low land or lower forest zone up to 2000 feet, and is rather a common tree on all the islands. On the west end of Molokai, *Walahee* trees form the sole arborescent growth in the little gulches (see plate 178).

The wood of the *Alahee* is very handsome, exceedingly hard, and durable. It was used by the natives for their implements with which they tilled the soil. The leaves were used in coloring articles black.

BOBEA Gaud.

Flowers polygamous-dioecious. Calyx cup-shaped, truncate, 4-toothed or 4-lobed. Corolla salver-shaped, lobes imbricate in the bud. Stamens inserted in the throat, their apices protruding. Ovary 2 to 11-celled; style in the male flowers with 2-, in the female flowers with 2 to 11 filiform branches. Drupe globose, somewhat dry or fleshy, furrowed when dry, with 2 to 11 osseous, uniseriate pyrenae. Seeds straight.—Trees with subcoriaceous to chartaceous, pale green leaves, and interpetiolar easily caducous stipules. Flowers usually 3, or single, in axillary symes.

PLATE 181.

BOBEA HOOKERI Hbd.
Ahakea.
Flowering and fruiting branch; reduced.

The genus Bobea, named by Gaudichaud in honor of M. Bobe-Moreau, a physician and pharmacist in the French Marine, consists of 4 or perhaps 5 species, which are all peculiar to the Hawaiian Islands. They form two groups, one composed of *Bobea elatior* and *B. Mannii* which are perhaps a single species, and *B. timonioides, B. sandwicensis* and *B. Hookeri,* only differing from each other mainly in the number of pyrenae.

KEY TO THE SPECIES.

Limb of calyx cup-shaped, truncate, drupe with 2 to 11 pyrenae.
- Leaves glabrous; peduncle erect..... **B. elatior**
- Leaves hairy underneath, peduncle drooping..... **B. Mannii**

Limb of calyx cup-shaped, 4 toothed..... **B. timonoides**

Limb of calyx broadly 4 lobed.
- Flowers in cymes; drupe with 2 pyrenae..... **B. sandwicensis**
- Flowers single; drupes with 4 to 6 pyrenae..... **B. Hookeri**

Bobea elatior Gaud.

Ahakea.

(Plate 180.)

BOBEA ELATIOR Gaud. Bot. Voy. Uranie (1826-30) 473. pl. 93;—A. Gray Proc. Am. Acad. IV. (1860) 36;—Mann Proc. Am. Acad. VII. (1867) 170;—Hbd. Fl. Haw. Isl. (1888) 173;—K. Schum. in Engl. et Prantl IV. 4. (1891) 96;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 192;—Heller in Minnes. Bot. Stud Bull. IX. (1897) 893.—**Burneya Gaudichaudii** Cham. et Schlecht. in Linn. IV. (1829) 190.—**Timonius Gaudichaudii** DC. Prodr. IV. (1830) 461;—Endl. Fl. Suds. (1836) 176, no. 1288.

Leaves pale, obovate oblong, 5 to 10 cm long, 2.5 to 5 cm wide, on petioles of 6 to 24 mm, acuminate, chartaceous, glabrous; stipules oblong-lanceolate, 8 to 12 mm, rather convolute in the bud; flowers 3 (accord. Hillbd. 3 to 7) in a cyme, with a common peduncle of 5 to 7.5 cm, the middle flower sessile, the lateral ones on pedicels of 12 to 18 mm; bracts and bractlets cup-shaped, low; calyx 4 to 5 cm, the cup-shaped truncate limb as long as the adnate portion; corolla greenish, glabrous, the lobes in the bud silky near the apex, the tube 4 to 8 mm, plicate at the throat, the obovate or rounded lobes 3 to 5 mm; anthers sessile at the middle of the tube; style 3 to 11 cleft; drupe rather fleshy, purplish ovoid 6 to 10 mm in diameter, or spheroidal crowned by the calycine limb which surrounds a glabrous disk of 2 mm in diam.; pyrenae 3 to 11, thick walled, complanate.

This *Ahakea* is a tree 30 feet or so tall with often a large trunk of 1½ feet in diameter. It occurs in the rain forests of the Islands of Oahu, Kauai, and Hawaii, and can be recognized by its rather pale green foliage, which is often reddish-veined.

It is not uncommon back of Honolulu in the Valleys of Pauoa and Palolo as well as in the whole Koolau range. The biggest trees were observed in the mountains of Punaluu on the windward side of Oahu. The wood of the *Ahakea* is yellow and was employed by the natives for poi boards and the top-rims of outrigger canoes, which in modern ones are painted yellow, to take the place of the yellow *Ahakea* wood.

Few are the natives now-a-days who are familiar with the *Ahakeas* of the Hawaiian forests.

At a lower elevation, about 1000 feet, there occurs an apparent variety of the

PLATE 182.

BOBEA HOOKERI Hbd.
Ahakea.
Flowering and fruiting branch pinned against trunk of tree. Growing on the lava fields Auahi, southern slopes of Mt. Haleakala, Maui.

true *B. elatior,* with smaller leaves, and fruits with only two pyrenae. The whole aspect of the tree is different from the true *B. elatior* occurring 1000 feet higher.

Hillebrand enumerates a variety *β. brevipes,* and gives the length of the peduncles at 3 lines or 6 mm; in a foot note, however, he states: "the single flowers are on a peduncle of 12 to 20 lines or 24 to 40 mm.

On the Island of Molokai in various districts, as in Wailau Valley, Mapuleho, and Kaluaha occurs a species of Bobea which at first glance would appear to be *B. elatior.* However, the flowers are single and usually with 11 pyrenae. The tree is entirely glabrous in all parts. It may be Gray's *B. brevipes,* but his description: "*pedunculis brevibus unifloris?*" would speak against it, and therefore the writer would suggest the name: *Bobea elatior* Gaud. var. *Molokaiensis* Rock var. nov. The type is 7028 in the College of Hawaii Herbarium. Collected flowering and fruiting Wailau Valley, Molokai, April, 1910. It is a small tree about 20 to 25 feet in height with a slender straight trunk.

On the Island of Kauai the writer observed several trees of Bobea, one occurring in the mountains of Halemanu in the dense forest, a rather large tree with a broad round crown. It is known to the natives as *Akupa.* Its leaves are ovate, bluntly acute, or obtuse or rounded at both ends and are on petioles of 4 mm, or even subsessile, the branchlets, petioles and leaves are hirtulose with whitish hair. As the tree was neither in flower nor in fruit its diagnosis is uncertain; it will probably prove to be a new species of Bobea when complete material is at hand.

On the lower mountain slopes back of Makaweli, Kauai, occur a few small trees which may be referred to Hillebrand's *Bobea Mannii,* though all peduncles, which are rather short, drooping and hirsute, are single flowered and would therefore come under Gray's *B. brevipes.* There is however some doubt in the writer's mind in regard to the specific value of *Bobea Mannii* which, with the exception of the three flowered inflorescence, agrees well with Gray's *B. brevipes.* Until the type material can be examined, these questions cannot be definitely settled.

Bobea Hookeri Hbd.

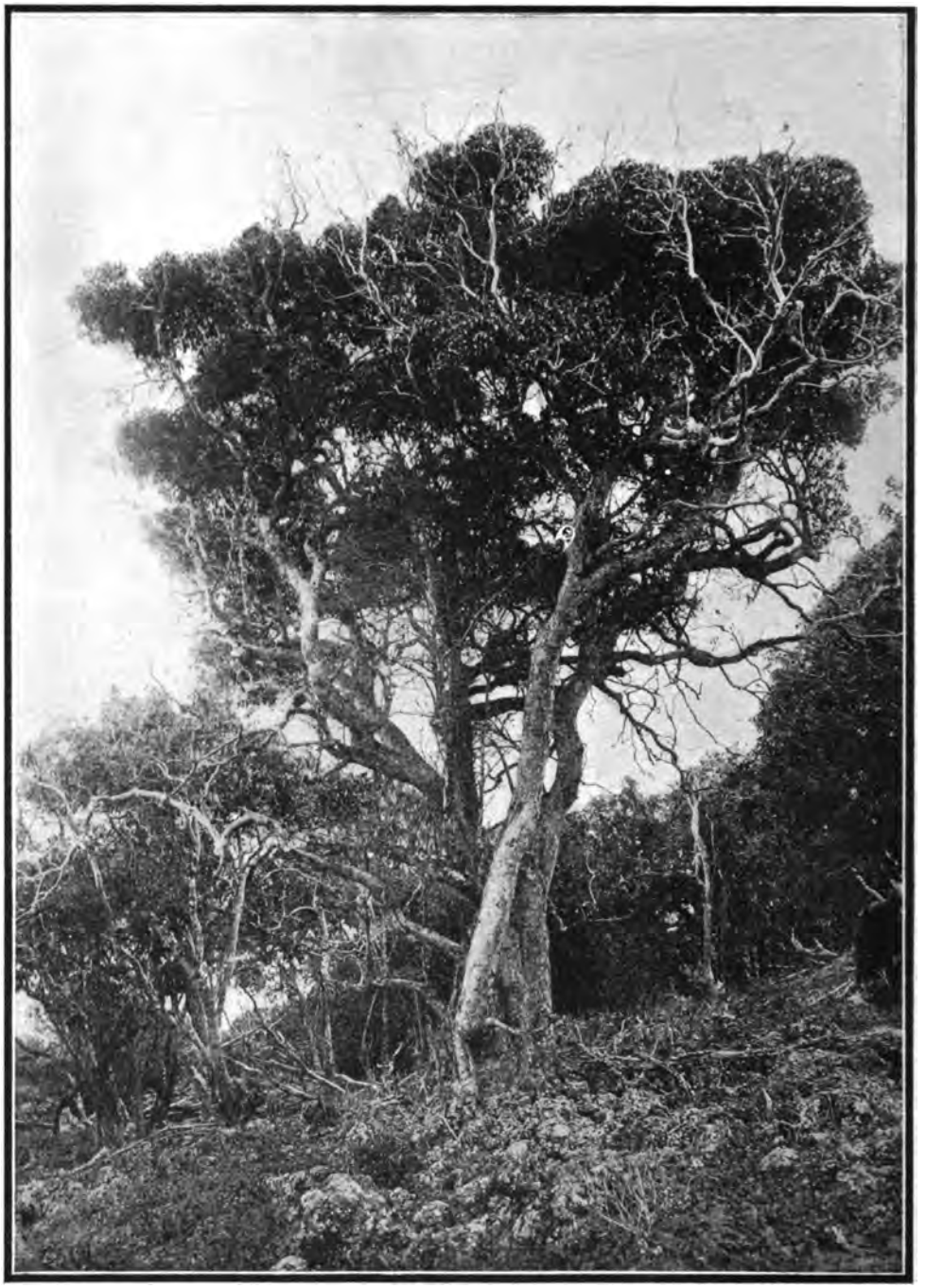
Ahakea.

(Plates 181, 182, 183.)

BOBEA HOOKERI Hbd. Flora Haw. Isl. (1888) 175;—K. Schum. in Engl. et Prantl Pflzfam. IV. 4. (1891) 96.—**Rhytidotus sandwicensis** Hook. f. Icon. Plant. (1870) tab. 1071;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 192.

Branches and branchlets terete, the latter nodose, stipules triangular puberulous, 4 mm; leaves ovate, slightly and irregularly crenulate, or with a transparent wavy margin, acuminate, 6 to 9 cm long, 3 to 5 cm wide, chartacous, with pellucid veins, dark green above, lighter underneath, with reddish midrib and petioles, the latter 6 to 12 mm, pubescent, as are the young leaves; flowers single, usually axillary or in the axils of fallen leaves, on peduncles of 1 mm to 2.5 cm and even slightly longer; calyx-tube 3 mm, pubescent, with 4 many-nerved ovate-oblong lobes of 4 to 5 mm, reticulately veined; corolla tube

PLATE 183.



BOBEA HOOKERI Hbd.
Ahakea Tree.
Growing on the *aa* lava fields of Auahi, southern slopes of Mt. Haleakala, Maui; elevation 3000 feet.

cylindrical, silky pubescent, 5 mm, the lobes one-third as long, with a patch of yellowish hair underneath each lobe; anthers linear, slightly exserted, sessile; style densely tomentose, protruding, divided into 4 to 6 filiform stigmatic branches, which are erect and not spreading; fruits globose, 8 to 12 mm, purplish, with a gray pubescence, pyrenae 4 to 6, crowned by the calyx lobes.

This species differs very little from *Bobea sandwicensis* Hbd. Its outward appearance, color of leaves, and branching habit, are exactly the same in both species. When neither in flower nor fruit it would be absolutely impossible to separate the two species. The only difference is that in the species in question the flowers are single and the fruits have from 4 to 6 pyrenae, while in *Bobea sandwicensis* the inflorescence is cymose but usually of only 3 flowers, and with fruits of 2 pyrenae; otherwise the trees could not be distinguished.

Bobea Hookeri Hbd. was collected by the writer on Molokai in the open dry gulches below Mr. G. P. Cooke's residence, Kauluwai, at an elevation of 2000 feet, only a single tree was observed, (no. 6177 flowering and fruiting March 26, 1910). It also grows on the lava fields of Auahi, district of Kahikinui, southern slopes of Mt. Haleakala, Maui; there the writer met with a single tree with a large trunk vested in a gray large-scaly bark, (see plates 182 and 183); it had three main trunks each of a foot or more in diameter. It is associated with *Alectryon macrococcus, Tetraplasandra meiandra* var., Pittosporum, *Dracaena aurea,* and others. It is one of the rarest trees in the territory. Hillebrand records it from Oahu, from the valleys of Wailupe and Makaleha, but it was never met with by the writer on Oahu.

Bobea sandwicensis Hbd.

Ahakea.

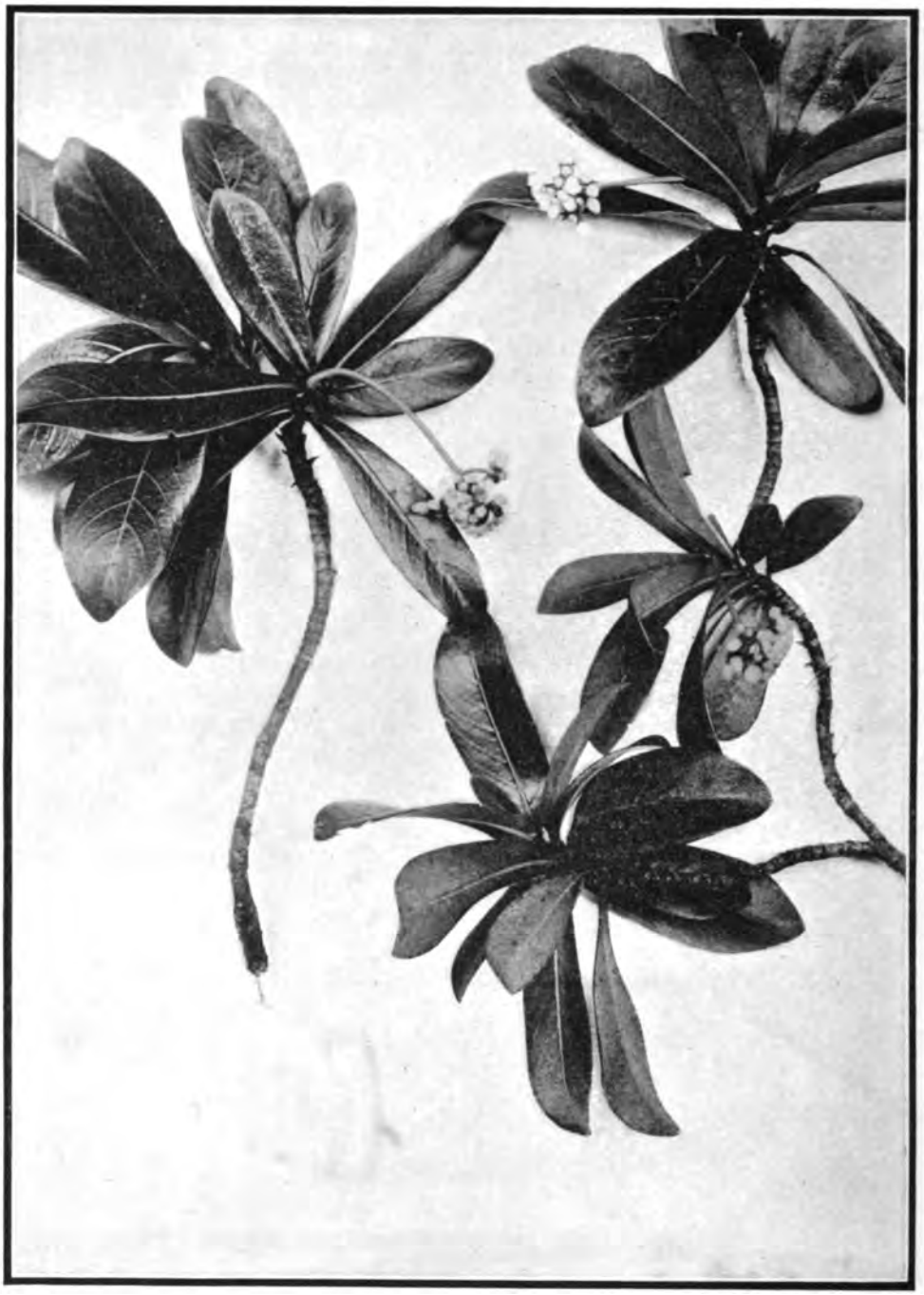
BOBEA SANDWICENSIS Hbd. Fl. Haw. Isl. (1888) 174;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 193.—**Chomelia ? sandwicensis** Gray in Proc. Am. Acad. IV. (1860) 38.—**Guettardella sandwicensis** H. Mann Proc. Am. Acad. VII. (1867) 170.

Branchlets pubescent, leaves as in *Bobea Hookeri* but pubescent underneath and puberulous above; inflorescence cymose, 3 flowered in the writer's material, 3 to 7 flowered according to Hillebrand, peduncle tomentose about 10 mm, the lateral flowers sessile, calyx and corolla silky tomentose, yellowish-green; bracteoles 1 mm; calyx as in *Bobea Hookeri,* the lobes larger; tube of corolla cylindrical, 8 mm, anthers exserted, style in all the writer's specimens only 1.5 mm long and slightly bifid, exserted or quite short according to Hillebrand; drupe globose 5 mm in diameter, blackish, with a gray pubescence, with two bony pyrenae.

The writer collected this species on the Island of Lanai on the dry open slopes below Koele, and near the edge of the Mauna Lei canyon. It is quite numerous and grows in company with *Sideroxylon spathulatum, Gardenia Brighami, Chrysophyllum polynesicum,* and others.

It is a medium sized tree about 20 to 25 feet in height, has a short trunk (about 4 feet), but a large round and spreading crown, and is very freely branching. (Flowering and fruiting July 26, 1910. Rock and Hammond, no. 8038.)

PLATE 184.



STRAUSSIA KADUANA Gray.
Kopiko kea.
Flowering branches; reduced; typical Oahu specimen.

Hillebrand records it from West Maui, Molokai and Lanai; it is known to the writer only from the latter island. The size of calyx and corolla varies considerably in this species; the larger flowers being an indication of dimorphism.

Bobea timonioides Hbd.
Ahakea.

BOBEA TIMONIOIDES Hbd. Fl. Haw. Isl. (1888) 174;—K. Schum, in Engl. et Prantl Pflzfam. IV. 4. (1891) 96.—**Obbea timonioides** Hook. f. Icon. plant. (1870) tab. 1070 et Gen. Plant. II. (1873) 102;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 193.—**Chomelia?** sp. Wawra in Flora (1874) 330.

A small tree with the ultimate branches slender and straggling, pubescent and ciliate on the deep cicatrices of the fallen stipules; leaves pale, ovate to ovate-lanceolate, sometimes falcate, on petioles of 8 to 12 mm, acuminate, chartaceous, glabrous or slightly puberulous on the nerves underneath; stipules triangular, acute pubescent; cymes many, tomentose, 3 to 7-flowered, the common peduncle 8 to 12 mm, the lateral flowers on pedicels of 2 to 4 mm; bractlets minute; calyx and corolla densely tomentose, the former turbinate, with the free limb cup-shaped, and 4-toothed; tube of corolla 6 to 8 mm, the obovate lobes 1/3 shorter; anthers sessile, above the middle of the tube, elongate, included or the tips exserted; disc conical, hairy; style thick, pubescent, about ½ the length of the corolla, deeply bifid into 2 pointed branches; ovary 2-celled, the single seed suspended from a short and broad funis.

Hillebrand records this tree from South Kona, Hawaii, and Kawaihaeiuka of the same island. This tree is not known to the writer, but is undoubtedly very close to *B. sandwicensis* from which it seems only to differ in the toothed calyx and one seeded fruits. These last three species may form in reality only a very variable species.

STRAUSSIA A. Gray.

Flowers hermaphrodite. Calyx cup-shaped, persistent, 4 to 5 toothed or truncate. Corolla short funnel-shaped with glabrous tube, sparingly pubescent at the throat. Stamens inserted at the throat, half exserted; anthers basifixed, with thickened connective. Ovary 2-celled; style short with two branches. Fruit convex.—Trees with coriaceous, obovate, obtuse, or acute leaves, and interpetiolar broad rather obtuse stipules. Flowers small, white, in peduncled, terminal cormybose cymes.

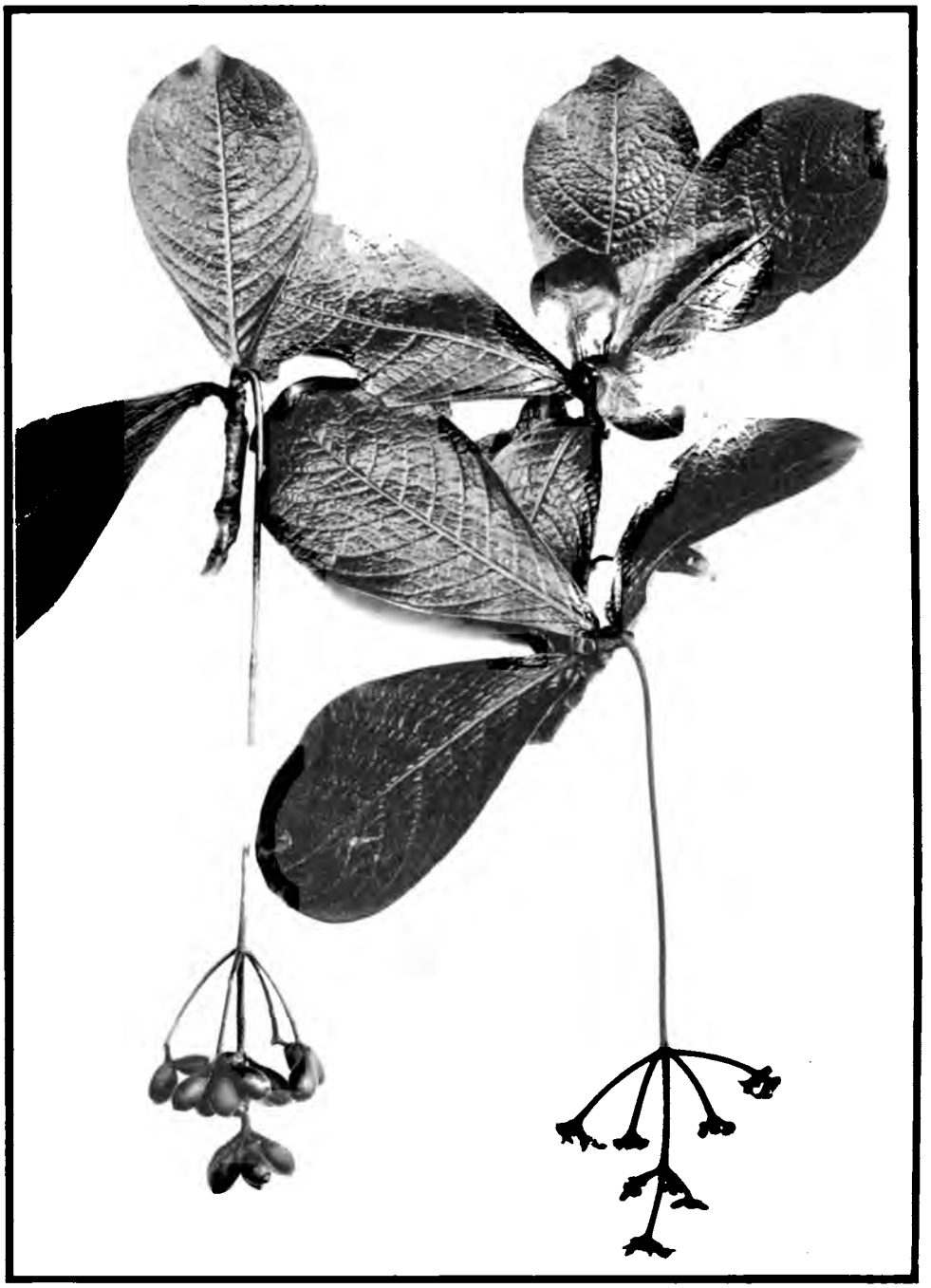
The genus Straussia consists of 7 species, all of which are peculiar to the Hawaiian Islands. Heller's two new species, *St. psychotrioides* and *St. pubiflora*, described in the Minnesota Botanical Studies Bull. IX. (1897) 904 & 905, are not very distinct species and will undoubtedly be referred to *St. Kaduana*.

The genus is not found at higher elevation than 4500 feet, but descends somewhat lower than 1000 feet. To the five species originally known the writer has added two new ones; a third new one was described by H. Léveillé.

KEY TO THE SPECIES.

Leaves on short petioles of 2 to 12 mm.
- Leaves obovate-oblong, obtuse, panicle long drooping..... **St. Kaduana**
- Leaves cuneate, subsessile, prominently nerved, panicles 25 cm long. **St. longissima**
- Leaves obovate-suborbicular pubescent, panicle short pubescent..... **St. oncocarpa**
- Leaves ovate acute or suborbicular glabrous, small, subsessile..... **St. Fauriei**

PLATE 185.



STRAUSSIA LONGISSIMA Rock sp. nov.
Flowering and fruiting branch, less than one-half natural size.

Leaves on petioles of 12 to 45 mm.
Leaves obovate-elliptical oblong, acuminate, pubescent underneath... **St. leptocarpa**
Leaves acute at both ends, obovate-oblong, panicle erect..... **St. Mariniana**
Leaves large, oblong, rounded at both ends, pubescent underneath... **St. Hillebrandii**
Leaves large, obovate with cuneate base, glabrous..... **St. hawaiiensis**

Straussia kaduana (Cham. et Schlecht.) Gray.

Kopiko kea.

(Plate 184.)

STRAUSSIA KADUANA (Cham. et Schlecht.) Gray in Proc. Am. Acad. IV. (1860) 43;—H. Mann in Proc. Am. Acad. VII. (1867) 170;—Wawra in Flora (1874) 321;—Hbd. Fl. Haw. Isl. (1888) 179;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 197;—K. Schum. in Engl. et Prantl Pflzfam. IV. 4. (1891) 112;—Heller in Minnes. Bot. Stud. IX. (1897) 903.—**Coffea kaduana** Cham. in Linnaea IV. (1829) 33;—DC. Prodr. IV. (1830) 502;—Hook. et Arn. Bot. Beech. (1832) 86;—Endl. Fl. Suds. (1836) 176 no. 1297.—**Apionaema obovatum** et **penduliflorum** Nutt. in Herb. Kew. (Hbd.).

Leaves obovate or obovate oblong, 5 to 10 cm long, 3 to 5 cm wide, on short petioles of 4 to 12 mm or even sessile, rounded or shortly acuminate, cuneate toward the base, chartaceous to coriaceous, with nerves prominent or little prominent, glabrate or puberulous underneath, turning black when dry; stipules short 4 to 6 mm, broadly triangular; panicle 4 to 12.5 cm long, erect or nodding, puberulous or glabrate, with only 1 or 2 approximate whorls of rays toward the end of a long peduncle; calyx 1 mm, the limb denticulate; corolla about 4 mm, naked at the throat, its 4 to 6 lobes generally longer than the tube, often 2 to 3 times as long; drupe obovoid or top-shaped, almost quadrangular, with a broad, flat disc, 10 to 14 mm long, and about 8 mm broad near the top.

This is a very variable species and occurs mainly in the mountains of the Island of Oahu, where it is quite common. The flowers, which are very small and white, are arranged on rather long drooping panicles; the drupes are yellow and resemble a coffee-drupe. It is a medium sized or small tree of 15 to 20 feet in height, and is often quite stunted and shrubby when growing on the crests of mountain ridges. It occurs on Lanai on the Mahana ridge (no. 8044) in company with *Pittosporum confertiflorum*, Xanthoxylum, Gouldia, *Tetraplasandra meiandra*, and others.

The wood being whitish, it is called *Kopiko kea* by the natives. Hillebrand records is also from Molokai; he enumerates two varieties which are here included in the species. A very interesting new species was found by the writer when in company with Mr. G. P. Wilder, in Nuuanu Valley, Oahu, and is described as follows.

Straussia longissima Rock sp. nov.

(Plate 185.)

Leaves obovate-oblong, acute at the apex or rounded, strictly cuneate at the base, sessile or on petioles of 2 m, 2 to 15 cm long, 4 to 8 cm wide, light green above and glabrous, with prominent strong nerves and midrib, which, like the whole underside of the leaves, are covered with a rufous pubescence; stipules broadly triangular to oblong, acute; panicles exceedingly long up to 25 cm, pendulous, the common peduncle up to 18 cm long, the shortest 10 cm. with three whorls, each of four rays, the whole inflorescence including peduncle rufous pubescent; calyx limb truncate to dentate, pubescent, corolla small 2.5 mm, white, naked at the throat, the 4 lobes as long as the tube, glabrous; drupe obovoid to oblong 12 to 14 mm long, 6 mm wide, with a small conical disc, not ribbed.

This exceedingly interesting Straussia, with decidedly specific characters, is a tree 12 to 20 feet high with ascending branches and is remarkable for the very long pendulous panicles, the longest in the genus. It is restricted as far as known to Nuuanu Valley in one of the small side gulches of Konahuanui, along a small streambed at a thousand feet elevation. It is associated with *Charpentiera obovata, Hibiscus Arnottianus, Perrottettia sandwicensis,* Cyrtandra and others.

It was collected when in company with Mr. Gerrit P. Wilder, flowering and fruiting May, 1912. The type is No. 10200 in the College of Hawaii Herbarium.

Straussia oncocarpa Hbd.
Kopiko.

STRAUSSIA ONCOCARPA Hbd. Flora Haw. Isl. (1888) 180;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 197.

Leaves obovate or suborbicular 5 to 7.5 cm long, 3.75 cm wide, on petioles of 4 to 12 mm, rounded at both ends, subcoriaceous, pubescent underneath, the costal glands hidden under the hairs; stipules triangular, obtuse 3 to 4 mm; panicle short, 2.5 to 5 cm long, bearing one whorl of short rays, rusty-pubescent, as are also the calyx and corolla; calyx distinctly dentate; corolla naked at the throat, its tube 4 mm; the lobes as long; drupe obovoid, 4-ribbed, tumid at the base, 12 mm long, 8 mm wide, with a small disc.

Hillebrand records this species from Ulupalakua, Maui, only. The writer collected the typical *St. oncocarpa* on the Island of Lanai, (nos. 8024 and 8025) at the head of Waiakiola gulch, at an elevation of 2800 feet. It is a tall tree 40 to 50 feet in height. The leaves are on slender petioles of little over 2.5 cm, about twice as long as in Hillebrand's specimens. On East Maui specimens were collected of this species which answer the original description in every detail with the exception that some of the leaves are subcordate at the base and strongly nerved (no. 8540); this latter tree occurs in the open drier gulches back of Makawao and is only about 25 feet tall. In the same locality occurs a tree which must be referred to the same species, the leaves are larger, pale green the panicle is 1 to 2 whorled, otherwise as in the species.

Hillebrand's var. β. the writer collected on Kauai at Kaholuamano, probably the type locality (no. 1935) fruiting, March 3-10, 1909. The panicles are shorter, less than 2.5 cm and contracted; the leaves are obovate-oblong and rounded, though cuneate at the base.

Var. **subcordata** Rock var. nov.

Leaves as in the species, but thin chartaceous, glabrous on both sides and subcordate at the base, on very short petioles; panicles of 3 whorls, pubescent, slender, 12 cm long including the peduncle, which measures often more than 7 cm; calyx-limb dentate; corolla lobes half the length of the tube.

This variety occurs at the Wailau pali on the Island of Molokai, at an elevation of 4000 feet. It is a small tree 25 feet in height. Collected April, 1910, flowering, no. 7072 in the College of Hawaii Herbarium.

Var. **scoriacea** Rock var. nov.

Branches light gray, terete and striate. Leaves suborbicular, shining, coriaceous, pubescent along the prominent nerves and midrib, on petioles of 2 to 2.5 cm; the flat glands triangular and very conspicuous in the axils of the nerves; panicles of 1 to 2 whorls, rather short, 2.5 to 3 cm, densely tomentose, with a dirty yellowish-gray tomentum; calyx and corolla pubescent, the former truncate; drupes angled, obovate, rather small, 7 mm, pubescent.

As the name implies, this variety occurs on the scoria or *aa* lava fields of Manuka in Kau on the southern slopes of Mauna Loa, Hawaii. It is a small tree 15 feet in height and grows in company with *Nototrichium sandwicense, Santalum Freycinetianum, Osteomeles anthyllidifolia*, and others. Collected July, 1911, flowering and fruiting. The type is no. 10201 in the College of Hawaii Herbarium.

Straussia Fauriei Lévl.
Kopiko.

STRAUSSIA FAURIEI Lévl. in Fedde Repert. X. 10/14 (1911) 155.

Branches stout; leaves obovate or suborbicular, 3 to 7.5 cm long, 2 to 6 cm wide, rounded or acute at the apex, somewhat contracted at the base, slightly subcordate, subsessile or on petioles of 1 mm, reddish to bronze-colored when dry, glabrate, with strong prominent nerves; panicles erect, short, rusty tomentose, peduncle 15 to 25 mm; calyx limb truncate or wavy, corolla lobes twice the length of the tube, puberulous, slightly bearded at the throat; the drupe is obovate, crowned by the calycine limb and a small conical disc which is not protruding.

This marked species is a small tree 10 feet or little more in height and occurs on Oahu as well as on Lanai on the crests of the mountain ridges exposed to the wind and cold and therefore appears stunted. The species was first discovered by the writer in the Punaluu Mts., Oahu, on Aug. 23rd, 1908 (no. 25), was again collected on December 3, 1908 (no. 634); and also on the Island of Lanai (no. 8047) on the top of the ridges leading to the summit Lanaihale. In the Lanai specimens the leaves are 3x2 cm, while the Oahu specimens have larger leaves. The panicles are usually one-whorled. Collected also by Abbé Faurie (no. 400) at Nuuanu pali, December, 1909.

Straussia leptocarpa Hbd.
Kopiko.

STRAUSSIA LEPTOCARPA Hbd. Fl. Haw. Isl. (1888) 180;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 197;—K. Schum. in Engl. et Prantl Pflzfam. IV. 4. (1891) 112.

Leaves obovate or elliptical oblong, 10 to 12.5 cm long, acuminate, contracted below triangular, obtuse, 3 mm; panicle furfuraceous-pubescent, erect, short, with 2 to 3 whorls, the peduncle about 2.5 cm; calyx and corolla puberulous in the bud, the latter four to six-lobed, with faint hairs at the throat, the lobes scarcely longer than the tube; stamens 4 to 6; ovary semi-superior; drupe slender, ellipsoidal or fusiform, 12 mm long and 4 mm broad at the middle, the conical apex or disc projecting beyond the calycine limb.

Hillebrand records this species as a shrub from East Maui, woods of Pumelei. The writer collected specimens from apparently this species from West Maui, and also East Maui, in open gulches above Makawao, where it is a small tree

PLATE 186.

STRAUSSIA HAWAIIENSIS Gray.
Kopiko.
Flowering and fruiting branch, less than one-half natural size.

15 to 20 feet in height. Hillebrand's description, which is cited above, answers very well to the writer's specimens. It may be remarked that *St. leptocarpa* and *St. oncocarpa* come very close to each other, as the number of whorls in the panicle and dentate calyx limb cannot always be relied upon as constant characters. The writer has observed subtruncate and decidedly dentate calyx limbs on a single panicle. In the writer's specimens (no. 8541) from Makawao, Maui, the peduncles are from 4.5 to 5 cm long, and glabrate, while the leaves are on petioles of 12 to 20 mm. Specimens from West Maui, above Kaanapali, (no. 8167) come much closer to *St. leptocarpa* than no. 8541, though the leaves are much smaller (4 to 5 cm) than the description calls for; the panicles are smaller, and pubescent, the peduncle is exactly 2.5 cm or 1 inch. The species is peculiar to the open dry forehills of West and East Maui.

Straussia Mariniana (Cham. et Schlecht.) Gray.

Kopiko.

STRAUSSIA MARINIANA (Cham. et Schlecht.) Gray in Proc. Am. Acad. IV. (1860) 43;—Mann in Proc. Am. Acad. VII. (1867) 170;—Hbd. Fl. Haw. Isl. (1888) 179;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 197;—Heller in Minnes. Bot. Stud. Bull. IX. (1897) 904.—**Coffea Mariniana** Cham. in Linnaea IV. (1829) 35;—DC. Prodr. IV. (1830) 86;—Endl. Fl. Suds. (1836) 176. no. 1298.—**Apionema sulcatum** Nuttal in Herb. Kew, teste Hillebrand.

Leaves obovate-oblong, or elliptical-lanceolate, acute at both ends or the apex bluntly acuminate, 10 to 15 cm long, 5 to 6.5 cm wide, on petioles of 12 to 15 mm, chartaceous to coriaceous, glabrate underneath, and dark green, with rather prominent reddish rib and nerves; stipules obovate from a broad base, somewhat obtuse, 6 to 12 mm long; panicles glabrous, erect, 5 to 8 cm (impossible to be 4 lines=8 mm, according to Hillebrand) in the writer's specimens, including a peduncle of about 3 to 3.5 cm; calyx truncate; corolla with a pilose patch at the base of each lobe; the lobes scarcely longer than the tube; drupe as in *Straussia kaduana.*

This species, which is distinguished from *Straussia kaduana* mainly in the bearded corolla, and the more or less elliptical-lanceolate leaves, which are acute at both ends and twice as long petioled as in the latter species, occurs on Oahu, Maui, and Kauai. On the latter island the writer collected it in the forests above Makaweli at an elevation of 3000 feet (no. 5833) and also in the woods of Kaholuamano, though from this locality the leaves have pubescent glands in the axils of the nerves, (no. 5352). An apparent variety with oblong leaves was collected at Kaholuamano, Kauai, in Sept., 1909, (no. 5346); the panicles in this variety are slightly pubescent, but the throat of the corolla appears to be naked. As it is a very variable species no exact limits of either *Straussia kaduana* or *St. Mariniana* can be set. It would perhaps be best to unite both into one species.

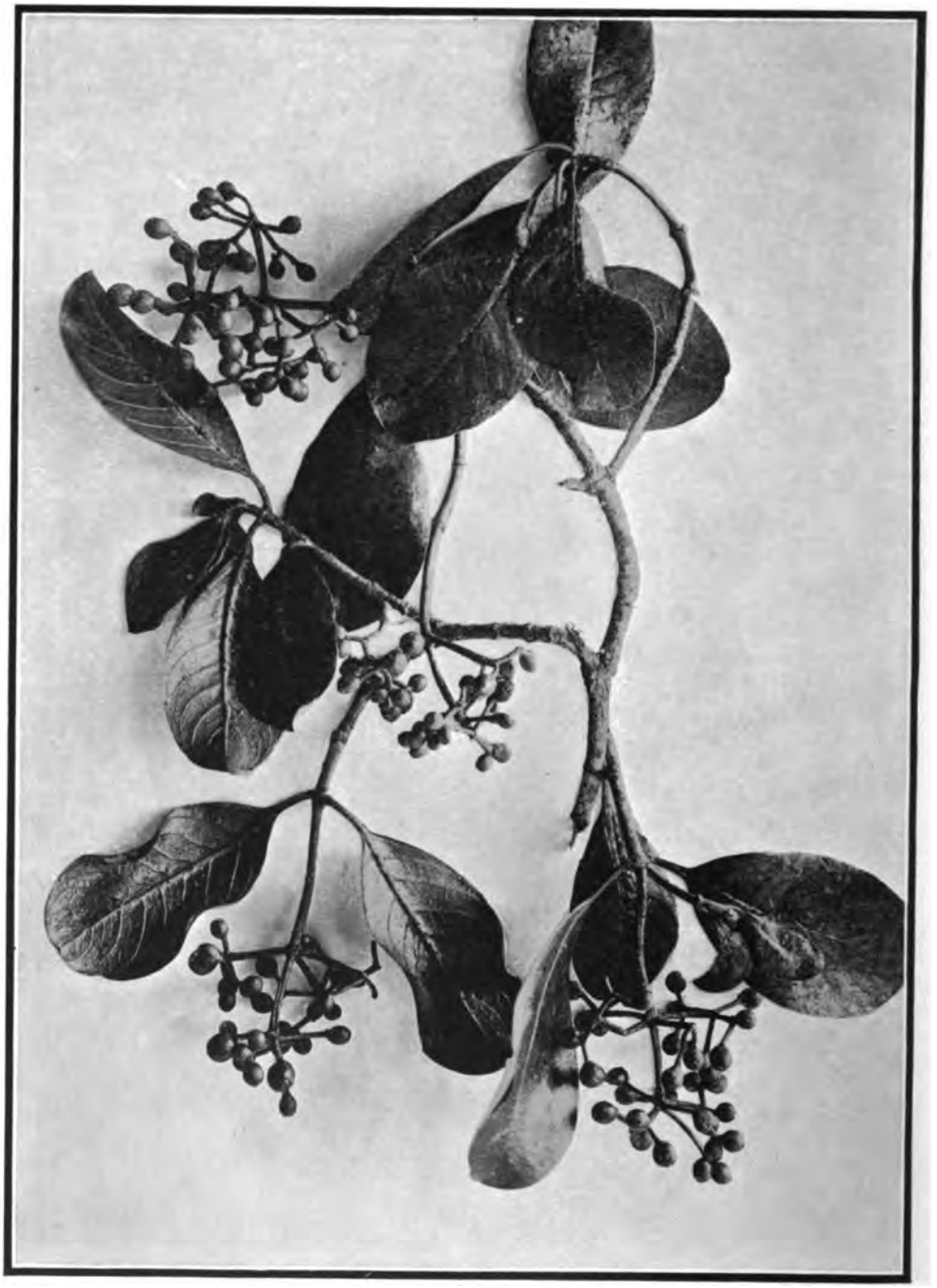
Straussia hawaiiensis Gray.

Kopiko ula.

(Plate 186.)

STRAUSSIA HAWAIIENSIS Gray in Proc. Am. Acad. IV. (1860) 43;—H. Mann Proc. Am. Acad. VII. (1867) 170;—Hbd. Fl. Haw. Isl. (1888) 180;—Del Cast. Ill. Fl. Ins Mar. Pacif. VI. (1890) 196.

PLATE 187.



STRAUSSIA HILLEBRANDII Rock sp. nov.
Kopiko.
Fruiting branch, about one-third natural size.

Leaves thick, chartaceous, with stout nerves, obovate 10 to 18 cm long, 5.5 to 8.5 cm wide, petioles of 1.5 to 3 cm, somewhat rounded at the apex or bluntly acute, obovate oblong, contracting or cuneate toward the base, glabrous, except on the flat glands in the axils of the nerves, which are usually large and pubescent; midrib impressed above, reddish underneath, stipules triangular, obtuse, 6 mm; peduncles from 16 mm to 8 cm long, whole length of panicle 16 cm or even more, panicle wide and spreading, often 12 cm in diameter, of 3 to 4 whorls, of usually 3 rays, whole inflorescence covered with a rufous pubescence, calyx truncate; corolla 3 to 4 mm, the 4.5 lobes as long as the tube or little longer each with a patch of hairlets at the base; drupe obovoid, small, 6 mm or less, crowned by the truncate limb of the calyx.

This species, which is a tree 20 to 35 feet tall, occurs in the forests of South Kona, Hawaii, on the slopes of Mauna Loa, especially in the more uniform forests above the lava fields of Kapua at an elevation of 3000 feet; the trunk is about one foot in diameter and vested in a smooth black bark. It is associated with *Metrosideros polymorpha, Myoporum sandwicense, Xylosma Hillebrandii, Clermontia coerulea,* and others. Hillebrand's description of the tree is not quite correct: he says: "panicles as in No. 2," *(Straussia Mariniana).* This latter species however has panicles only 4 lines long according to his description, while *St. hawaiiensis* has exceedingly large panicles. Gray's description of this species is too vague to permit a certain diagnosis. However the plant figured (plate 186) is none other than *St. hawaiiensis* and was collected in the type locality. The leaves are over 18 cm long, and the panicles 16 cm long, including the peduncle, while on the same tree some panicles are only 3 cm long, but none are 8 mm as stated by Hillebrand. Collected flowering and fruiting Feb., 1912, (no. 10028). The flat circular glands in the axils of veins, are well brought out in the accompanying plate (plate 186).

Straussia Hillebrandii Rock sp. nov.

Kopiko.

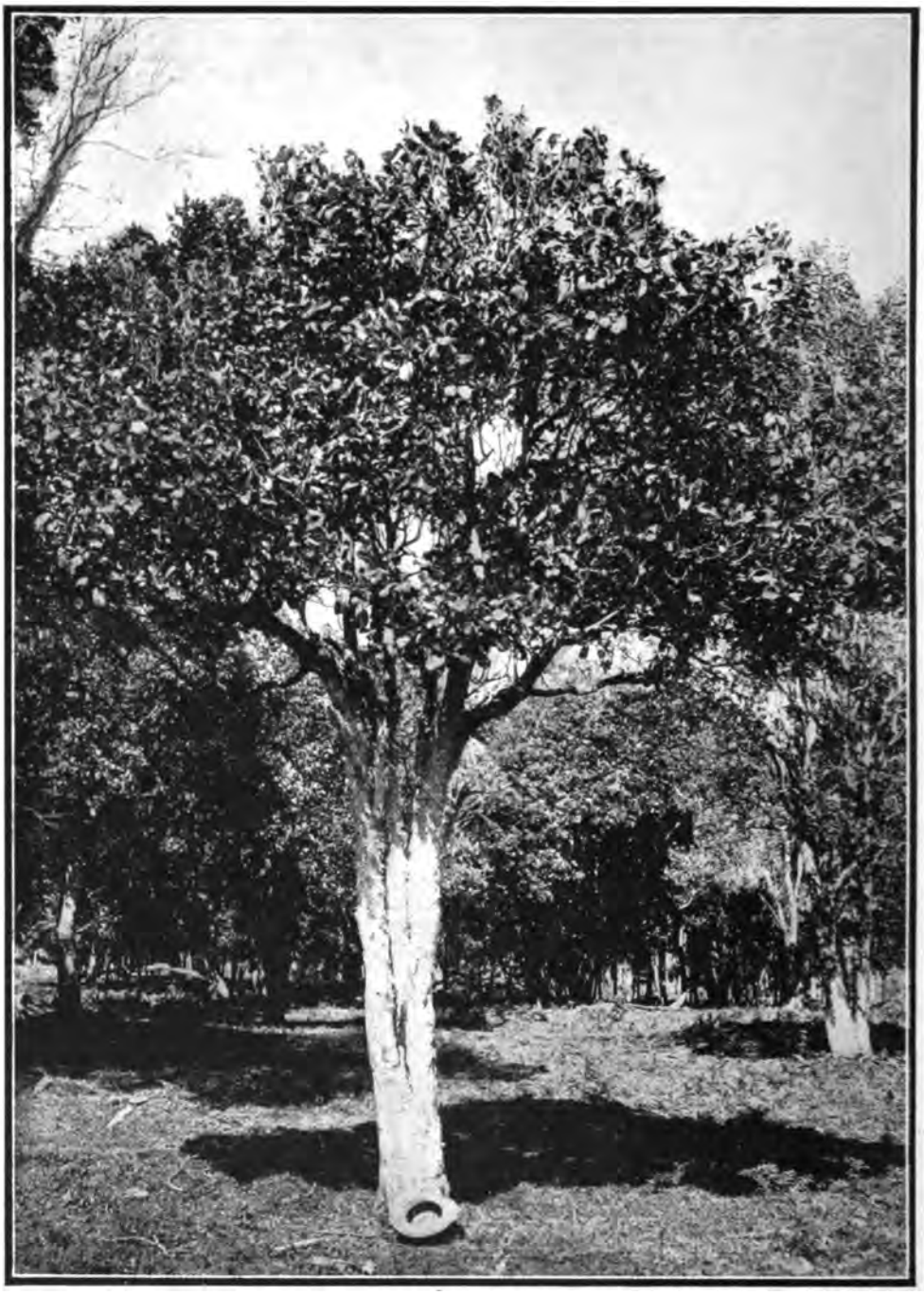
(Plates 187 and 188.)

Leaves obovate oblong, rounded at both ends, or cuneate at the base, chartaceous to coriaceous, glabrous and dark green above, but with a scattered rufus pubescence underneath, especially on the very prominent reddish midrib and nerves, whose axils are entirely destitute of glands, so conspicuous in *St. hawaiiensis*, 10 to 15 cm long, 6 to 9 cm wide, on petioles of 10 to 45 mm; stipules ovate-oblong, acute, 12 mm long; panicles stout, rusty pubescent, large and open, 12 to 16 cm long, 7 to 10 cm wide, erect or drooping, with 3 whorls, each with 4 to 6 rays which in turn branch dichotomously, the free peduncles 6 to 10 cm long; calyx dentate to subtruncate, subglabrous; corolla 3 mm, the 4 lobes longer than the tube, puberulous inside, anthers partly exserted, style exserted, with two long clavate stigmatic branches; drupe small, obovoid, 6 mm, crowned by the minute dentate calyx-limb.

This new species of *Kopiko,* named in memory of Dr. W. Hillebrand, occurs on the Island of Hawaii, on the slopes of Mauna Loa, only 3 miles from the volcano of Kilauea in the famous Kipuka Puaulu, which has already furnished a number of new species and even a new genus.

The species comes close to *Straussia hawaiiensis* in one way and in the other to *St. oncocarpa.* Hillebrand, in a foot note under *St. Hawaiiensis* says: "A specimen, probably from the Kohala range, has the leaves rounded at the base

PLATE 188.



STRAUSSIA HILLEBRANDII Rock.
A new **Kopiko** tree.
Growing in the Kipuka Puaulu, Kilauea, Hawaii.

and pubescent underneath along the nerves, which are almost destitute of glands; the panicle is also pubescent and inclined."

This seems to apply very much to the species in question, but it is really quite distinct from *St. Hawaiiensis,* in the leaves, fruits and dentate calyx-lobes, besides in the whole aspect of the tree, which is much smaller (see plate 188). Collected flowering and fruiting in the above mentioned locality, April, 1911, and July, 1911, type no. 8779 in the College of Hawaii Herbarium.

The species also occurs on the Parker ranch, Hawaii, and in the forests of Paauhau, Hamakua, Hawaii.

Var. **Molokaiensis** Rock var. nov.

Leaves as in the species, chartaceous, quite large; panicles slender, drooping, pubescent, about 10 cm long, including the 6 cm long peduncle; calyx-limb dentate; corolla as in the species; drupe oblong, larger than in the species.

The panicles of this variety are not so open and wide, but rather close and of only 1 to 2 whorls. It occurs in the rain forests of Molokai, especially at Kaluaha on the leeward side. It was collected flowering and fruiting April, 1910, the type is no. 7085 in the College of Hawaii Herbarium.

PSYCHOTRIA Linn.

Flowers hermaphrodite. Calyx short, 5 to 6 toothed. Corolla funnel-shaped, tubular or campanulate. Stamens inserted in the throat, partly exserted. Ovary 2- (rarely 3-5) celled. Fruit 2 to 5 seeded.—Shrubs or trees, rarely herbs. Leaves whorled or opposite, stipules interpetiolar. Flowers in terminal cymose corymbs, rarely axillary, white in the Hawaiian species.

The genus Psychotria consists of about 350 species or more. It is distributed over tropical Africa, the Malayan archipelago, East India, Brazil; it also occurs in China, but is not known from Japan. In the Hawaiian Islands three species are found of which two, *P. grandiflora* and *P. hirta,* are peculiar to Kauai, while the third, *P. hexandra,* occurs on Oahu and Kauai but on none of the other islands of the group. The genus occurs also in Fiji and other Pacific Islands.

KEY TO THE SPECIES.

Flowers in a trichotomous corymbose cyme.
- Leaves acute at both ends, glabrous..... **P. hexandra**
- Leaves obovate, cuneate, pubescent underneath..... **P. hirta**

Flowers large in a panicle with verticillate rays..... **P. grandiflora**

Psychotria hexandra Mann.

PSYCHOTRIA HEXANDRA Mann in Proc. Am. Ac. VII. (1867) 170;—Wawra in Flora (1874) 328;—Hbd. Fl. Haw. Isl. (1888) 181;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 198;—Heller Pl. Haw. Isl. (1897) 902.

Branches quadrangular, compressed; leaves obovate or obovate-oblong, 7.5 to 15 cm long, 2.5 to 3.5 cm wide, on petioles of 6 to 25 mm, shortly and abruptly acuminate, cuneate at the base, membraneous, pale and glabrous underneath; stipules one on each side, broad, oblong, 8 to 12 mm long, caducous, leaving a fringe of hairlets in the axils; flowers in a terminal semi-erect, corymbose, glabrous cyme of not more than 5 to 6 cm, the peduncle 12 to 25 m; bracteoles below the calyx ovate, acute 4 to 2 mm; calyx 6 mm, with 6 toothlets;

PLATE 189.

PSYCHOTRIA HEXANDRA Mann.
Fruiting branch, little more than one-half natural size. From the mountains behind Honolulu, Oahu.

corolla waxy white, funnel shaped, villous at the throat, 6-lobed; anthers subsessile at the throat, acute, little exserted; style slightly exserted, the short lobes dilated; drupe 12 mm crowned with the calycine limb; pyrenae with 3 ridges at the back.

This species, for which there is no native name as far as can be ascertained, was originally discovered on Kauai. It was however found by the writer on the Island of Oahu, in the forests of the Koolau range. It is a small tree 15 to 20 feet in height and occurs along the Manoa cliff trail back of Honolulu, as well as in the forest of Punaluu, on the windward side of Oahu. The flowers of this species are white and much larger than those of Straussia *(Kopiko)*.

On Kauai in the mountains of Kaholuamano and Halemanu occur two other species, one of them a small tree, first described by Wawra as a variety *hirta* of the above species, but raised since to specific rank by Heller and now known as *Psychotria hirta* (Wawra) Heller. It differs from *P. hexandra* in the leaves, which are obovate cuneate at the base and pubescent underneath; the calyx teeth are also shorter. The third species, *Psychotria grandiflora* Mann, is a shrub and was collected by the writer in the swampy forests of Halemanu near Alakai swamp. It is the handsomest species, as it has the largest flowers, which are pure white to cream colored on long drooping panicles. Hillebrand records it as a tree, but it was observed by the writer only as a shrub.

COPROSMA Forst.

Flowers unisexual, dioecious in all Hawaiian species. Calyx cup-shaped, truncate or more or less toothed or lobed, larger in the female flowers than in the male. Corolla funnel-shaped or campanulate 4 to 9 lobed, lobes in the female flowers often reflexed. Stamens 4 to 9 inserted at the base of the corolla-tube, exserted. Ovary 2, very rarely 4-celled; style divided to the base, pubescent. Drupe ovate or globose, fleshy.—Prostrate or erect shrubs or trees with opposite or rarely verticillate leaves, entire or dentate stipules. Flowers white or greenish, quite inconspicuous, single or in few flowered cymes, terminal or axillary.

The genus Coprosma, which consists of about 45 to 50 species, of which the majority are found in New Zealand, has quite a number of species in the Hawaiian Islands. So far 15 species have been found in these islands, of which 4 were described lately,—two by the present writer in this volume and two by H. Léveillé in Fedde repertorium *(C. Fauriei* and *C. parvifolia)*. The latter was first collected by the writer on West Maui, while Faurie's specimen came from Molokai. *C. Fauriei* is not a good species and is referable to *C. Kauaiensis* (Gray) Heller. A few species occur in the Fiji and Norfolk Islands, 8 in Australia, 1 in the Malay Peninsula, and 1 or 2 in Chile.

None of the Hawaiian species has a foetid odor, as the generic name would imply.

KEY TO THE SPECIES.

Leaves opposite.
- Flowers sessile on short axillary spurs..... **C. montana**
- Flowers raised on distinct peduncles.....
  - Drupes beaked with the long tubular limb of the calyx.
    - Flowers 3-5-6, subsessile at the end of a short peduncle. **C. rhynchocarpa**
    - Flowers single or in racemes, pedicellate..... **C. Vontempskyi**

PLATE 190.

COPROSMA RHYNCHOCARPA Gray.
Pilo.
Fruiting branch, less than one-half natural size.

Drupes crowned by the calycine teeth.
Flowers 2-3, sessile at the end of a short peduncle..... **C. Grayana**
Flowers 2 on axillary peduncles of 5 mm, drupes largest of all Hawaiian species . . . . **C. Waimeae**
Drupes naked at the apex.
Flowers numerous, crowded on short peduncles..... **C. pubens**
Flowers 3, sessile on a peduncle of 2 cm..... **C. Kauaiensis**
Leaves ternate.
Flowers many, crowded at the ends of long peduncles..... **C. longifolia**

Coprosma montana Hbd.

Pilo.

COPROSMA MONTANA Hbd. Fl. Haw. Isl. (1888) 185;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 201;—K. Schum. in Engl. et Prantl Pflzfam. IV. 4. (1891) 132.—**C. Menziesii** var. γ Gray in Proc. Am. Acad. IV. (1860) 49;—Wawra in Flora (1874) 326.

A small tree 5 to 6 m in height, with stiff, stout ascending branches, densely foliose, covered with stipules below and more or less pubescent; leaves obovate or spathulate, 18 to 25 mm long, 10 to 12 mm wide, penninerved, bluntly acuminate or rounded, the base contracting into a margined petiole, thick coriaceous, shining; stipules broad triangular, ciliate at the upper border; flowers axillary, sessile on very short and thick spurs; female flowers: calyx 2 mm, urceolate, the limb denticulate; corolla 4 mm, deeply 5 to 6 parted, with reflexed lobes; styles 6 mm; drupe yellow or reddish, ovoid, 6 to 8 mm, tipped with the short calycine limb.

This species, which is occasionally a shrub of 3 to 4 feet and often even prostrate as recorded by Hillebrand, is also a small tree 15 to 18 feet in height, especially on Mauna Kea, Hawaii, at an elevation of 10000 feet, above the crater of Kaluamakani and on Papalekoki as well as Moano and Nau, where it grows in company with arborescent compositae such as *Raillardia struthioloides, R. arborea,* as well as with the leguminous tree, *Sophora chrysophylla,* the *Mamani* of the natives. It is decidedly a high mountain species, as it grows to a small tree on Mt. Haleakala on Maui, on the crater of Puunianiau in company with *Mamani* and *Santalum Haleakalae,* a species of sandalwood peculiar to that mountain. On Mt. Hualalai, Hawaii, 8000 feet, it is a shrub 4 feet high and grows with *Dodonaea viscosa.* The leaves are thick glabrous but almost succulent in all locations.

Two varieties β and γ occur in the high mountain swamps of Puukukui, West Maui, and Waialeale, Kauai, respectively. The varieties are prostrate, but occasionally shrubby.

Coprosma rhynchocarpa Gray.

Pilo.

(Plate 190.)

COPROSMA RHYNCHOCARPA Gray in Proc. Am. Acad. IV. (1860) 48;—Mann Proc. Am. Acad. VII. (1867) 169;—Wawra in Flora (1874) 325;—Hbd. Fl. Haw. Isl. (1888) 187;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 201.

Leaves elliptical or obovately oblong, 4 to 7 cm long, 15 to 25 mm wide, on petioles of 6 to 18 mm, acuminate at both ends, chartaceous, papillose to pubescent or sparsely hispid underneath; stipules 5 to 7 mm, a loose funnel-shaped sheath, the free portions triangular,

PLATE 191.

COPROSMA VONTEMPSKYI Rock sp. nov.
Pilo tree.
Growing in the forests about Olinda, slopes of Mt. Haleakala, Maui; elevation 4000 feet.

the upper border ciliate with pale fawn-colored hair as is the base, and thus resembling *C. stephanocarpa*; flowers 3-5-6, subsessile at the end of a short peduncle of 4 to 6 mm; the bracts 2 to 3 mm; male flowers sometimes racemose; calyx minute; corolla 4 mm long, 6 to 8 lobed; female flowers: calyx 6 mm, the limb twice as long as the adnate portion and equalling the corolla, constricted below, tubular or funnel-shaped, with 5 to 6 small teeth; styles 6 mm; drupe yellowish red, globose or ovoid, 6 to 8 mm, crowned with the long, beak-like limb of the calyx.

The species occurs as a tree of 15 to 20 feet or so in height with a trunk of a foot in diameter on the upper slopes of Mt. Hualalai, at Hinakapauula, elevation 6000 feet. It however descends as low as 4000 feet. Nearly every trunk of these trees, which are very numerous at the above locality, is rotten, though the outward appearance of the tree is healthy; the trunks are without bark and full of holes, and are entirely hollow being inhabited by thousands of sow-bugs, *(Philoscia angusticauda)*. It is also common at Paauhau, 3000 feet elevation on Parker ranch, Hawaii, and was also collected by the writer on the slopes of Mauna Loa in the upper part of the rain forest of Kau above Naalehu and Waiohinu, 5000 feet elevation. Specimens from this latter locality differ somewhat from those of Hualalai in that the calycine limb is only half the length of that occurring on Hualalai and Paauhau.

Coprosma Vontempskyi Rock sp. nov.

Pilo.

(Plate 191.)

A small tree with rather slender branches, which are terete; leaves membraneous, ovate or linear oblong, acuminate at both ends, pubescent above and underneath especially along the midrib, 3.5 to 5.5 cm long, 14 to 20 mm wide, on a somewhat margined pubescent petiole of about 10 mm; stipules thin, 2 mm, sheathing, acute, pubescent, with slightly ciliolate margins, flowers unknown; drupes single or in racemes of 2.5 cm length on pedicels of 3 mm, when single the peduncle measures 5 mm, with foliaceous bracts of 6 mm length; drupe ovoid, 6 mm long, 4 mm wide, crowned by the calycine, dentate limb of 3 to 4 mm.

This interesting species seems to be an intermediate between *C. cymosa* and *C. rhynchocarpa*. It has the typical, though somewhat shorter, calycine limb of the latter species, and the inflorescence of the former. In general habit it is however quite different, as well as in many other respects. It occurs in the rain forest above and below Olinda on Maui, on the slopes of Mt. Haleakala, where it was collected by the writer in September, 1910. It is named after the writer's friend, Mr. L. v. Tempsky, the manager of Haleakala ranch, to whom he is greatly indebted for often extended hospitality and without whose aid the exploration of Mt. Haleakala could not have been accomplished in such a satisfactory way.

The type is 8529 in the College of Hawaii Herbarium.

Coprosma Grayana Rock sp. nov.

(Plate 192.)

Branches pale terete, glabrous, leaves opposite, elliptical-oblong, acute or bluntly acuminate at both ends, midrib and veins prominent, dark green, dull, lighter underneath,

PLATE 192.

COPROSMA GRAYANA Rock sp. nov.
Pilo.
Fruiting branch, one-half natural size.

chartaceous, glabrous on both sides, 8 to 12 cm long, 3 to 4 cm wide; on petioles of 3 to 4 cm; stipules broad sheathing, thin, 8 mm high, slightly broad, ciliate at the upper border; flowers 2 to 3, sessile at the end of a short axillary peduncle of 2 to 5 mm; bracts 2.5 mm; (flower buds only known) calyx urceolate, very short dentate; corolla about 4 mm; drupes oblong-ellipsoidal bright red, usually single, 12 mm long, crowned by the calycine teeth; seeds whitish, rounded at the apex, acute at the base, oblong.

This new species, which is a tree 20 feet or more high, with a trunk of several inches in diameter was discovered by the writer in the forests of Naalehu, Kau, Hawaii, in the tropical rain forest situated on the southern slopes of Mauna Loa at an elevation of 3000 feet. The bark of this tree is fawn-colored and corky, the sap-wood yellow like that of the *Noni (Morinda citrifolia)*, the heart-wood is blackish; when cut into an exceedingly large amount of sap squirts out in all directions, having a very peculiar oily odor. The wood is quite close grained and comparatively hard. It was collected in flower buds and fruit on January 9, 1912. The type is no. 10005 in the College of Hawaii Herbarium.

Coprosma pubens Gray.

Pilo.

COPROSMA PUBENS Gray in Proc. Am. Acad. IV. (1860) 49;—Mann Proc. Am. Acad. VII. (1867) 169;—Wawra in Flora (1874) 324;—Hbd. Fl. Haw. Isl. (1888) 188;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 201.

Leaves lanceolate or obovate-oblong, 5 to 12.5 cm long, 2.5 to 3.5 cm wide, on petioles of 10 to 20 mm, acuminate, narrowing at the base, chartaceous glabrous, or pubescent at higher elevations, dark when dry; stipules 4 to 8 mm, loosely sheathing on half their length, the free portions triangular, strigose-pubescent; flowers numerous, glomerate at the apex of short peduncles; male flowers: calyx 2 mm, corolla 6 to 8 mm long, 6 to 7 lobed; female flowers: calyx 2 to 4 mm, cylindrical, the very short limb dentate; corolla 4 mm; styles 18 to 16 mm; drupes reddish, ovoid or ellipsoidal, 8 to 12 mm long, naked at the top, the pointed apex projecting beyond the calycine scar.

This species, often a shrub, was however observed only as a small tree 15 to 18 feet in height. It occurs only in the rain forests and is quite common in the mountains of Kohala, Hawaii, where the writer collected it, as well as in the valleys of Waipio, Puakalehua, Waimanu, etc. According to Hillebrand it occurs on all the islands of the group, but the typical *C. pubens* was collected only on Hawaii by the writer. It is distinguished from the other species of Coprosma in the numerous flowers, which are glomerate at the end of a short peduncle, and the narrow ellipsoidal fruit.

Coprosma kauaiensis (Gray) Heller.

Koi.

COPROSMA KAUAIENSIS (Gray) Heller Pl. Haw. Isl. (1897) 894.—**Coprosma pubens** var. **Kauaiensis** Gray in Proc. Am. Acad. IV. (1860) 49;—Wawra in Flora (1874) 323.—**C. stephanocarpa** β. var. **Kauaiensis** Hbd. Fl. Haw. Isl. (1888) 187;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 201.

Leaves obovate-oblong, or ovate, bluntly acute at both ends, 6.5 cm to 3 cm, dull green, pubescent underneath, on petioles of 4 to 8 mm; peduncle naked about 2 cm long with 3 sessile flowers at the apex, supported by spathular bracts of 3 mm; calyx of female flower urceolate 3 to 4 mm with 5 to 6 lanceolate lobules; drupe small obovate, very obtuse

PLATE 193.

COPROSMA LONGIFOLIA Gray.
Pilo.
Fruiting branch, about one-half natural size.

The *Koi* is a tree 15 to 20 feet in height with a trunk of a few inches in diameter. It is like the *Olena* peculiar to the Island of Kauai, where it occurs in the forests of Kaholuamano. The name *Pilo,* by which all other Hawaiian Coprosmas are known on the other islands, is applied on Kauai to a species of Pelea and to one of Platydesma.

Coprosma Waimeae Wawra.

Olena.

COPROSMA WAIMEAE Wawra in Flora (1874) 327;—Heller Pl. Haw. Isl. (1897) 895.—**C. foliosa** Hbd. Fl. Haw. Isl. (1888) 186, in part

Leaves elliptical-oblong, acuminate at both ends or shortly acute, on petioles of 5 mm, glabrous; stipules broadly triangular or ovate and long or caudately acuminate; drupes orange colored, largest of all Hawaiian species, ovate, 12x8 mm, crowned by the calycine teeth.

This species, which Hillebrand incorrectly referred to *C. foliosa,* is certainly distinct from all the other Hawaiian species, and as Wawra remarked in a footnote, has the largest fruits of all Hawaiian Coprosmas. It is a small tree and occurs in the forests of Halemanu and Kaholuamano, Kauai, above Kekaha and Waimea at an elevation of 3600-4000 feet.

The native name, *Olena,* meaning yellow, is derived from the yellow color of the wood.

Coprosma longifolia Gray.

Pilo.

(Plate 193.)

COPROSMA LONGIFOLIA Gray in Proc. Am. Acad. IV. (1860) 48;—Mann Proc. Am. Acad. VII. (1867) 169;—Wawra in Flora (1874) 324;—Hbd. Fl. Haw. Isl. (1888) 188;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI (1890) 200;—Heller Pl. Haw. Isl. (1897) 895.

Leaves ternate, elliptico-oblong or lanceolate of even breadth in their greatest length, 6.5 to 10 cm long, 1.5 to 2.5 cm wide, on petioles of 12 to 18 mm, acute at both ends, chartaceous, stipules thin 6 to 12 mm, connate; flowers 6 to 15, glomerate at the end of axillary peduncles of 6 to 10 mm; bracts 6 mm, sometimes foliaceous; male flowers: calyx 2 mm, 5 to 8 toothed, corolla 6 to 8 mm, with 5 to 8 lobes; stamens long exserted 12 to 16 mm; female flowers: calyx urceolate, 4 mm, corolla 4 mm, with revolute lobes; styles 8 to 12 mm; drupes ellipsoidal 6 to 8 mm long, reddish, tipped with the short calycine teeth.

On the lower slopes of Mt. Konahuanui, Oahu, at an elevation of 2500 feet or higher, this very distinct species occurs as a tree 15 feet or more high with a short trunk of several inches in diameter. It is quite striking in its appearance, especially during the early winter months when the tree is loaded with the bright reddish drupes or fruits, contrasted with the graceful foliage. According to Hillebrand the species occurs on Kauai, besides Oahu, but was only seen on the latter island by the writer, where it is plentiful on the whole Koolau mountain range.

PLATE 194.

MORINDA CITRIFOLIA Linn.
Noni.
Flowering and fruiting branch, one-half natural size.

MORINDA Linn.

Calyx cup-shaped truncate or toothed. Corolla salver-shaped to campanulate. Stamens inserted in throat of the tube, included or exserted. Ovary 4-celled; style with two branches. Drupes or berries united into one fleshy fruit. Seeds obovoid or reniform.—Trees or shrubs (occasionally climbing and epiphytic but not in Hawaii) with opposite leaves, and interpetiolar stipules, connate with the petioles. Flowers in globose heads, on axillary, terminal single or clustered peduncles.

The genus consists of about 46 species distributed over both hemispheres, but especially in the old world and the Pacific islands. Only two species occur in Hawaii, one of which is endemic.

KEY TO THE SPECIES.

Leaves oblong, fruit 2.5 cm in diameter..... **M. trimera**
Leaves ovate, fruit 5 to 10 cm in diameter..... **M. citrifolia**

Morinda citrifolia Linn.

(Plate 194.)

MORINDA CITRIFOLIA Linn. Spec. Pl. ed. 1. (1753) 176;—DC. Prodr. IV. (1830) 446;—Hook. et Arn. Bot. Beech. (1832) 65;—Endl. Fl. Suds. (1836) 176;—Seem. Flora Vit. (1866) 129;—Mann Proc. Am. Ac. VII. (1867) 170;—Wawra in Flora (1874) p. ?;—Mrs. Sincl. Indig. Fl. Haw. Isl. (1885) t. 40;—Hbd. Fl. Haw. Isl. (1888) 177;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 195;—K. Schum. in Eng. et Prantl Pflzfam. IV. 4. (1891) 138;—Heller Pl. Haw. Isl. (1897) 901;—Brigham Ka Hana Kapa Mem. B. P. B. Mus. III. (1911) 144. fig. 87.

Leaves broadly ovate 15 to 20 cm long, 10 to 15 cm wide, on short petioles, somewhat obtuse, thick; stipules broad and rounded, connate into a sheath enclosing the peduncle; flowerheads on short bractless peduncles placed opposite the leaves; calycine limb short, truncate; corolla white, tubular to funnel-shaped, 5-cleft, pilose at the insertion of the sessile anthers below the middle of the corolla; syncarpium 5 to 10 cm, fleshy.

This well known cosmopolitan species, which Hillebrand believes to be of aboriginal introduction, occurs only on the lowlands in the vicinity of native dwellings, or now growing apparently wild but more correctly on overgrown forsaken native dwelling-sites. The species has an exceedingly wide distribution and is cultivated by the Polynesians as a dye-plant. It is also used medicinally by the Hawaiians and from the mature fruits they extract an oil of very unpleasant odor, used for the hair; ripe fruits are also used as a poultice. The wood is intensely yellow when fresh cut. The root yields a yellow dye while the bark furnishes a red dye. It is a small tree 15 feet in height with a trunk of usually a few inches in diameter; the leaves are large and shining and have impressed veins. The fruit when mature is foetid and of a yellow color. In Fiji the fruit is eaten either raw or cooked. The leaves are also used medicinally against diarrhoea and disturbances in menstruation, as well as for fever.

Morinda trimera Hbd.

Noni-kuahiwi.

(Plate 195.)

MORINDA TRIMERA Hbd. Fl. Haw. Isl. (1888) 177;—K. Schum. In Engl. et Prantl Pflzfam. IV. 4. (1891) 148.—**M. trinerva** Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 196, should be trimera, evidently a misprint.

Branches pale terete, covered with numerous warts and lenticels; leaves elliptical or obovate-oblong, 10 to 18 cm long, 3.5 to 6 cm wide, on petioles of 2.5 to 3.5 cm, acuminate

PLATE 195.

MORINDA TRIMERA Hbd.
Noni-kuahiwi.
Fruiting branch, from the type locality.

at both ends, chartaceous to membraneous, pubescent underneath; stipules 6 mm, acuminate; peduncles in the axils of old leaves and cauline 3.5 to 4 cm long, pluribracteate at the base; flowers 8 to 12 in a glomerule, connate with their bases; calyx 2 to 3 mm, free from the ovary, truncate, with 3-toothlets; corolla 8 mm, puberulous, tubular, 3-toothed; anthers 3, subsessile on the lower third of the corolla, included; ovary small, globose depressed, immersed in an annular disc at the bottom of the calyx; style of the length of the calyx, bifid; drupe or berry of 4 distinct woody pyrena, fleshy, adherent with and enclosed within the globose calyx, each pyrena with 1 erect seed, and the calyxes connate into a syncarpium which measures about 2.5 cm in diameter.

This exceedingly rare species was first collected by J. Lydgate in the forests of Hamakua and Waikapu, Maui. The writer's attention was called to a tree growing in the forest above Makawao, Maui, by Mr. L. v. Tempsky, who having become interested in native trees, happened to find it though practically hidden by *Kopiko* trees and *Ie-ie* vines. It turned out to be this rare species.

A large tree of this species was found by the writer along the ditch trail on the windward side of Mt. Haleakala, near Honomanu gorge. The tree is freely branching and has a trunk of over one foot in diameter. The wood is yellow.

According to Hillebrand a variety occurs on Mt. Puakea of the Waianae range, Oahu. Its leaves are thicker and obtuse; the corolla is four-toothed and possesses 4 stamens instead of three. First collected by Dr. H. Wawra.

CAMPANULACEAE.

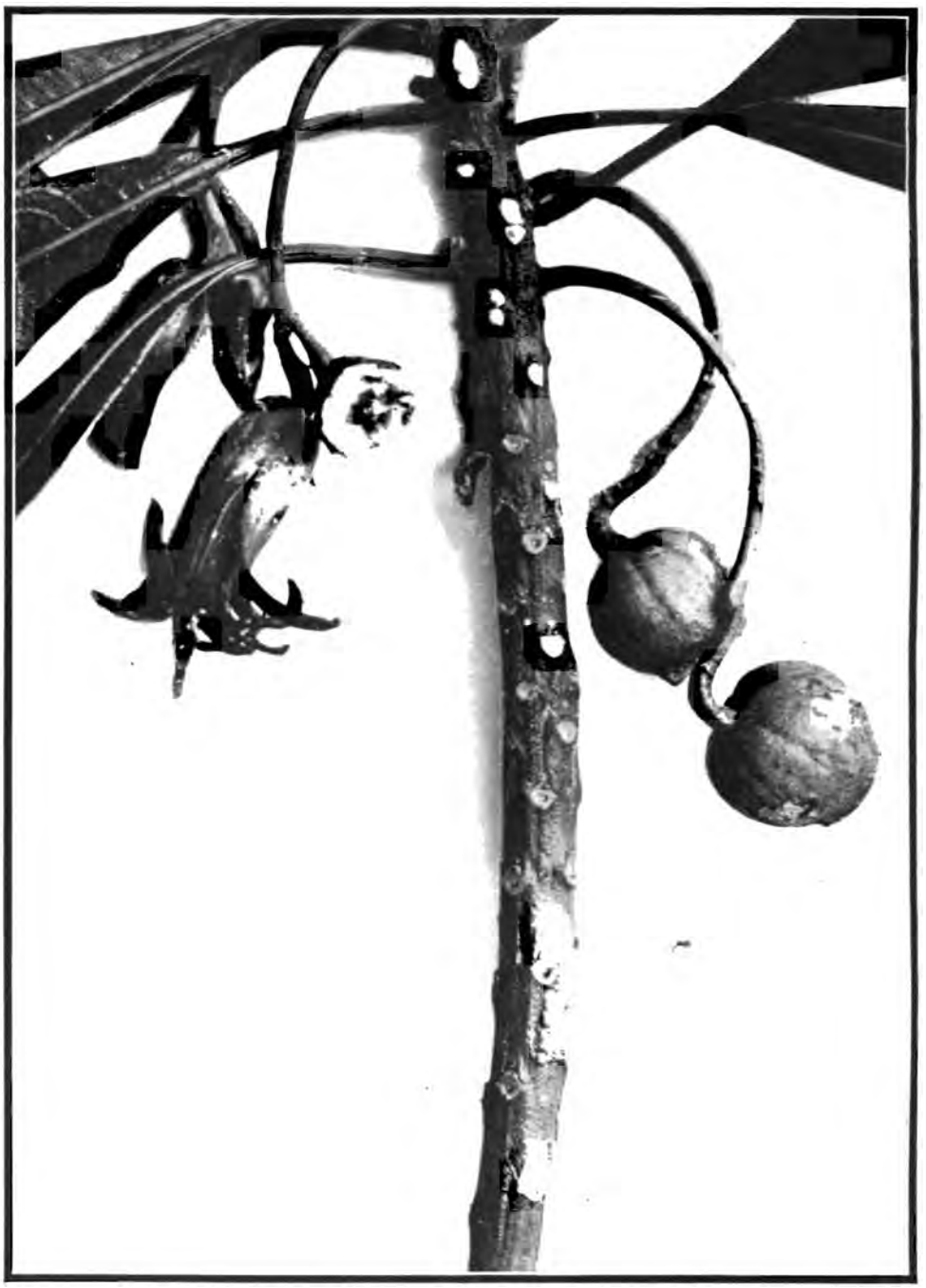
Tribe Lobelioideae.

While the family Campanulaceae numbers 59 genera, only the tribe Lobelioideae, with 22 genera, is of importance as far as Hawaii is concerned. Of this tribe, the Hawaiian Islands possesses six genera, five of which are endemic, the remaining one being the cosmopolitan genus Lobelia. Nowhere, with the exception of South America, does this tribe reach such a wonderful development as in the Hawaiian Islands. It has the largest number of species of any plant family represented here in these islands; next to it ranks the Compositae.

Many of our Lobelioideae are arborescent, some of them reaching a height of 40 feet, and are a typical feature in the forests of Hawaii. The tribe in general is mainly tropical, and reaches to the southern temperate zone. Quite a number inhabit North America, and two the Mediterranean regions. The Hawaiian Islands, with its numerous arborescent forms, ranks next to South America, which has the largest number of species, as Centropogon Presl., with 80 to 90 species, and Siphocampylus Pohl, with 100 species, especially numerous in the Andes and Brazil. But if we compare South America in size with the Hawaiian Islands, which has up to 100 species of the tribe Lobelioideae, we find that really nowhere in the world does this tribe reach such a wonderful development in such a comparatively small area. The other islands of the Pacific are void of Lobelioideae, and only Tahiti and the Society Islands, with Raiatea, have in all four species belonging to three different genera.

The Hawaiian species present sometimes really grotesque and specialized

PLATE 196.



CLERMONTIA DREPANOMORPHA, Rock.
About two-thirds natural size; showing flowers and fruits.

forms, while others again (new forms) run into each other to such an extent that it is difficult to recognize specific distinction. While most of them are shrubs or small trees, only those are included here which reach a height of about 18 to 40 feet. *Delissea undulata,* which attains a height of over 30 feet on Mauna Loa, Hawaii (see plate XVI), is here omitted, as its stem is rarely thicker than two inches.

The genus Lobelia, which is represented by five very handsome species, some reaching a height of 18 feet *(L. macrostachys* in Kau, Hawaii), possesses about 200 species, which are distributed over Africa and South America, while very few are to be found in Central America. They usually inhabit high mountains, like Abyssinia, Ruwenzori, Kenia, etc., in company with arborescent Compositae.

In the Hawaiian Islands the genus Lobelia is confined to the middle forest zone, but does occasionally ascend into the upper forest zone to an elevation of 6500 feet. (*L. hypoleuca,* Puunianiau crater, Haleakala.)

KEY TO THE GENERA.

Milky shrubs or trees with axillary inflorescences.
Berry large yellow, an inch or more in diameter:
Corolla deeply slit to the base; flowers 2-6 in simple cymes..... **Clermontia**
Berry small, occasionally large, but then purple:
Corolla slit beyond the middle, flowers in racemes..... **Cyanea**

CLERMONTIA Gaud.

Calycine lobes either as long as the corolla and then bilabiate and deciduous or shorter than the corolla, bluntly lobed or acute, free and persistent; corolla nearly unilabiate, staminal column free from the corolla; the two lower anthers penicillate, the upper ones naked; fruit a globose or pear-shaped berry with a broad epigynous disc; seeds brown shining. Shrubs or trees (with thick latex) branching candelabra like. Inflorescence a two to many flowered cyme.

The genus Clermontia, which is peculiar to Hawaii, consists of 17 species, 13 of which can be included in the term tree.

The most common of the shrubby ones is *C. macrocarpa* Gaud., which grows at an elevation of from 1000 to 2500 feet, and even higher, and is replaced in the middle forest zone by *C. persicaefolia, C. oblongifolia* on Oahu, and *C. drepanomorpha,* etc., on Hawaii. Their branching habit is always candelabra-like, and not more than 6 or 8 feet above the ground.

KEY TO THE SPECIES.

I. CLERMONTIA GENUINAE.
Calyx lobes connate, as long as the corolla; at maturity the entire tube falls with the corolla.
Peduncle two flowered.
Peduncle long filiform pendulous..... **C. grandiflora**
Peduncle arched, drooping, 1-10 cm long; fleshy, corolla dark purple **C. drepanomorpha**
Peduncle short, erect.
Corolla and calyx not or little curved when open, slender, whitish **C. persicaefolia**
Corolla and calyx strongly arched, green..... **C. oblongifolia**

PLATE 197.

CLERMONTIA PERSICAEFOLIA Gaud.
Less than half natural size.

Peduncle 20-25 mm, drooping.
Corolla long, slender, dark, purplish-black..... **C. Kohalae**
Peduncle two to four flowered.
Corolla smaller, dark, purplish; calyx green; branches slender; leaves with a purplish black tinge..... **C. leptoclada**
Corolla large, green, purplish or white, ovarian portion strongly ribbed **C. Hawaiiensis**

II. CLERMONTIOIDEAE.

Calyx lobes free, shorter than the corolla, persistent.
Peduncle short 15 mm or less.
Calyx five toothed; corolla puberulous..... **C. Gaudichaudii**
Calyx with minute acute teeth; corolla dark purplish-red... **C. Peleana**
Calyx five lobed; corolla glabrous, thick, fleshy..... **C. arborescens**
Calyx with five short obtuse lobes; corolla and calyx covered with tubercles **C. tuberculata**
Peduncle 2 cm or more in length; two to three flowered.
Corolla bluish-white or purplish-green..... **C. coerulea**
Peduncle two-six flowered; flowers whitish-green..... **C. Haleakalensis**

Clermontia grandiflora Gaud.

CLERMONTIA GRANDIFLORA Gaud. Bot. Voy. Uranie (1826) 459; pl. 73; Presl Monogr. Lobel. (1836) 48.—DC. Prodr. VII (1839) 342;—A. Gray Proc. Am. Acad. V. (1862) 150;—H. Mann Proc. Am. Acad. VII (1866) 184;—Hbd. Fl. Haw. Isl. (1888) 240;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VII. (1892) 221.—**Delissea filigera** Wawra in Flora (1873) 31;—Not Kauai, but Maui:—Wälder ober Waihee.

Leaves obovate to oblong 7 to 10 cm x 2.5 to 3 cm on petioles of 1 to 4 cm, shortly acuminate, bluntly serrulate or dentate, chartaceous glabrous dull; peduncle filiform, pendulous 2 to 8 cm long bracteate at the middle, two flowered, pedicels slender bracteolate about the middle, sometimes cymosely 4 to 5 flowered by dichotomy of pedicels; calyx glabrous greenish or purplish, thin, the lobes tubular, strongly curved before expansion 5 to 6 cm long; corolla purplish somewhat longer than the calyx, berry pear-shaped about 2 cm orange yellow.

This quite distinct species occurs on the Islands of Molokai, Lanai, and Maui, where it inhabits the rain forest from an elevation of 2000 to 5000 feet, or a little higher. It is very common on West Maui, but especially at the summit of Puu Kukui (5788 feet), at the edge of Iao valley, in company with *Lobelia Gaudichaudii*, Labordea, *Wilkesia Grayana*, etc. On Molokai it can be found in the forest above Mapulehu and along a stream back of Kamoku. It is quite conspicuous by its green, purplish-streaked corolla, which is pendulous on long filiform peduncles, which characterizes it from all the other species. It is most plentiful at 4000 feet elevation on the windward slope of Haleakala, East Maui, in the dense mossy rain forest along Waikamoi, Puohaokamoa and Honomanu gulch. On Lanai it grows in the more open dry districts at the ridge of Kaiholena valley, where it is a shrub, while in the other more shaded localities it becomes a small tree 15 to 18 feet in height.

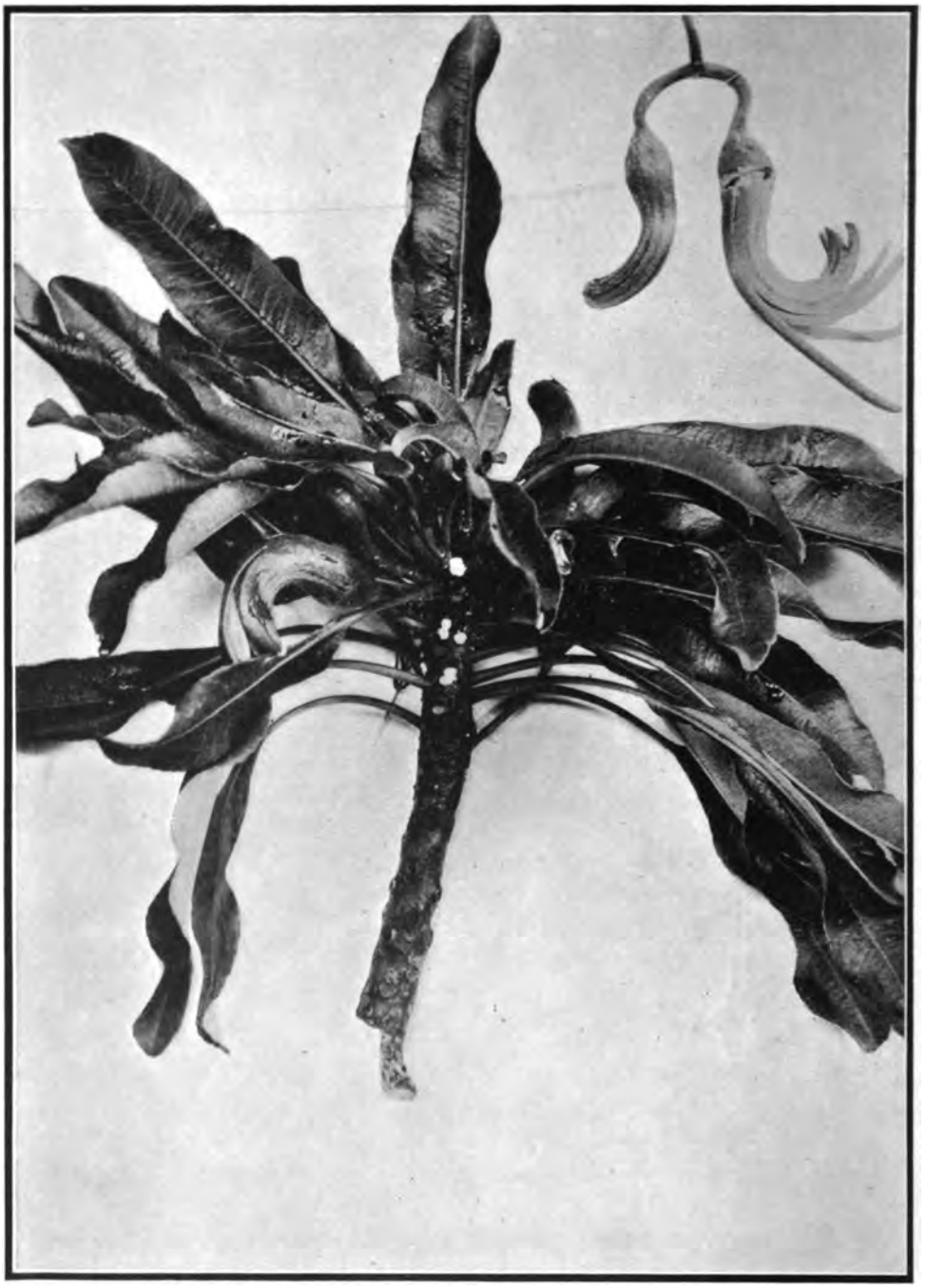
The specific name grandiflora is rather misleading, as it is by no means the largest flowering Clermontia, being exceeded by *C. drepanomorpha* and *C. arborescens.*

Clermontia drepanomorpha Rock sp. nov.

(Plate 196.)

Leaves oblong or obovate, lanceolate 10 to 18 cm x 1.5 to 4 cm glabrous above or sparsely hispid underneath along the prominent reddish midrib, dark green above, lighter

PLATE 198.



CLERMONTIA OBLONGIFOLIA Gaud.
Less than one-half natural size; showing flowers and flower buds.

underneath, on petioles of 3 to 5 cm, denticulate in the upper two-thirds with callous teeth, entire in the lower; peduncle glabrous 6 to 8 cm long with flower, 10 cm long with fruit, pedicels 2 cm, two flowered; bracts and bractlets triangular; calyx dark purplish, the ovarian portion 1.5 to 2 cm triangular to globose, the lobes as long as the corolla, the peduncles drooping, but the flowers erect; corolla purple, curved 4 to 6 cm long by 1.5 to 2 cm wide, fleshy; staminal column glabrous purplish; anthers bluish-lilac, hirsute along the sutures, the lower anthers penicillate; berry large globose yellow 3 cm in diameter; seeds yellowish-brown, smooth.

This remarkable species was discovered by the writer on the open swamp lands in the mountains of Kohala, Hawaii; also along Alakahi and Kawainui gorges at an elevation of 4000 to 5000 feet. It is a small tree 12 to 20 feet in height, and is peculiar to the boggy regions of West Hawaii, where the rainfall is enormous. It was collected flowering and fruiting in July, 1909, and again the following year during the same month on the high plateau, summit of Kohala; the type is No. 4745 in the Herbarium of the College of Hawaii.

It grows in company with several species of Pelea, Cheirodendron, Tetraplasandra, and a number of other species of Clermontia. It is remarkable for its handsome flowers, which are even larger than those of *C. arborescens.*

The birds are very fond of its very large, bright-yellow fruits, which they hollow out until only the skin remains on the stalks. This, however, is the case with most of our Lobelioideae. The trunks of this species are thickly covered with moss up to the ultimate branchlets. The wood is soft and whitish.

Clermontia persicaefolia Gaud.

(Plate 197.)

CLERMONTIA PERSICAEFOLIA Gaud. Bot. Voy. Uranie (1826) pl. 72;—DC. Prodr. VII (1839) 342;—Hbd. Fl. Haw. Isl. (1888) 241;—Del. Cast. Ill. Fl. Ins. Mar. Pacif. VII (1892) 222;—Heller Pl. Haw. Isl. (1897) 907.—**Clermontia persicifolia** Presl Monogr. Lob. (1836) 48.—**Clermontia grandiflora** var. *β* **oblongifolia** Gray, in part, Proc. Am. Acad. V. (1862) 150;—H. Mann l. c. p. 184 in part.—**Lobelia persicifolia** Endl. Fl. Suds. (1836) no. 1061.—**Clermontia parviflora** Wawra Flora (1873) 47.

Leaves lanceolate or oblong 8 to 10 cm x 1 to 2 cm acuminate or obtuse, coarsely crenate or serrulate, the base gradually contracting into a long petiole of 4 to 6 cm subcoriaceous, glossy above, glabrous and glaucous underneath; peduncles 10 to 14 mm, two flowered, with a pair of bracts below the middle; pedicels 12 to 15 mm long bibracteolate at or near the base; calyx and corolla slender almost white, with purplish tinge, greenish when young, smaller than *C. macrocarpa*; the ovarian portion is turbinate.

A handsome shrub or small tree 15 to 18 feet in height, sometimes growing on other trees. It is peculiar to the Island of Oahu, where it can be found in the rain forests of the main range, and not uncommon on the mountain Waiolani, and also near the crater in Palolo valley at an elevation of from 1300 to 2000 feet. It is much branching and has a beautiful, round, symmetrical crown; flowers in spring. It also occurs on Mt. Kaala of the Waianae range.

Wawra's *Clermontia parviflora* No. 2206 in the Herb. Museum Caes. Palat Vindob., which the writer had occasion to examine, is really Gaudichaud's *Cl. persicaefolia.*

Clermontia oblongifolia Gaud.

(Plate 198.)

CLERMONTIA OBLONGIFOLIA Gaud. Bot. Voy. Bonite (1838) 459 pl. 71;—Presl Monogr. Lob. (1836) 48;—DC. Prodr. VII (1839) 342;—Wawra in Flora (1873) 47;—Hbd. Fl. Haw. Isl. (1888) 241;—Del Cast. VII (1892) 222;—Heller Pl. Haw. Isl. (1897) 908.—**Lobelia oblongifolia** Endl. Fl. Suds. (1836) no. 1061.—**Clermontia grandiflora** var. **oblongifolia** Gray Proc. Am. Acad. V. (1862) 150 pro parte;—. Mann l. c. p. 184 pro parte.

Leaves oblong 8 to 12 cm x 3 cm obtuse or rounded, crenate or bluntly serrulate toward the apex, contracting into a long petiole of 4 to 8 cm, chartaceous pale, whitish underneath; peduncle 10 to 16 mm long, two rarely three flowered, with one or two pairs of dentiform bracts; pedicels of the same length as peduncle, with two bractlets near the base; calyx pale greenish, the lobes as long as the corolla, strongly arcuate, circa 6 cm long by 12 mm wide; berry globose not furrowed, seeds dark brown.

It is a small and handsome tree, reaching a height of about 15 to 25 feet, but is often found as a shrub in the more open country or swampy flat lands, as at the head of Pauoa valley on Oahu, to which island it was thought to be peculiar. It has since been found by the writer on Maui in Honomanu gulch, and on Molokai at Maunahui, as on the ridges of Manoa, Palolo, Niu and Waipio valleys, Oahu. Its large, very arched, green flowers are not particularly handsome.

All Clermontiae are known to the natives as *Ohawai* or *Haha*. The milky, viscous sap was employed as bird lime in the olden days by the native bird-hunter.

Var. **Mauiensis** Rock var. nov.

Leaves acuminate 15 to 19 cm long, 3.5 to 4.5 cm wide, glabrous, pale green, on shorter petioles (4 cm); peduncle 1.5 cm long 2-3 flowered, pedicels somewhat longer, bracts 4 mm, bracteoles 2 mm; calyx green; corolla purplish; staminal column and anthers dark purple, the former glabrous, the latter hirsute along the sutures.

A small tree 15 to 18 feet high, resembling very much the species on Oahu. This tree is not at all common, but can be found on the Island of Maui on the windward slopes of Mt. Haleakala along the Kailua ditch trail in the valley of Honomanu at an elevation of 2800 to 3000 feet in the rain forest. The type specimen is No. 8804 in the College of Hawaii Herbarium. Collected flowering April, 1911. The tree grows in company with *Cl. macrocarpa*, which is the most common species in that locality, and *Cl. arborescens*.

Clermontia Kohalae Rock sp. nov.

Leaves linear oblong bluntly acuminate or obtuse 7 to 16 cm long, 2 to 3 cm wide, gradually narrowing into a petiole of 2 to 4 cm, glabrous, dull, pale underneath, with impressed veins chartaceous denticulate or serrate in the upper two-thirds, entire at the base; peduncle 15 to 35 mm, two flowered, hispid or even scabrous, with two triangular bracts above the middle; pedicels as long as the peduncles bibracteolate; the ovarian portion of the calyx turbinate, green, the lobes as long as the corolla, dark blackish purple, slender, not fleshy, suberect or slightly arcuate, glabrous; corolla of the same color as the calycine lobes, glabrous; staminal column glabrous; anthers pale. hirsute along the sutures, the two lower anthers only penicillate; berry subglobose circa 2 cm in diameter; seeds pale brown smooth shining.

This species, new to science, is a small tree 15 to 18 feet in height with a trunk of a few inches in diameter, branching candelabra-like a few feet above

the ground. It was discovered by the writer in July, 1910, in the lower forests of Kohala, Hawaii, and in the gulches on the windward side, along the streams at an elevation of 1500 to 2500 feet, where it is not uncommon. It is exceedingly handsome when in flower; the numerous dark-purple corollae in the axils of the leaves give it a pleasing appearance. It flowers during the summer months. The type is No. 8810 in the Herbarium of the College of Hawaii.

This very interesting and handsome Lobelia is peculiar to Kohala, Hawaii, after which district it is named. It was also observed along the lower Kohala ditch trial when in company with Mr. Bluett.

Clermontia leptoclada Rock sp. nov.

Branches slender loosely foliose; leaves oblong acuminate at both ends 12 to 18 cm long by 2.5 to 4 cm wide, denticulate with callous teeth, dark green above, with a dark purple-bluish tinge at the margins and apex, glabrous above, coriaceous, with impressed veins, pale underneath and sparingly hispid along the veins and midrib, on petioles of 4 to 6 cm; flowers all along the slender stem on cymosely branching hirsute peduncles of 2.5 to 4 cm, which are bracteate in the upper third; pedicels two usually three to four 1.5 to 3.5 cm long, bibracteolate at the middle, the bractlets linear subulate 5 mm long; calyx, ovarian portion subglobose, the tube as long as the corolla, purplish with prominent hispid nerves; corolla slightly arcuate 4.5 cm long, lobes linear lanceolate, dark purple, hispid with white hair; staminal column purplish puberulous, the anthers hirsute along the sutures, bluish purple, the lower ones penicillate; fruit globose 2.5 cm in diameter; seeds brown smooth shining.

This species, which becomes a tree of 18 to 20 feet in height, was discovered by the writer near the summit of the Kohala mountains on Hawaii, along the Alakahi and Kawainui ditch trail at an elevation of 4200 feet, during the month of July, 1909, at which time it was found in flower and fruit. It is one of the many remarkable Lobelioideae which inhabits our high swampy plateaus. The type is No. 4760 in the Herbarium of the College of Hawaii.

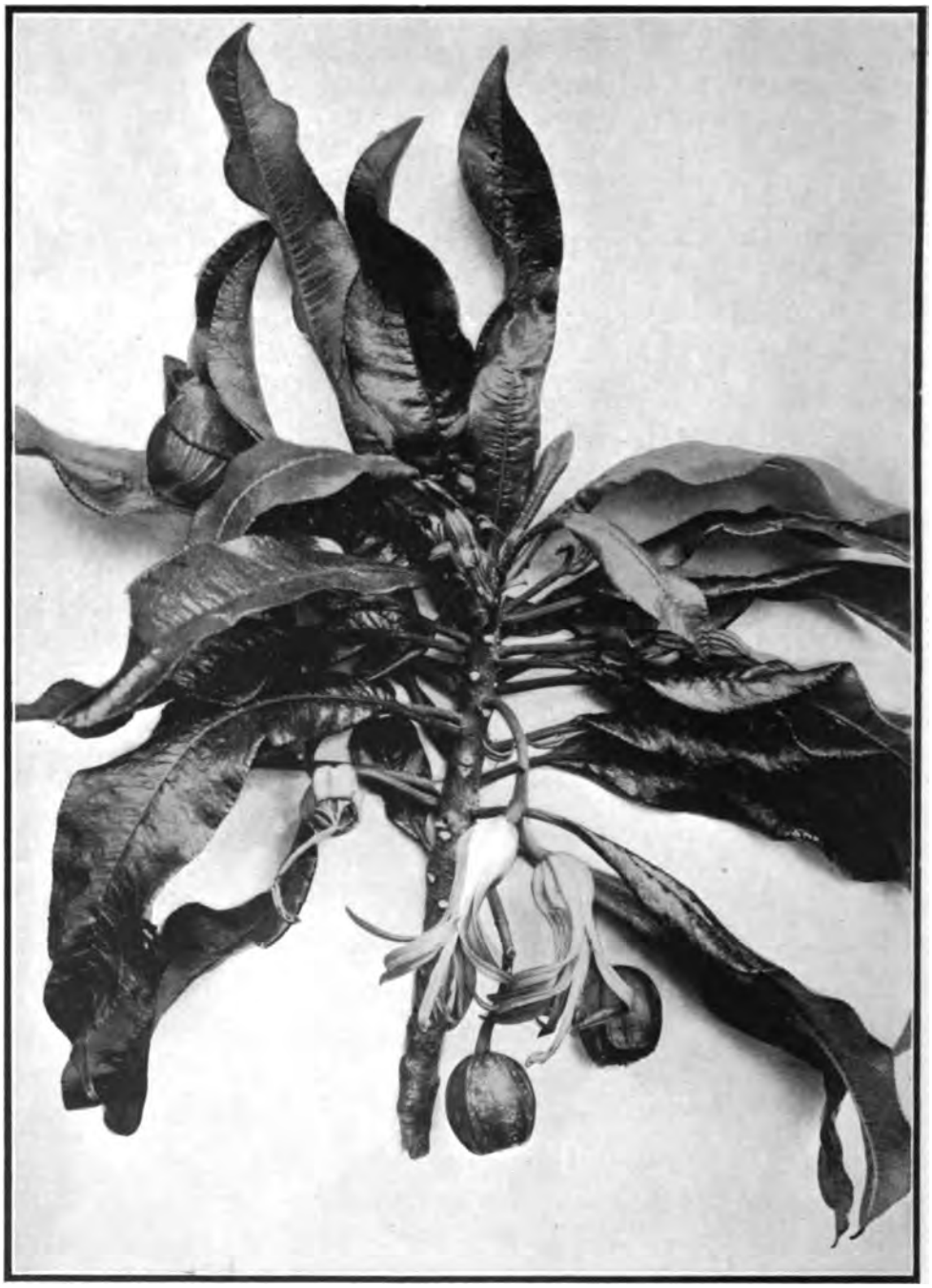
Clermontia Hawaiiensis (Hbd.) Rock.
(Plate 199.)

CLERMONTIA HAWAIIENSIS (Hbd.) Rock.—**Clermontia macrocarpa** var. **Hawaiiensis** Hbd. Fl. Haw. Isl. (1888) 241.

Leaves ovate-obovate, oblong, undulate dark green, glossy above, glabrous, lighter underneath, pubescent along the veins and midrib; the veins impressed; 15 to 22 cm long, 3 to 6 cm wide on petioles of 2.5 to 3 cm reddish; peduncles 2 to 4 flowered, 3 to 6 cm long, pedicels 2 to 4 cm long; peduncle bibracteate in the upper fourth, bracts foliaceous 2 to 3.5 cm long, linear oblong denticulate, pedicels bibracteolate at the middle and at their common base, puberulous, calyx subglobose, the ovarian portion pronouncedly 10 ridged, the dorsal one almost wing-like, the tube green or purplish 6 to 6.5 cm long, as long or even longer than the corolla; the dorsal slit extending to the base, the lateral slits beyond the middle, each lobe strongly nerved, each nerve being a continuation of a ridge of the ovarian portion of the calyx; corolla slightly arched thickened toward the apex in the bud; staminal column glabrous, green or purple, anthers pale purple or dark hirsute along the sutures or glabrous, the two lower only penicillate, berry large 3 cm in diameter. 10 ridged, orange yellow.

This shrub or small tree reaches a height of 20 or more feet. It is a very variable species; the leaves are sometimes oblong or ovate, the peduncle either very long and then twice as long as the pedicels and two-flowered, or as long as the pedicels or little longer and then four-flowered; the two inner pedicels

PLATE 199.



CLERMONTIA HAWAIIENSIS (Hbd.) Rock.
Ohawai.
Flowering and fruiting specimen from near the Volcano of Kilauea, Hawaii; elevation 4000 feet. One-half natural size.

shorter and thicker(almost four-cornered) than the two outer pedicels. In the four-flowered specimens the corolla is purple, while in the long peduncled, two-flowered specimens the corolla is either whitish or green.

This species occurs in the semi-wet forest on the land of Keauhou about three miles from the Volcano House. It becomes exceedingly plentiful as one penetrates into the interior. It usually grows on the trunks of Cibotium tree ferns or is also occasionally terrestrial. It is associated with *Acacia Koa, Metrosideros polymorpha, Perrottetia sandwicensis, Straussia* sp., *Myoporum sandwicense,* etc.

The specimens found lower down along the government road come nearer to *Cl. macrocarpa;* while the plants found back of Hilo are *Clermontia macrocarpa.* The plants found below the Volcano House and those beyond Shipman's paddock on Keauhou, cannot be very well separated, and therefore the writer found it advisable to make it a species, as the plants from the type locality can certainly not be called a variety of *Cl. macrocarpa.*

Collected April, 1911, July, 1911, and July 9, 1912, in company with Mr. W. M. Giffard. The type is No. 8803 in the College of Hawaii Herbarium.

Clermontia Gaudichaudii (Gaud.) Hbd.

Haha or *Hahaaiakamanu.*

CLERMONTIA GAUDICHAUDII (Gaud.) Hbd. Fl. Haw. Isl. (1888) 243;—Del. Cast. Ill. Fl. Ins. Mar. Pacif. VII (1892) 211.—**Delissea clermontioides** Gaud. Voy. Bon (1838) pl. 47, (1866) p. 64;—Gray Proc. Am. Acad. V (1862) 147;—H. Mann. l. c. p. 178;—Wawra in Flora (1873) 8.—**Clermontia clermontioides** Heller Pl. Haw. Isl. (1897) 906. **Clermontia Clermontioides** (Gaud.) Heller, would really be correct but owing to the silliness of the combination, Hillebrand's name is here retained.

Leaves elliptico oblong to lanceolate 8 to 12 cm x 1.5 to 4 cm on petioles of 2 to 3 cm, acute at both ends, crenulate, glabrous, pale and dull, chartaceous; peduncle short about 1 cm; pedicels 12 to 15 mm, bracts 1 mm; calyx broad campanulate about 15 mm high with 5 short acute teeth; corolla arched as much as in *C. oblongifolia,* about 4 cm long and 1 cm wide, greenish purple; anthers pale, glabrous; berry globose, furrowed, 22 to 25 mm in diameter.

This species, which is peculiar to the middle forest region of the Island of Kauai, is either a shrub or small tree, with many candelabra-like branches forming a beautiful round or flatish crown. It grows mainly along stream beds, and is plentiful along Waialae gulch (4000 feet). It also grows in the swampy high plateau in gray, muddy soil, or can often be found on other trees between their main branches in accumulated humus.

It ascends even as high as to the foot of Mt. Waialeale (4600 feet), where it grows in company with the curious *Gunnera petaloidea,* or *Apeape,* along Kaluiti and Kailiili streams.

The natives, as well as the birds, are very fond of the large, sweet, yellow berries, from which the tree receives its name, *Haha* or *Oha* being the native generic name for all Clermontiae, while *ai a ka manu* is the specific one, meaning "eaten by the birds."

PLATE 200.

CLERMONTIA PELEANA Rock sp. nov.
Flowering specimen from near Kilauea, Hawaii. More than one-half natural size.

PLATE 201.

CLERMONTIA ARBORESCENS (Mann) Hbd.
Ohawai.
Less than half natural size; showing flowering branch and fruit.

PLATE 202.

CLERMONTIA TUBERCULATA Forbes
Natural size, showing flowerbuds. Note tubercles on the inflorescence.

Campanulaceae.

Clermontia Peleana Rock sp. nov.

(Plate 200.)

Leaves oblong acuminate 18 to 20 cm long by 3.5 to 4.5 cm wide, dark green above, glossy somewhat lighter underneath, with dark purple veins and midrib, irregularly crenate to nearly the base of the leaf, which is on a petiole of 4 to 6 cm; flowers axillary usually two on a short peduncle of 1.5 cm with two small linear bracts at the middle; pedicles 3 to 4 cm with two bracteoles at their common base; calyx dark green, the ovarian portion turbinate 1.5 to 2 cm in diameter, with minute teeth; corolla strongly arched when open, 4 to 5 cm, dark blackish purple, thin not fleshy, silky, the apex almost returning to the level of the base; staminal column glabrous dark purple, as are the anthers of which the two lower are penicillate; style glabrous with a bluntly two-lobed stigma; fruit unknown.

This species, which is a small, glabrous tree 20 feet in height, has long, more or less rambling branches. It was discovered by the writer on the Island of Hawaii, in the middle rain forest zone, at an elevation of 3800 feet, four or five miles below Kilauea volcano, along the government road. Only three plants were observed, one of which had never flowered. It is a very handsome species, and is associated with *Clermontia Hawaiiensis, Cheirodendron Gaudichaudii,* Cyrtandra, Cibotium tree ferns, Ilex, etc.

It is named after the Hawaiian goddess Pele, whose abode is in the fires of Kilauea, in the vicinity of which this tree grows.

The type is in the Herbarium of the College of Hawaii, No. 8800, collected flowering in July, 1911, and July 10, 1912.

Clermontia arborescens (Mann) Hbd.

Oha wai.

(Plate 201.)

CLERMONTIA ARBORESCENS (Mann) Hbd. Fl. Haw. Isl. (1888) 242;—Del. Cast. Ill. Fl. Ins. Mar. Pacif. VII (1892) 221.—**Cyanea arborescens** Mann. Proc. Am. Acad. VII (1866) 183.—**Delissea Waihiae** Wawra in Flora (1873) 8.

Leaves obovate oblong 12 to 16 cm x 4 to 5 cm, on petioles of 3 to 6 cm, shortly acuminate or rounded, narrowing at the base, crenate or serrulate, coriaceous, dark green, glossy above, paler underneath; peduncle very short fleshy, two flowered only, the pedicels about 25 mm or also 35 cm, bracts small, bractlets at the base of the pedicels; calyx green with a campanulate tube of about 20 mm and thick obtuse or deltoid lobes of very variable length, separated by sinuses when small and partly connate when large; corolla exceedingly thick and fleshy, strongly arched about 6 cm long of an even width, greenish white or sometimes cream colored with a tinge of reddish purple; anthers glabrous; berry yellow very deeply furrowed and crowned by the calycine lobes; seeds pale yellow shining.

It is one of the most common Clermontia, next to the Oahuan *C. macrocarpa,* but unlike the latter inhabits the middle forest zone between 2000 and 4000 feet. It occurs on the three central islands, but is absent on Oahu, Kauai, and Hawaii. It is peculiar to the wet forests, where it is a small tree 15 to 25 feet in height. The yellow berries, which reach the size of a little lime, are eaten by birds and the natives. It is conspicuous by its monstrous fleshy inflorescence, which is, next to that of *C. drepanomorpha,* the largest in the genus. The *Oha wai* can be found along the Kula pipe line trail, East Maui, where it is extremely common. Also on West Maui (Kaanapali), Molokai (Pelekunu), Lanai (Haalelepakai), usually in company with species of Cyanea and *Clermontia grandiflora.*

PLATE 203.

CLERMONTIA COERULEA Hbd.
One-third natural size; showing flowers and fruits.

Clermontia tuberculata Forbes.

(Plate 202.)

CLERMONTIA TUBERCULATA Forbes Occas. Papers B. P. Bish. Mus. V. (1912) 8, pl. 3.

Leaves obovate to oblong, serrulate, glabrous, coriaceous, the veins on the underside minutely tuberculate 19.5 cm to 4 cm, with petioles 2 to 3 cm long; peduncle two-flowered 5 mm long pedicels 3 cm, both covered with small tubercles; calyx tube campanulate with short obtuse lobes, which together with the thick fleshy corolla is covered with pronounced tubercles; anthers dark red, glabrous; berry globose, strongly tuberculate on the outside 1.3 cm in diameter; seeds smooth, yellow, shiny, ovoid.

This small tree, which reaches a height of about 12 to 15 feet, was discovered by Mr. C. N. Forbes of the Bishop Museum, who collected it on the Island of Maui on the slopes of Haleakala, in the wet forests near Ukulele (5000 feet).

The writer collected specimens of this species a year later from the identical tree from which Mr. Forbes derived his material. One other tree was seen along a stream bed, its branches touching the rushing waters, between Puukakai hill and the Kula pipe line trail, when in company with Dr. P. Ceresole.

It comes nearest to *Clermontia arborescens* Hbd., but does not grow to such a size. It is a very distinct species, differing from all other Clermontiae in its tuberculate inflorescence, a character which, however, occurs in certain species of Cyanea new to science.

Clermontia coerulea Hbd.

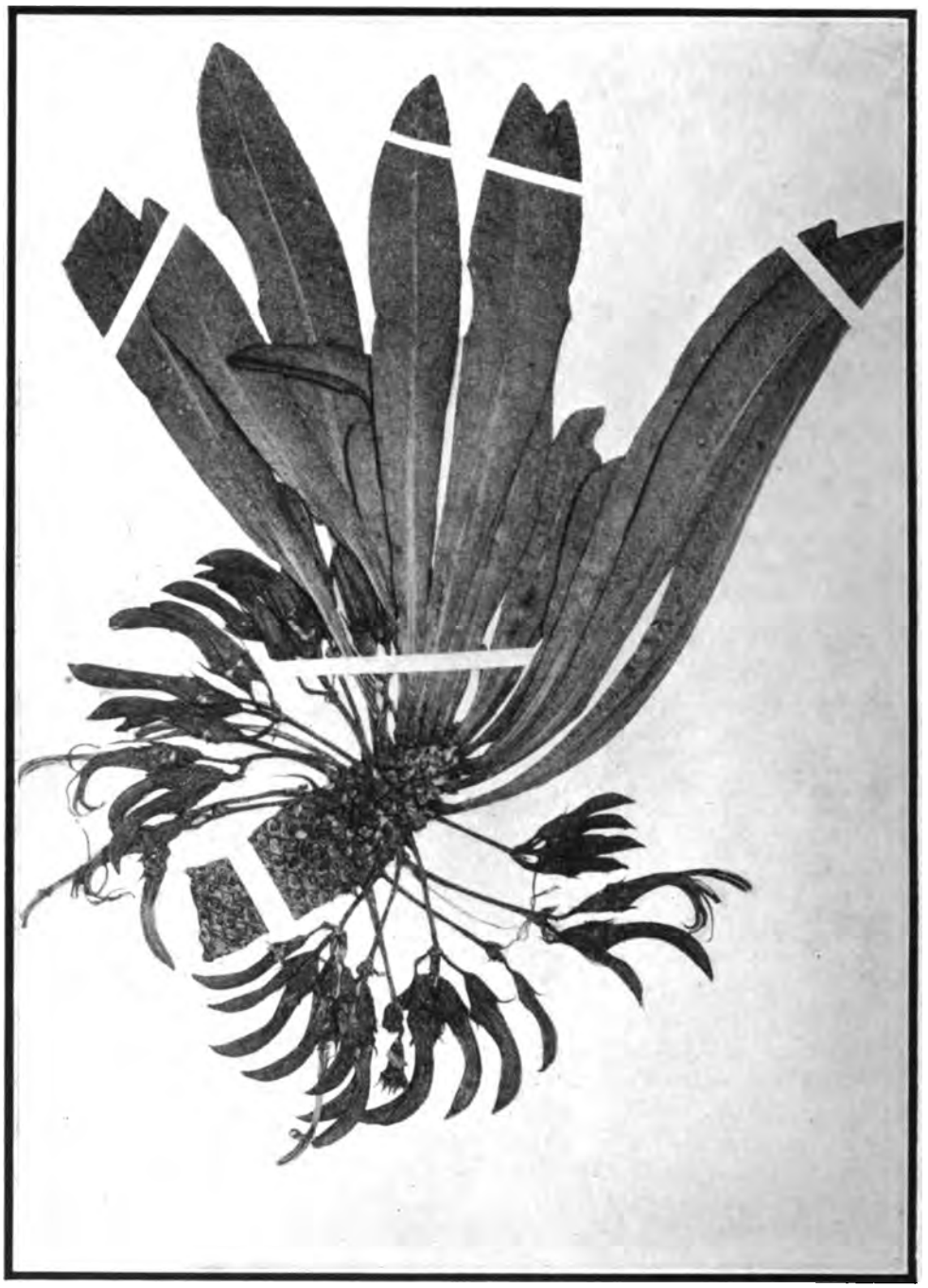
(Plate 203.)

CLERMONTIA COERULEA Hbd. Fl. Haw. Isl. (1888) 243;—Del. Cast. Ill. Fl. Ins. Mar Pacif. VII (1892) 211.

Leaves oblong 12 to 15 cm long 2 to 4 cm wide on petioles of 3 to 5 cm shortly acuminate, contracting at the base, minutely denticulate, glabrous above, membraneous, with a scattered pubescence along the midrib underneath; peduncle slender 2.5 to 4 cm long, with a pair of short bracts considerably above the middle, pedicels of the same length or longer (in Hillebrand's specimen the pedicels are shorter) than the peduncle, bracteolate below the middle; (Hillebrand's statement that the bracteoles are at the middle is incorrect; his specimen of *C. coerulea* which I examined has the bracteoles also below the middle) calyx colored, the tube about 15 mm, turbinate, the lobes either large 15 to 17 cm or minutely denticulate; corolla moderately curved about 4 cm long greenish in Kau specimens, purplish in Kona specimens, of a thin texture; berry globose yellow about 2 cm in diameter somewhat furrowed.

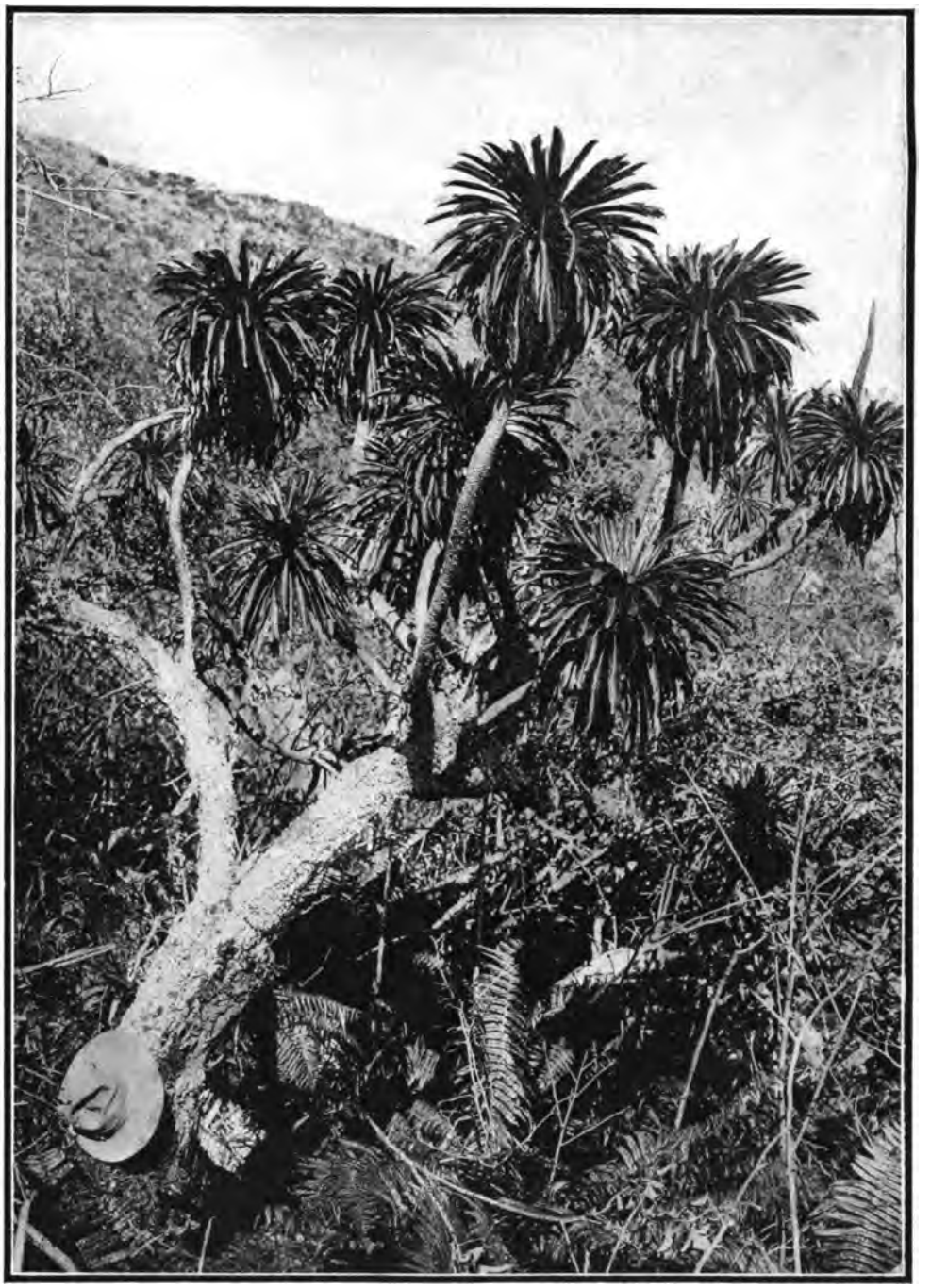
What *Clermontia macrocarpa* is to Oahu, *Clermontia coerulea* is to Hawaii, especially on the southern end. It is the most common Clermontia on the slopes of Mauna Loa in Kau, from where it ranges way over to North Kona. It can be found at an elevation of 2000 feet above Naalehu, Kau, in wet rain forests up to an elevation of 4000 feet. It also occurs in the wet forest back of Kapua, where it extends up into the Koa belt. It is not uncommon in the forests above Kealakekua and on the slopes of Hualalai back of Huehue. In Kau it is a tree 15 to 20 feet in height with a trunk of about 4 to 5 inches in diameter, and is freely branching. In the specimens from Kau, the calycine lobes are minutely denticulate, while in the Kona specimens the lobes are broad deltoid. In the latter locality it is a shrub.

PLATE 204.



CLERMONTIA HALEAKALENSIS Rock.
Less than half natural size.

PLATE 205.



CLERMONTIA HALEAKALENSIS Rock.
Growing on the inner crater wall of Puunianiau, slopes of Mt. Haleakala; elevation 7000 feet. Island of Maui.

PLATE 206.

CYANEA ARBOREA (Gray) Hbd.
Portion of crown of leaves with inflorescence; less than one-third natural size.

Campanulaceae.

Clermontia Haleakalensis Rock, sp. nov.

(Plates 204, 205.)

Leaves 20 to 30 cm long including the short margined petiole, fleshy, 1.5 to 4 cm wide, obtuse, oblong lanceolate, dark green above, pale underneath, midrib thick prominent, veins impressed, pellucid, the upper half crenate, lower half entire, glabrous, gradually tapering into a short margined petiole; cymes in the axils of the leaves, peduncle 2 to 5 cm long, bearing usually 6 flowers on pedicels of 1 to 1.5 cm, the bracts linear subulate about 7 mm, the pedicels bibracteolate below the middle; calyx tube oblong turbinate 1.5 cm slightly pubescent, the lobes linear subulate 5 mm long, corolla whitish green 3.5 to 4 cm long, curved, the dorsal slit not always extending to the base, sometimes only to the middle, lobes linear lanceolate glabrous; staminal column white pubescent at the base, as is the disc, glabrous in the upper part, the two lower anthers penicillate; style slightly pubescent, inner side of the staminal column hispid with white hair in the lower half, berry oblong, seeds smooth whitish.

A small tree 10 to 20 feet tall, with few very robust branches, having at first glance the aspect of a Dracaena. It is soft-wooded, and glabrous. This very curious tree, which has almost an antediluvian appearance, comes nearly between Clermontia and Cyanea. Its decidedly cymose inflorescence places it with the former genus, while the dorsal slit of the corolla does not always extend to the base, but the middle. It also has a characteristic of the genus Delissea, and that is the thickened portion or knob in the flower bud about the middle, indicating the termination of the dorsal slit; though the seeds, which in Delissea are deeply wrinkled, are smooth and shining in the species in question.

This remarkable tree is undoubtedly one of the oldest forms of our Hawaiian Lobelioideae, as it is so strikingly different from all the rest of the Lobelioideae inhabiting these islands.

This particular species was discovered by the writer October 11, 1910, on the Island of Maui, on the western slopes of Mt. Haleakala, on the crater of Puunianiau, at an elevation of 7000 feet, in a locality where no one would expect to find a member of this wonderful tribe. It grows in open, dry scrub in company with plants belonging to the upper forest zone, such as *Raillardia platyphylla, Argyroxiphium virescens, Sophora chrysophylla, Santalum Haleakalae,* etc. Unfortunately, only three trees are in existence, and as they are peculiar to the above locality, it will not be long before they will have shared the fate of so many of our native trees, becoming extinct, as cattle have free access and browse on the lower branches within their reach. The writer appealed to the manager of Haleakala ranch to protect these trees from the ravages of cattle, which he kindly promised to do.

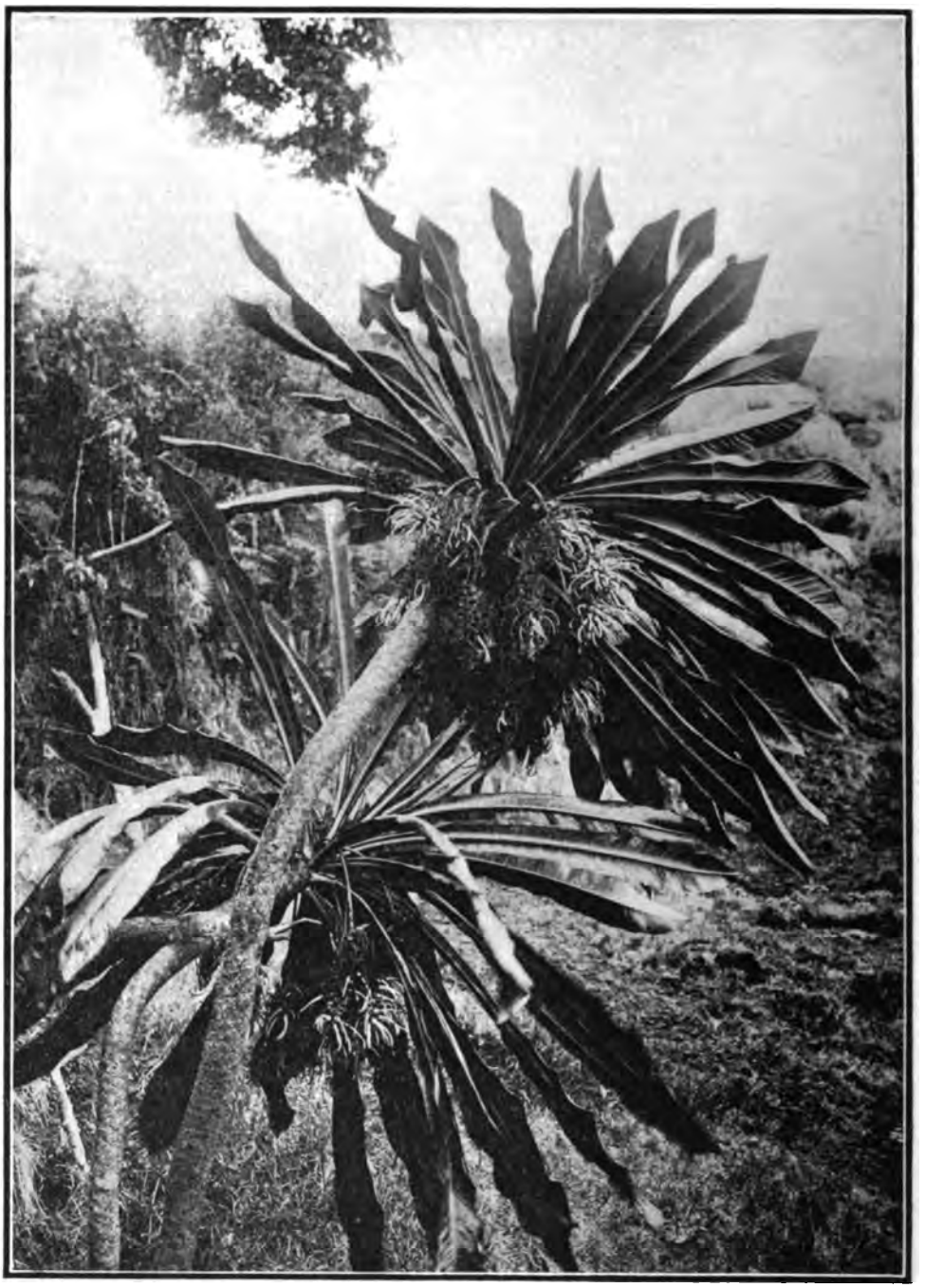
The type specimen is No. 8595 in the Herbarium of the College of Hawaii.

CYANEA Gaud.

(*Kittelia* Reichb., *Marcrochilus* Presl.)

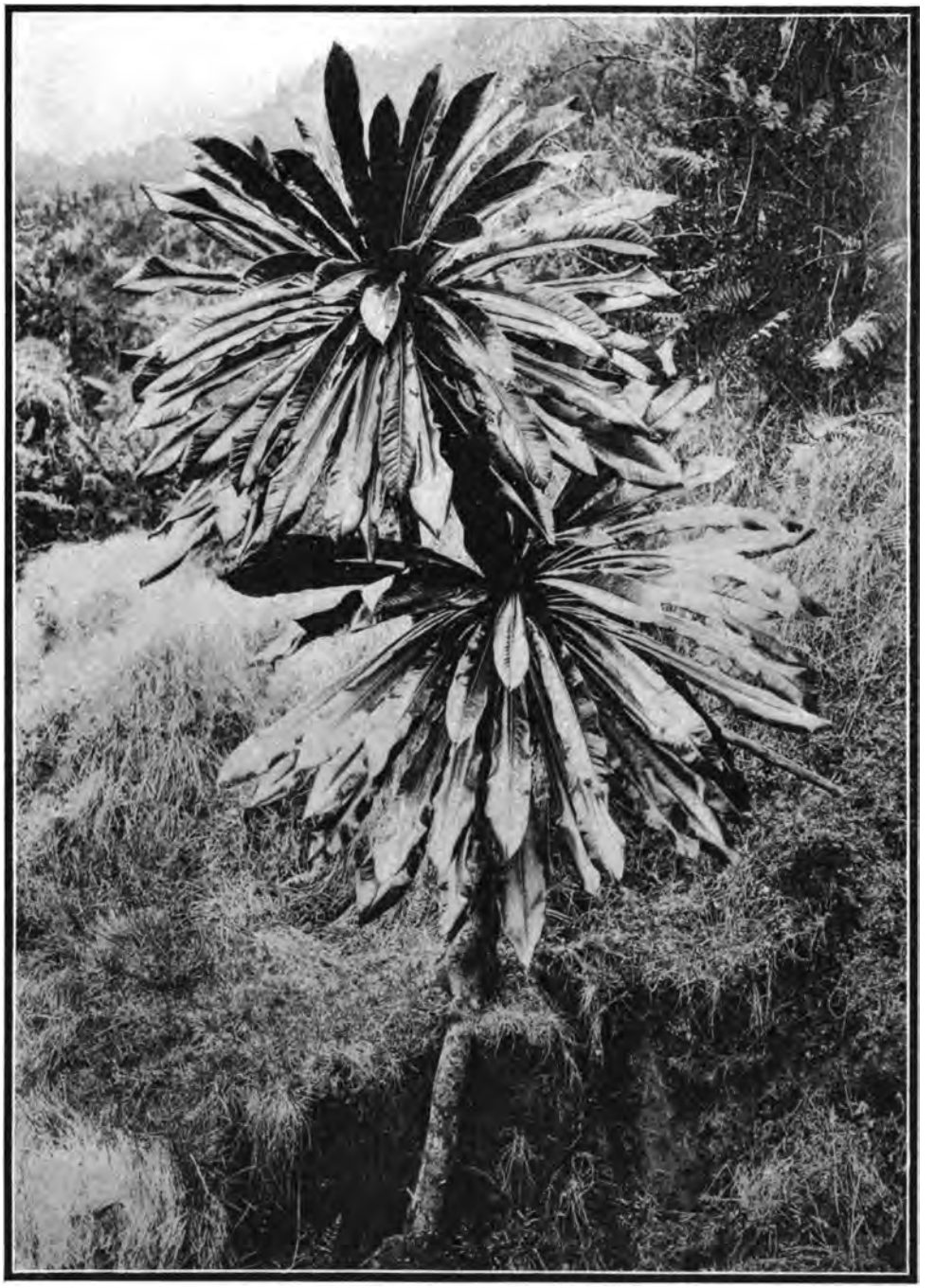
Calycine lobes of variable length, from dentate to foliaceous; the dorsal slit of the corolla extending to the middle. The two lower small anthers or all penicillate; seeds crustaceous shining smooth. Shrubs or small trees with erect simple stem or branches, occasionally covered with thorns. Leaves entire, lobed, or pinnate. Flowers bluish or purple or white in axillary racemes.

PLATE 207.



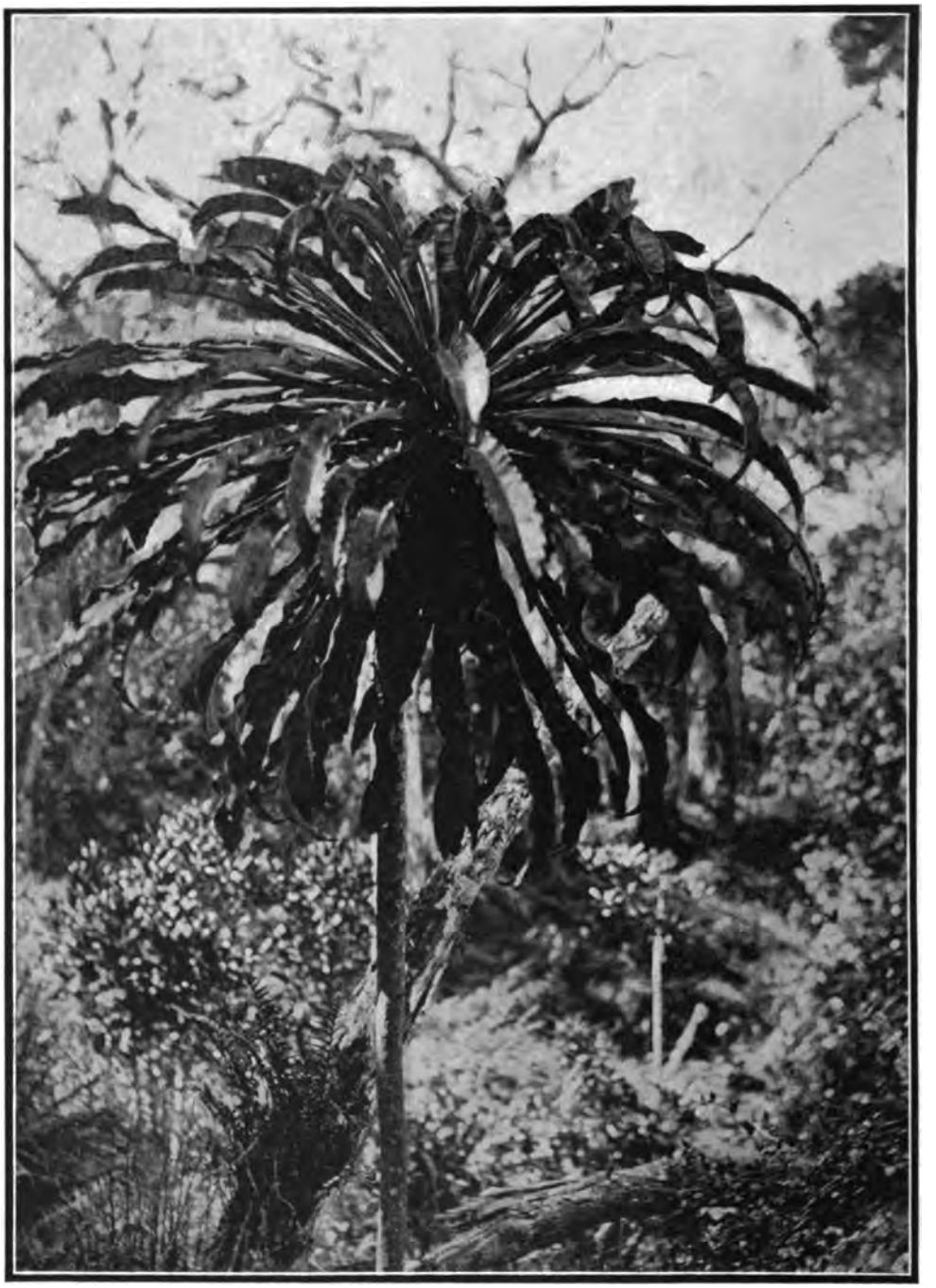
CYANEA ARBOREA (Gray) Hbd.
Side view. At Ulupalakua, Maui. Note the dense inflorescence.

PLATE 208.



CYANEA ARBOREA (Gray) Hbd.
Front view. Growing in a small gulch at Ulupalakua, Maui; elevation 5500 feet.

PLATE 209.



ÇYANEA LEPTOSTEGIA A. Gray.
Hahalua.
Plant reaches a height of forty feet. Growing in the forest of Kaholuamano on Kauai.

The genus Cyanea is endemic in the Hawaiian Islands and possesses more species than either Clermontia or Delissea. All the species are shrubby, with three exceptions. One species, *C. leptostegia,* reaches 40 feet in height, and is the tallest of any of our Lobelioideae. The genus consists of many species, 31 having been so far described, while many more have been discovered by the writer which will be published in a monograph on this tribe, bringing the number of species of Cyanea probably up to 45, or even more.

The genus Cyanea consists of milky shrubs or trees with a single erect or branching stem, which includes a medullary cavity. Flowers are arranged in racemes.

KEY TO THE SPECIES.

Calycine lobes shorter than the tube.
Flowers grayish white or cream colored..... **C. arborea**
Calycine lobes longer than the tube.
Flowers dark purple..... **C. leptostegia**

Cyanea arborea (Gray) Hbd.

(Plates 206, 207, 208.)

CYANEA ARBOREA (Gray) Hbd. Fl. Haw Isl. (1888) 261;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VII (1892) 219.—**Delissea coriacea** var. β A. Gray l. c. p. 148;—H. Mann l. c. p. 178.—**Delissea arborea** H. Mann l. c. p. 180.—**Cyanea longifolia** Heller l. c. p. 909.

Leaves sessile oblanceolate 40-65 cm x 7-12.5 cm, shortly acuminate or rounded and apiculate, gradually narrowing toward the base, faintly dentate, but almost entire and wavy towards the base, glabrous or pubescent along the rib, glossy, chartaceous to coriaceous; peduncle slender but stiff 15-30 cm long, almost naked above, closely many flowered in the last fourth, pedicels short 3.8 mm; bracts 2-4 mm; bractlets 1 mm; calyx subglobose, glabrous, shortly toothed, the tube 6 mm; corolla slender moderately curved, suberect 5 cm long, 5 mm wide, glabrous grayish white, rather thin, with a deep dorsal slit and connivent lobes; staminal column glabrous; berry globose, faintly ribbed, 10-12 mm in diameter.

A tree 12 to 24 feet tall of palm-like habit with a crown of leaves at the apex of the stem, the latter measuring about 4 inches in diameter or more.

This is one of the most handsome Lobelias which the islands possess. Unfortunately it is exceedingly scarce, and the writer fears that it has become extinct.

Where there was once a forest at Ulupalakula there is now only grassland with planted Eucalypti. The writer met with only one single plant in a small gulch which was inaccessible to cattle. For three days the writer searched for this beautiful Lobelia, and he had nearly abandoned all hope when he saw this handsome plant hidden in a small and very narrow gulch. It evidently is the last of its race. In the whole district of Ulupalakua there is now no forest at all, only here and there stands a tree of the araliaceous species *Pterotropia dipyrena.*

Cyanea comata, another beautiful lobeliaceous plant once common in this district, has vanished forever.

The plant is peculiar to Haleakala, Ulupalakua, Maui, and was once plentiful at an elevation of 4000 to 5000 feet. It flowers in the early spring.

Cyanea leptostegia A. Gray.

Hahalua.

(Plate 209.)

CYANEA LEPTOSTEGIA A. Gray Proc. Am. Acad. V. (1862) 149;—Mann. Proc. Am. Acad. VII (1866) 184;— Wawra in Flora (1873) 47;—Hbd. Fl. Haw. Isl. (1888) 261;—Del. Cast. Ill. Fl. Ins. Mar. Pacif. VII (1892) 219;—Heller Pl. Haw. Isl. (1897) 908.

Leaves sessile narrow lanceolate, 40 to 48 cm x 4 to 5 cm denticulate or subentire, glabrous shining chartaceous, the midrib of the leaves hollow, leaves of young plants lobed, the lobes extending sometimes to the midrib; peduncle (with flower) 2 to 3 cm slender, naked below, many-flowered at the apex, 10 to 20 flowers in a crowded cluster on pedicels of about 8 mm, bracts linear, twice as long as the bractlets; calyx glabrous, the tube cylindrical, lobes linear or filiform, sometimes 4 cm long; corolla dark purplish red, glabrous, semierect and slender about 4 cm long and 4 mm broad, anthers glabrous; berry ovoid, yellow, crowned by the filiform calycine lobes.

The *Hahalua,* which reaches a height of sometimes 40 feet, or about 13 m, has a pronounced palm-like habit, possessing a single erect trunk which is densely covered in its upper portion with rhomboid leaf-scars, bearing at the end a crown of sessile leaves.

The *Hahalua* is peculiar to the Island of Kauai, where it inhabits the middle forest zone on the leeward side in the drier and more open districts. It is associated with *Antidesma platyphyllum* var. *β.*, *Xylosma Hawaiiense, Maba sandwicensis* var., *Pisonia sandwicensis, Cyanea spathulata,* and *Cyanea hirtella.* It flowers in the summer months.

Numerous species of caterpillars feed on the fruits and withered flowers

The leaves of the young plants are always lobed, a characteristic found quite often in young plants of Cyaneae, especially in those of Section III Palmaeformes. The milky juice of this species is yellow.

GOODENIACEAE.

The family Goodeniaceae consists of 13 genera, of which 10 are only found in Australia. The species number 291, of which 27 are not found in Australia. In the Hawaiian Islands only the genus Scaevola is represented of this family, with a few species.

SCAEVOLA L.

Flowers hermaphrodite, zygomorphous, pentamerous. Calyx tube adnate to the ovary, the limb very short, annular, truncate or 5-parted. Tube of corolla dorsally slit to the base, all lobes nearly of equal length or the two superior ones shorter. Filaments linear, anthers free. Ovary inferior, rarely very shortly superior, bi-locular, ovules solitary in each locule, erect, anatropous. Style entire, the margin of the indusium ciliate, very rarely glabrous; stigma truncate or subbilobate. Fruit indehiscent, exocarp fleshy succulent, or suberose, endocarp hard, ligneous, or bony. rarely crustaceous. Seeds solitary. Embryo as long as the albumen, with terete or foliaceous cotyledons.—Herbs, shrubs or small trees with alternate, rarely opposite leaves, which are toothed, serrate, or entire. Flowers rarely solitary, usually in cymes, bracteate and bracteolate, sessile or pedicellate. Corolla white, purple or yellow.

The genus consists of 83 species, distributed over Australia, but mainly West

Australia, India, a few in New Caledonia and 6 endemic species in the Hawaiian Islands, with one other *S. frutescens* (Mill.) Krause, of wide distribution.

KEY TO THE SPECIES.

Leaves obovate oblong, toothed or serrate.
Cymes short, crowded, leaves pubescent..... **S. procera**
Cymes long, many flowered; leaves glabrous..... **S. Chamissoniana**

Scaevola Chamissoniana Gaud.

Naupaka or *Naupaka kuahiwi.*

(Plate 210.)

SCAEVOLA CHAMISSONIANA Gaud. Bot. Voy. Uranie (1826) 461. t.82;—Hook. et Arn. Bot. Beech. Voy. (1832) 89;—Endl. Fl. Suds. Ann. Wien. Mus. I. (1836) 170 no. 1043;—DC. Prodr. VII. (1839) 506;—A. Gray in Proc. Am. Acad. VII. (1867) 187;—Hbd. Fl. Haw. Isl. (1888) 267;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 216;—Heller in Minnes. Bot. Stud. Bull. IX. (1897) 913;—Krause Das Pflzenr. LIV. 4. 277. (1912) 123.—**S. Chamissoniana** Gaud. var. γ Hbd. Fl. Haw. Isl. (1888) 267.—**S. ciliata** G. Don Gen. Syst. III. (1834) 728.—**S. ligustrifolia** Nutt. in Trans. Am. Phil. Soc. N. S. VIII. (1843) 253.—**Tenninckia Chamissoniana** de Vriese Gooden. (1854) 8;—Walp. Ann. II. (1852) 1057.—**Lobelia Chamissoniana** O. Ktze. Rev. Gen. Pl. II. (1891) 378.

A shrub or small tree 5 to 6 m high; branches terete glabrous or in the axils of leaves sparsely white-villose; leaves chartaceous, obovate or obovate lanceolate, acuminate at the apex, cuneate at the base, narrowing into a petiole of 6 to 12 mm, margins serrate-dentate, glabrous on both sides, 4 to 10 cm long, 2 to 4.5 cm wide; flowers in subdivaricate cymes, 7 to 15 flowered, as long as the leaves or longer; bracts small linear, acute 2 to 5 cm long, ovary obovoid, glabrous, 3 to 4 mm long; calyx 1 to 2 mm long, shortly 5-lobed, sparsely ciliolate; corolla white with purple streaks or pure white, the erect tube narrow cylindrical, 1.5 to 2 cm long, glabrous outside, sparsely pubescent inside, lobes about half the length of the tube or shorter, winged; stamens almost the length of the tube, the filiform filaments somewhat dilated at the base, anthers small, oblong, truncate; style slightly protruding from the corolla, pubescent below, glabrous above; indusium glabrous, the superior margin sparsely and shortly ciliate. fruit ellipsoidal, glabrous, 6 to 10 mm long, 4 to 5 mm thick.

This species is one of the most common shrubs or often small trees which one is likely to meet everywhere in the lower or middle forest zone. It is in flower nearly all the year round and is quite a conspicuous object in the forest on account of its white flower, which appears to be only a half a flower, though complete. It occurs on all the islands of the group from 800 feet elevation up to 4000 feet and even higher; several varieties have been described. Krause in his monograph on the Goodeniaceae of the world distinguishes three varieties of this species: (1) var. *pubescens* (Nutt.) Krause, from Kohala, Oahu, (2) var. *bracteosa* Hbd. from Maui, Hawaii, and Molokai, and (3) var. *cylindrocarpa* (Hbd.) Krause, from Lanai.

There are many more varieties of this species in the writer's possession, which belong all to shrubs and therefore do not come within the scope of this book. Plate 210 shows a branch from the typical *S. Chamissoniana,* as it occurs in the forests of Oahu.

Here may be recorded another species, the *Ohenaupaka* of the natives or *Scaevola glabra* H. et A. This latter plant often reaches a height of fifteen

PLATE 210.

SCAEVOLA CHAMISSONIANA Gaud.
Naupaka.
Flowering and fruiting branch, reduced.

feet, but is seldom a tree; it grows usually in out-of-the-way places, as on the summit ridges of the mountains of Oahu, and in the swampy forest and borders of great bogs on Kauai, usually at an elevation of from 3000-5000 feet. The flowers are the largest of the Hawaiian *Naupaka* and are bright yellow.

Scaevola procera Hbd.

Naupaka or *Naupaka kuahiwi.*

SCAEVOLA PROCERA Hbd. Fl. Haw. Isl. (1888) 268;—Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 217;—Heller in Minnes. Bot. Stud. Bull. IX. (1897) 914;—Krause Das Pflzenreich LIV. 4. 277. (1912) 123.—**Lobelia procera** O. Ktze. Rev. Gen. Pl. II. (1891) 378.

Branches terete, densely and shortly cinereous tomentose, adult ones somewhat glabrous, and barbellate in the leaf-axils; leaves chartaceous obovate-oblong or lanceolate-oblong, acuminate at the apex, contracting into a petiole of 1 to 1.6 cm rarely longer, margin acutely serrate-dentate, or the base entire, 6 to 15 cm long, 2.5 to 4.5 cm broad, sparsely hispidulous above, pubescent beneath, with distinct and prominent nerves; flowers large in axillary divaricate trichotomous cymes which are cinereous tomentulose, and shorter than the leaves; bracts linear lanceolate, acute, 2 to 4 mm long, ovary obovoid-oblong, puberulous or subglabrous, about 4 mm; calyx lobes very short, obsoletely deltoid-ovate, subacute, with ciliolate margins; corolla white with purple streaks, 1.8 to 2.5 cm long, outside sparcely but inside densely puberulous, the subpatent lobes shorter than the tube, with somewhat broad wings; stamens at the base little dilated, the filiform filaments 7 to 8 mm long, anthers elliptical-oblong, truncate, much shorter than the filaments; style somewhat complanate, sparsely puberulous, quite glabrous at the apex, little shorter than the corolla; indusium with the upper margin shortly ciliate; fruit ovoid, glabrous, 6 mm long, 3 to 4 mm thick, indistinctly and longitudinally costate.

This rather handsome species occurs as a shrub and small tree 15 feet or so high on several islands of the Hawaiian group, but is most common on Molokai. It resembles somewhat *S. mollis.* It was first found by Hillebrand on Molokai at the Pali of Pelekunu Valley. It was collected by the writer March, 1910, flowering and fruiting back of Kamoku, near Kawela swamp (no. 6159), and again at Wailau pali (no. 7031 and 7036), Molokai. On Kauai he collected it back of Lihue on the Haupu range with almost entire leaves, flowering March 19, 1909. (College of Hawaii Herbarium.)

COMPOSITAE.

The Composite, or Sunflower, family, is the largest family of plants, comprising over 800 genera, with more than 10,000 species. The Composite family is considered one of the youngest of the plant families, as some of its tribes are still in full evolution.

It is distributed over the whole Globe, and is represented in these islands by about 60 species, only a few of which become trees. Of striking character is the well-known Hawaiian Silversword, *Argyroxiphium sandwicense (Hinahina),* with its variety *macrocephalum* from Haleakala crater. Some of the arborescent species of Hawaiian Compositae inhabit the high mountains of the group, up to an elevation of over 10,000 feet.

PLATE 211.

DUBAUTIA PLANTAGINEA Gaud.
Naenae.
Flowering branch, about one-half natural size.

KEY TO THE GENERA.

Flowerheads small, yellowish:
  Style of fertil flowers bifid:
    Bracts of involucre in one row free..... **Dubautia**
    Bracts of involucre connate..... **Raillardia**
Flower heads large, two inches or more, brownish yellow:
  Style of all florets entire or shortly bidentate..... **Hesperomannia**

DUBAUTIA Gaud.

Flowerheads homogamous, discoid, all florets hermaphrodite and fertile. Involucre turbinate, with 5 to 10 equal bracts in one row; receptacle naked or paleaceous, the paleae corresponding in number to the inner florets; corolla tubular with a 5-fid limb; anthers purple, shortly appendiculate; style-branches revolute; achenes hispid, 4 to 5 ribbed, with several shortly ciliate rays in a single row.—Shrubs or small trees with opposite or ternate leaves which are either sessile or subsessile, the leaves are parallel nerved, with a slightly branching middle nerve, and remind one of the leaves of species of Plantago or Bupleurum. Inflorescence terminal, paniculate or corymbose.

The genus Dubautia is strictly Hawaiian and is closely allied to the genus Raillardia, which is also peculiar to the Hawaiian Islands. It consists of seven species, only two of which attain the height which entitle them to be called trees; the remaining five are shrubs. The Dubautiae or *Naenae*, as the Hawaiians term these plants, are peculiar to the wet regions of the middle forest zone, and reach their best development on the Island of Kauai, where five species are found.

Dubautia plantaginea Gaud.

Naenae.

(Plate 211.)

DUBAUTIA PLANTAGINEA Gaud. Bot. Voy. Uranie (1826) 469. pl. 84;—Less in Linnaea VI. (1831) 162;—Endl. Fl. Suds. (1836) n. 998;—A. Gray Proc. Am. Ac. V. (1862) 134;—Wawra in Flora (1873) 76;—Hbd. Fl. Haw. Isl. (1888) 222;—Hoffmann in Engl. et Prantl Pflzfam. IV. 5. (1889) 248. fig. 120. G.;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 212;—Heller in Minnes. Bot. Stud. Bull. IX. (1897) 918.

Leaves opposite, lanceolate 10 to 20 cm x 8 to 20 mm, acute gradually contracting at both ends, clasping with the narrow base, entire or remotely denticulate in the upper half, strongly 7 to 13 nerved; panicle pubescent, pyramidal, 15 to 25 cm long, projecting beyond the leaves, with horizontal branches, the lowest 5 to 7.5 cm long, the ultimate pedicels 2 to 3 mm, racemosely arranged; heads cylindrical, florets 7 to 10, involucral bracts 7 to 8; receptacle mostly naked; corolla orange colored, exserted; style branches revolute; pappus-rays linear-subulate, with upright ciliae.

The *Naenae* is a small tree of 10 to 16 feet in height with a short trunk of a few inches in diameter. The branches are very slender, spreading, and bear at their ends long, lanceolate, bright-green opposite leaves, which are strongly 7 to 13 nerved. It is a strikingly handsome tree when in full flower, which is from about July to August, varying, of course, according to locality. The small yellow flowers are borne on a large pyramidal panicle which projects beyond the leaves, about ten inches or more in length, drooping or standing erect. The corolla is orange-colored with a slender tube which dilates into a bell-shaped (campanulate) limb with reflexed lobes. The flowers have the odor of bee's-wax, and are often purplish instead of yellow.

PLATE 212.

RAILLARDIA ARBOREA Gray.
Naenae.
Photographed from an herbarium specimen, about one-half natural size.

The *Naenae* is more or less common on all the islands, but particularly on Oahu, where it can be found at an elevation of 2000 feet at the head of Pauoa valley, at the foot of Konahuanui. On Maui it is very common at the west end at a lower elevation along Honakawai gulch, back of Kaanapali, as well as at Honokahau. On Haleakala it is plentiful along the gulches near Kula, at 3000 feet, and is scattered in the rain forest near Waikamoi and Puukakai above Olinda at an elevation of 4000 feet. Occasional plants can be found in the crater of Haleakala in Kaupo Gap at an elevation of 5000 to 6000 feet, together with *Raillardia* sp., *Argyroxiphium virescens, Lobelia hypoleuca, Geranium multiflorum,* etc. On Hawaii it is found in the mountains of Kohala, as well as on the slopes of Hualalai at about 6000 feet, in company with Dodonaea, Styphelia, Coprosma, etc., on black cinder. On Kauai it is gregarious along Waialae stream together with *Dubautia laevigata* and other plants.

It is peculiar to the rain forest, where it reaches its best development, but can occasionally be found in the drier districts. On Oahu it is also plentiful in the mountains of Punaluu at an elevation of 2000 feet.

Another species, *Dubautia laxa* Hook. et Arn. occurs on Oahu, though a shrub. The writer discovered a variety of this latter species on Kauai at the central plateau in the swampy forests and on the borders of the great open bogs at an elevation of 4500-5000 feet. It is a small tree 15 to 18 feet in height with few spreading branches, which, together with the leaves are hirsute with whitish-gray hair. The inflorescence is a large hirsute corymb, bearing dark orange-yellow heads of 6 mm in diameter on pedicels of 12 mm. It differs from the species in the large, orange colored flower-heads which are on long pedicels, while in the species they are nearly subsessile. It may be known as *Dubautia laxa* H. et A. var. *pedicellata* Rock var. nov.

RAILLARDIA Gaud.

The genus Raillardia differs from Dubautia in its plumose pappus-rays and usually naked receptacle; flower-heads as in Dubautia.—Shrubs or trees with ternate, alternate, or opposite leaves, with various venations; flowers in terminal racemes, panicles or corymbs, yellow.

The genus Raillardia is peculiar to the Hawaiian Islands, though it is of American affinity, as it is closely related to the California genus, Raillardella, established by Gray, with four species peculiar to the high mountains of the Sierra Nevada and Yosemite district at elevations from 8000 to 11,000 feet. Most of the Hawaiian Raillardiae inhabit our high mountains to an altitude of 11,000 feet, but a few species (shrubby) occur as low as 2500 feet, or even lower.

The arborescent species are found at high elevations only. The California Raillardella are acaulescent herbs with stout, creeping rootstocks.

The species of Raillardia are not at all clearly defined in Hillebrand's Flora, and need a revision. A few species run into each other so that it is sometimes

PLATE 213.

RAILLARDIA MENZIESII Gray.
Fruiting branch pinned against trunk of tree; growing in the upper forest of Mt. Haleakala; elevation 6000 feet.

very difficult to distinguish them. Some species will have to be united, and perhaps one or two new species described, as they do not fit in Hillebrand's key to the species.

KEY TO THE SPECIES.

Leaves with a viscous pubescence; inflorescence paniculate.....	**R. arborea**
Leaves silky pubescent, lanceolate acute.....	**R. struthioloides**
Leaves glossy, stiff ciliate; flower heads in a foliose raceme.....	**R. Menziesii**

Raillardia arborea Gray.

Naenae.

(Plate 212.)

RAILLARDIA ARBOREA Gray in Proc. Am. Acad. V. (1862) 134;—H. Mann Proc. Am. Acad. VII. (1867) 176;—Hbd. Fl. Haw. Isl. (1888) 228;—Hoffm. in Eng. et Prantl IV. 5. (1889) 248;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI (1890) 213.

Young branches and inflorescence hirsute with glandular hairs; leaves ternate, close, sessile with a broad base, but not clasping, 3 to 5 nerved, hispid and viscid as is the inflorescence; the foliose panicle 8 to 10 cm long, involucre of 9 to 14 bracts with 22 to 45 florets; corollae glandular; achenes glabrous.

This species, which inhabits the dry upland slopes of Mauna Kea, is by no means common. It is usually a shrub or, when growing in black cinder at an elevation of 10,000 to 11,000 feet, a tree of about 20 feet in height with a trunk a foot in diameter. The writer saw only a few trees; the best developed specimen grew at a little over 10,000 feet on the slopes of Mauna Kea above Kemole; above Waikii at 9000 feet elevation it was a shrub, as well as back of Nau crater on the windward slope at 8000 feet. These arborescent Raillardia have a peculiar odor, and their presence can be detected long before the plants are reached, when once familiar with the odor. This applies also more or less to the shrubby species of the lower forests. *Raillardia arborea* is associated with *Styphelia Grayana, Geranium cuneatum* var. γ., *Raillardia struthioloides, Sophora chrysophylla, Rubus Hawaiiensis, Coprosma montana, Rumex giganteus,* etc. It can stand severe frost, and is sometimes covered with snow during part of the year.

Raillardia struthioloides Gray.

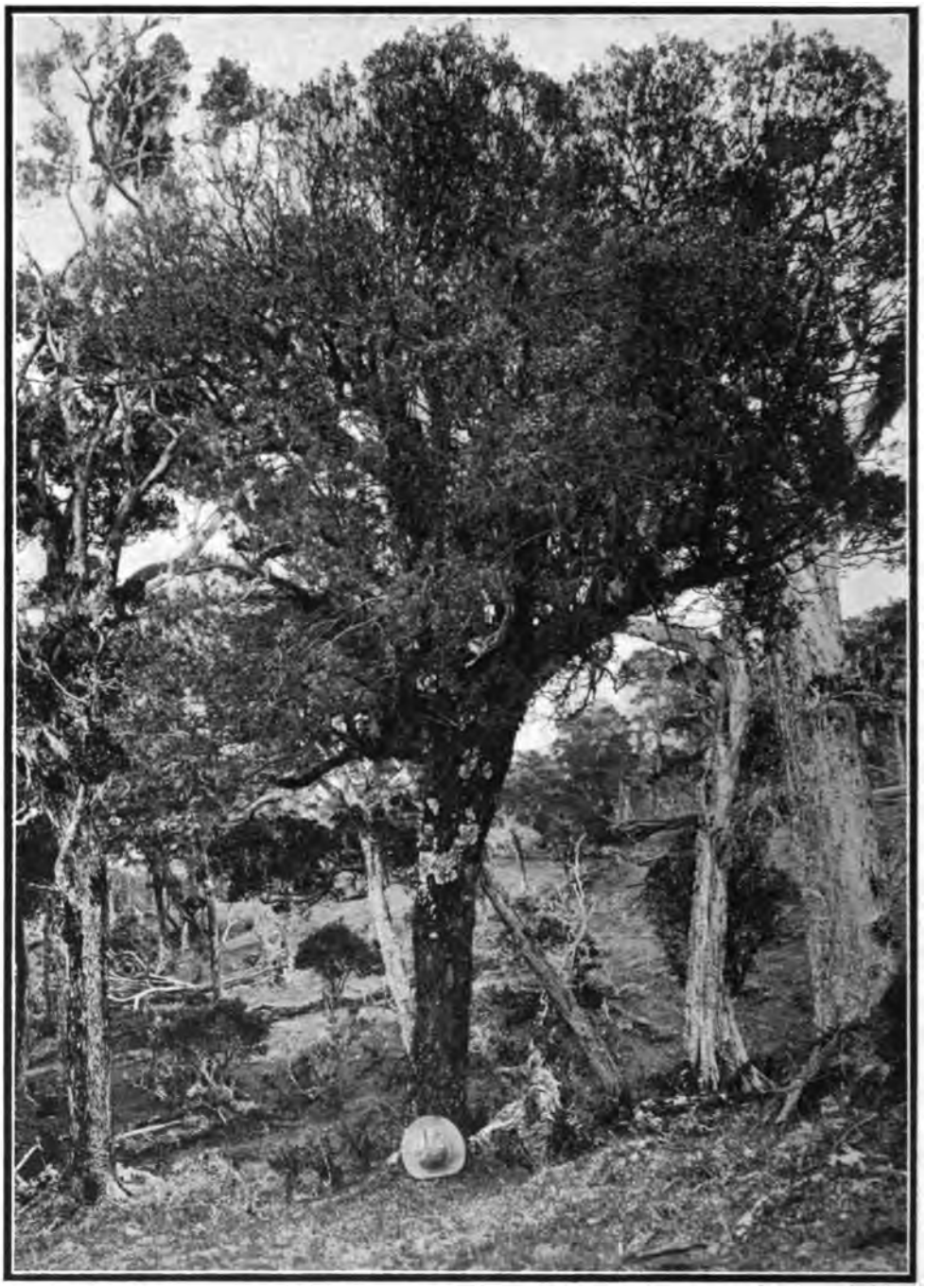
Naenae.

RAILLARDIA STRUTHIOLOIDES Gray in Proc. Am. Acad. V. (1862) 134;—H. Mann Proc. Am. Acad. VII. (1867) 176;—Hbd. Fl. Haw. Isl. (1888) 228;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VI. (1890) 214.

A small tree 6 to 7 m high, with a trunk of about 22 cm in diameter, the branches canescent with a silky not glandular pubescence; leaves closely crowded, erect, imbricate, or at length spreading, lanceolate, 5 cm long, 8 to 14 mm wide, acute, broadly sessile, entire, coriaceous, rather concave when young, with 3 to 5 indistinct nerves, dull opaque, canescent with soft appressed hairs, scabrous on the margin, but not ciliate; inflorescence a raceme or panicle 10 to 15 cm long, with recurved pedicels; heads 12 mm; involucre 8 mm, pubescent, of 7 to 11 bracts; florets 12 to 22, the corolla almost tubular, not exserted.

This species, which is usually a shrub, but often a tree of 20 feet or so in height, ascends the highest of any of our Raillardia, as it can be found at an elevation of 11,500 feet on Mauna Kea. The trunk is not thicker than about nine inches. It differs from *R. arborea* in not being viscous, but covered with

PLATE 214.



RAILLARDIA MENZIESII Gray.
Naenae tree.
Growing on the slopes of Mt. Haleakala, Maui, near Puunianiau crater; elevation 6000 feet.

a silky canescent pubescence which is not glandular. The leaves are lanceolate acute, leathery in texture, and concave when young. The flowers are yellow. It is found lower down in company with *Argyroxiphium sandwicense*, or Silversword, Silene, etc.

Raillardia Menziesii Gray

Naenae.

(Plates 213, 214.)

RAILLARDIA MENZIESII Gray Proc. Am. Acad. V. (1862) 133;—Mann Proc. Am. Acad. VII. (1867) 176;—Wawra in Flora (1873) 79;—Hbd. Fl. Haw. Isl. (1888) 228;—Hoffm. in Engl. et Prantl Pflzfam. IV. 5. (1889) 248;—Del Cast. Ill. Fl. Ins. Mar. Pac. VI. (1890) 214.

A shrub or small tree, branches stiff and stout, or at lower elevation profusely branching, densely foliose, cinereous or with a rufous hispid not glandular pubescence; leaves ternate or opposite, sessile, elliptical-oblong, or lanceolate, acuminate, entire, or faintly and remotely denticulate, coriaceous, 3 to 5 nerved, glabrate when full grown, but retaining a fringe of stiff scabrous ciliae among the margins; heads 10 mm or less, few in a foliose raceme or panicle of 5 cm or more, on pedicels of 2 to 8 mm; involucre obconical, or oblong, florets 2 to 25, but usually only 2 to 10, corollae funnel-shaped, not exserted; achenes glabrous or slightly hispid, ribbed.

The typical *Raillardia Menziesii* Gray, (no. 8621 and 8546, in the Herbarium of the College of Hawaii) is a shrub with stiff stout branches and thick, fleshy leathery, ternate leaves, and occurs on and near the summit of Mt. Haleakala at an elevation of from 7000-10000 feet. At 6000 feet elevation, and in gulches at 7000 feet, above Ukulele, on the same mountain, there are quite a number of trees some of them 20 feet high and pictured on plate 214; the leaves are thinner, opposite, and approach more *Raillardia linearis* Gaud. In order to ascertain the identity of the tree, the writer sent several specimens of the species in question to the Gray Herbarium for comparison. In the absence of Prof. M. L. Fernald, Mr. E. W. Sinnott kindly compared the material, of which he writes as follows: "Of *R. Menziesii* we have but two sheets, one of them the type. Your specimens no. 8621 and 8546 (the latter from the summit of Mt. Haleakala with ternate leaves) are obviously typical *R. Menziesii* upon comparison. The other two, no. 8573 and 8590, (the latter a specimen from the tree figured on plate no. 214) are probably referable to the same species, but seem to approach *R. linearis* Gaud. These two species are placed next each other by Dr. Gray, in his review of the genus in 1862."

The writer collected the typical *R. linearis* on the lava fields of Auahi, Kahikinui, southern slopes of Mt. Haleakala where it is a shrub 3 feet high at 2000 feet elevation. At present it will be advisable to retain the tree in question under *R. Menziesii* rather than create a new species, until the vast Hawaiian composite material is thoroughly worked up and monographed.

HESPEROMANNIA A. Gray.

Heads homogamous, all florets hermaphrodite and equal. Involucre turbinate-campanulate, the bracts imbricate, in many rows, dry, thin, chartaceous to coriaceous, the

PLATE 215.

HESPEROMANNIA ARBORESCENS A. Gray.
Flowering and fruiting specimen; one-half natural size.

inner bracts longest, linear lanceolate, the outer ones short, ovate. Receptacle flat naked. Corollae regular, slender, deeply 5-cleft into linear acute straight lobes. Stamens affixed to the base of the corolla, the anthers long linear, united until fertilization, exserted. Style filiform, long exserted, shortly bi-dentate or entire. Achenes linear-oblong, 5-angular, with several faces ribbed. Pappus of many pluri-seriate stiff and scabrous capillary bristles which are twice the length of the achene.—Trees or shrubs with very hard grained wood. Leaves alternate, penni-nerved, entire. Heads large and few in terminal clusters, or in the forks of the branches. Corolla brownish-yellow.

This most interesting Hawaiian genus consists of three species two of which become arborescent. The genus belongs to the tribe *Mutisieae* which is chiefly American, but especially occurring in the South American Andes. It has been called the Hawaiian Thistle tree.

Hesperomannia arborescens Gray.

(Plate 215.)

HESPEROMANNIA ARBORESCENS Gray in Proc. Am. Acad. VI. (1866) 554;—H. Mann in Proc. Am. Acad. VII. (1867) 176;—Brigham in Mem. Bost. Soc. Nat. Hist. I. 4. (1868) 527. p. 20;—Wawra in Flora (1873) 76;—Hbd. Fl. Haw. Isl. (1888) 232;—Del Cast. Ill. Fl. Ins. Mar. Pacif. VI. (1890) 215.

Leaves glabrous, dark on both faces, thin chartaceous, or often somewhat fleshy in texture when fresh, and minutely pubescent with grayish hairlets when young, especially along the veins and midrib, obovate-oblong 12 to 34 cm long, 4 to 20 cm wide, with reddish midrib and petiole, the latter 2 to 4 cm; bluntly acuminate, crenate-dentate, often sub-entire; heads about 5 cm high, 5 to 7 in a terminal cluster or cymose umbel on thick pedicels of about 10 to 14 mm; involucre 2.5 cm high, quite glabrous, its bracts in 4 to 7 rows, corolla 24 to 30 mm, divided to the middle, anthers 8 to 10 mm, achenes glabrous, 12 to 14 mm, linear-oblong, the tawny pappus twice that length.

The first tree of this species was discovered by H. Mann, on the Island of Lanai on the highest ridge; Hillebrand writes that he saw about eight, four years later. Dr. R. C. L. Perkins who thoroughly explored the islands for insects, and consequently became familiar with the Hawaiian Flora to some extent, informed the writer that he saw 2 trees of this species on Lanai about 10 years ago. When exploring the Island of Lanai in the year 1910, from June to August, the writer failed to find even a sign of this tree anywhere on the island. However, large trees of apparently this species were found by C. N. Forbes in the Koolau Mts. on Oahu, and the writer found a tree about 20 feet in height on the lower slopes of Mt. Konahuanui, back of Honolulu, practically at the head of Pauoa Valley. Its leaves were exceedingly large, though the last terminal ones answered the description by Gray. It was in flower and fruit and is figured on plate 214.

Mr. C. N. Forbes described a very interesting species from Kauai in the Wahiawa Mts. where it was collected by J. M. Lydgate. It has the habit of growth of a lobelia. The large flower-heads are on slender filiform pedicels. The leaves are entire. It was named by him *H. Lydgatei* Forbes.

ADDENDA.

Descriptions of New Species other than Trees.

Lobelioideae.

Cyanea pilosa Gray.

Var. **densiflora** Rock var. nov.

Leaves oblong-obovate, same as in the species; somewhat fleshy, white or silvery underneath, dark green above; the hirsute 10-16 flowered peduncle very short, pedicels hirsute; flowers white or with purplish tinge; staminal column white glabrous; anthers white, hirsute, the lower ones penicillate only; berry dark orange colored, 10-ribbed, crowned by the small linear calycine lobes, sparingly hispid.

Hawaii:—Southern slopes of Mauna Loa in the forest back of Naalehu, Kau, in swampy jungle, terrestrial, elevation 4000 feet; flowering and fruiting January 9, 1912; Rock no. 10001 in the Herbarium of the College of Hawaii.

Var. **glabrifolia** Rock var. nov.

Herbaceous, terrestrial, about 9-10 dm high, the stem strigosely hispid; leaves elliptical oblong, acuminate at both ends, thin chartaceous, pale green above, paler underneath, 18-28 cm x 5-8 cm, on hirsute petioles of 2½-3 cm, young leaves densely hispid underneath, old ones glabrous above, hispid along the midrib and veins; flowers several on a hirsute peduncle of about 7 cm, bracteate above the middle; pedicels 6-10 mm long, filiform, sparingly hispid and bibracteolate at the base; bracteoles linear lanceolate, about 4 mm long; calyx greenish, the ovarian portion 5 mm, the lobes of nearly the same length (4 mm); corolla greenish white, sparingly hispid, 2 cm long; staminal column glabrous, whitish, the anthers densely hirsute; berry glabrous, oblong, dark orange, crowned by the calycine teeth; seeds light yellow.

Hawaii:—In dense swampy forest near Kilauea, elev. 3700 ft., but especially numerous in Mr. W. M. Giffard's mountain lot, Kalanilehua; outside the fenced portion in the forest it is scarce owing to cattle which are allowed to graze in portions of the forest. The plant is usually small and can easily be overlooked, as it grows in dense shaded places, hidden under the numerous ferns and other foliage. Rock no. 8805, flowering and fruiting July, 1911; Type in College of Hawaii Herbarium.

Var. **Bondiana** Rock var. nov.

Plant about 8 dm high, terrestrial, stem hirsute; leaves short petiolate, coriaceous, ovate oblong, glabrous above, covered with a soft light brown tomentum underneath, acuminate at both ends, 10-14 cm x 3.5-5.5 cm; peduncles very short 3 mm, few flowered, hirsute, as are the pedicels and calyx, the lobes of the latter of the same length as the ovarian portion, linear; (flower buds only) corolla purple, sparingly hispid; berry glabrous yellow, globose.

Hawaii:—Mountains of Kohala, about 7 miles above Awini, near summit in exceedingly dense swampy forest, altitude about 5000 feet; flowerbuds and fruiting June, 1910. Rock, no. 8727 in the herbarium College of Hawaii, T. H.

Named in honor of Dr. B. D. Bond of Kohala for many courtesies received from him by the author.

Var. **megacarpa** Rock var. nov.

Plant erect, terrestrial, stem hirsute, leaves large, obovate oblong, blunt at the apex, narrowing suddenly into a fleshy petiole of 5 cm, with few scattered single hairs above, sparingly hispid underneath, 20-22 cm x 9.5-10.5 cm; berries large, 22 mm in diameter, globose, crowned by the broadly triangular 8 mm long calyx lobes (flowers unknown).

Hawaii:—Mts. of Kohala in swampy forest back of Waimea, along the Alakahi gorge, elev. 4200 ft. Only one plant observed; fruiting June, 1910, Rock no. 8728, in the herbarium, College of Hawaii, T. H.

Cyanea Bishopii Rock sp. n.

Cyanea Kunthiana? Hillebr. Fl. Haw. Isl. (1888) 264;—Drake Del Cast. Ill. Fl. Ins. Mar. Pac. VII. (1892) 219.

Plant subherbaceous, woody only at the base 10-14 dm high, rarely branching, leaves crowded at the top, obovate oblong, bluntly acuminate at the apex, gradually tapering into a margined petiole of ca 3 cm; leaves 20-30 cm long, 4-7 cm wide (measured at their widest portion) sparingly hispid with scattered whitish hairlets above, pubescent underneath especially along the veins and midrib; inflorescence densely clustered along the stem, immediately under the leaves, extending down for about 12-15 cm; flowers numerous on a short hirsute many bracteate peduncle, ca 8 mm in length; pedicels 5-6 mm when with flowers, 12 mm when with fruit, bibracteolate above the middle, bracteoles linear subulate ca 3 mm; calyx hirsute the subglobose ovarian portion 6 mm, calycine lobes as long as the tube or longer; corolla slender, somewhat curved, 3 cm long, 4 mm wide, hirsute, pale purple or lilac with whitish streaks, lobes very short, 3-4 mm, retrorsely dentate above, the dorsal slit extending one-third the length of the tube; staminal column sparingly hispid, anthers densely covered with strigose pale purplish hair, the lower ones only penicillate; berry subglobose, deep orange ca 8 mm in diam., crowned by the calycine lobes.

Maui:—Back of Lahaina, West Maui, 4000 ft. on the ridge overlooking Wailuku, coll. by E. F. Bishop, Jan., 1871. Slopes of Haleakala, wet forest between Waikamoi and Honomanu gulch, along Kula pipe line trail in dense swampy jungle, elev. 4200 ft., west of Olinda, East Maui; fruiting October, 1910; Rock no. 8572; flowering May, 1911; Rock no. 8806, Herbarium, College of Hawaii.

Cyanea stictophylla Rock sp. nov.

Plant 2 m high, erect, not branching; leaves 20-30 cm long, 4-4.5 cm wide, linear lanceolate, bluntly acuminate at both ends, narrowing into a petiole of 2.5-3 cm, glabrous above and evenly punctate with glandular points, hirsute underneath especially along the midrib and veins, with an undulate or irregularly notched margin, peduncles axillary 1-2.5 cm long, hirtellous, bracteate at the apex, usually 5-flowered, pedicels hirtellous 7-15 mm long, bibracteolate below the middle; calyx green puberulous, ovarian portion ovoid, calycine lobes triangular about 2 mm (flowers unknown).

Hawaii:—Mts. of Kaiholena, in rain forest southern slopes of Mauna Loa, Kau, elevation 6000 ft., Jan., 1912; Rock no. 10055, shortly after flowering with immature fruits. Type in Herbarium, College of Hawaii. The plant belongs to the group to which *Cyanea pilosa* belongs, to which it is related.

Cyanea aculeatiflora Rock sp. nov.

Plant 3-7 m tall single stemmed or occasionally branching not far above the ground, covered with leaf-scars especially in the upper half; leaves at the ends of erect stems, large 40-60 cm x 10-20 cm, thick and stiff, dark green above, lighter underneath, the midrib as well as the 15 cm long fleshy petiole muricate; the upper side muricate at the angles of the veins, densely hispid underneath; inflorescence muricate throughout with aculeate tubercules; arranged in cymes in the axils of the leaves, on a common peduncle of

about 8 cm with large foliaceous bracts of 3-4 cm, the ultimate pedicels 1 to 1.5 cm; calyx oblong, 2 cm long the oblong liner muricate lobes 2.5 cm x 0.5 cm; corolla dark purple, curved, muricate with yellow spines, the lobes bluish white, spreading, muricate on the outside; staminal column glabrous, purple, longer than the 5 cm long tube, of the corolla, anthers dark purple, glabrous, the two lower penicillate; style thickening towards the shortly two-lobed hirsute stigma; fruit unknown.

Maui:—Northwestern slopes of Haleakala in dense rain forest along streams or swampy ground, terrestrial, from Waikamoi to Honomanu gorge, elev. 4000 ft.; flowering Sept., 1910, Rock. no. 7513, type Herb., Board of Agriculture & Forestry, T. H. It grows in company with *Clermontia arborescens, Cyanea hamatiflora*, Tetraplasandra, etc.. The young plants are covered with spines throughout while the trunk of old ones is prickly only at the base.

Cyanea hamatiflora Rock sp. n.

Plant 3-4 m high, unarmed, glabrous, erect not branching; leaves broadly lanceolate, somewhat acute, broadly sessile at the base 60-70 cm long, 10-14 cm wide, puberulous above, pubescent underneath, midrib thick fleshy red, irregularly serrate with callous teeth; flowers on short peduncles in the axils of the leaves under which they are hidden; bracts lanceolate acuminate with a prominent median nerve, pedicels 5-6 mm with linear lanceolate bracteoles at their base; calyx ovate, green, 1.5 cm x 6-7 mm, lobes of irregular length, the lower two usually much shorter than the remaining three, lanceolate, obtuse the lower 12-14 mm, the upper 15-18 mm x 4 mm; corolla purplish red, unilabiate, the dorsal slit extending more than one-third of its length, lobes sharply curved at the apex only, thick in texture and somewhat hirsute, staminal column glabrous, anthers sparingly hispid along the sutures, the two lower ones long penicillate. The whole inflorescence exudes a very viscid resinous substance especially when with young flowerbuds, which adhere to the paper in the Herbarium.

Fruit obovate-oblong dark purplish-red 10-12 ribbed, crowned by the long calycine lobes, 4 cm long, 2.5 cm wide, purple inside, seeds dark brown, shining.

Maui:—Slopes of Mt. Haleakala, elev. 4000 ft. in dense rain forest, between Waikamoi and Honomanu. The plant is conspicuous by its broad sessile light green leaves, which stand out horizontally. It grows in company with *Cyanea aculeatiflora, Clermontia arborescens, Cyrtandra* sp., Phyllostegia, Stenogyne, etc.

Rock n. 8514 flowering Sept., 1910; type in Herbarium, Board of Agriculture & Forestry, T. H.

Cyanea Gayana Rock sp. nov.

Trunk 1.5-3 m high, hardly woody, erect, stem smooth, not branching, (only when broken) foliose at the apex. leaves thick fleshy, lanceolate oblong, bluntly acuminate, denticulate, gradually narrowing into a margined petiole of 1 cm, making it appear subsessile, the lower portion entire, dark green above glabrous or puberulous, veins and midrib bright red thick fleshy, lighter underneath, and covered with grayish pubescence; peduncles thick fleshy, multi-bracteate from the base, hispid strigose, bearing flowers from half its length to the apex; pedicels densely hirsute 1-1.5 cm long, bracteate at the base; calyx dark, hirsute as is the corolla, tube ovate-obconical, 6-8 mm, the lobes triangular dentiform, 4 mm; corolla, suberect magenta-red with darker streaks, 3-4 cm long by 4 mm wide, the dorsal slit extending to the base; staminal column glabrous as well as the anthers, of the latter the two lower only penicillate; fruit ovoid of a glaucous color about 2-1.5 (?) cm long, crowned by the calycine teeth.

Kauai:—Mountains back of Waimea, woods of Kaholuamano, elev. 4000 ft., along streams only, near Waialae and Waiakealoha on the high plateau in company with numerous other Lobelioideae, Kadua, Cyrtandra, Hillebrandia, *Clermontia Gaudichaudii*, etc. Rock n. 2463, flowering March 10, 1909, and n. Sept., 1909, fruiting, (but fruits were lost, description of fruit from notes),

Rock, 1905, flowerbuds Oct. 20, 1911. Named in honor of Mr. Francis Gay of Kauai to whom the writer is greatly indebted for extended hospitality on Kauai, and without whose aid the writer would have been unable to make such a thorough botanical survey of that part of Kauai.

Type in Herbarium, Board of Agriculture and Forestry, T. H.

Cyanea rivularis Rock sp. n.

A shrub 4-5 cm high, stem simple or branching at the base, leaf whorls at the end of the tomentose branches; leaves linear oblong bluntly acuminate at both ends, crenate or serrate with callous teeth; 20-30 cm long, by 3-8 cm wide; pubescent above, densely velvety tomentose underneath, and pale; on tomentose petioles of 4-8 inches; whole inflorescence tomentose including the blue corolla; peduncle 4-8 cm long, naked two-thirds of its length, many flowered, the pedicels 1-1.5 cm, bracts linear subulate; calyx dark purplish green, its teeth sharply triangular, corolla 3 cm long, light pale to whitish with dark ultramarine blue streaks, velvety tomentose with short white hairlets, the dorsal slit extending one-third its length, curved with a knob in the bud showing the termination of the dorsal slit, lobes short; staminal column glabrous, white, anthers bright blue, slightly pubescent at the base, only the two lower ones penicillate, stigmatic lobes pubescent outside; berry dark bluish-black, globose 1-1.5 cm in diameter, crowned by the calycine teeth, seeds whitish large, and somewhat minutely wrinkled.

Kauai:—Mts. above Waimea along streambeds at the high plateau only, elev. 4200 ft. or more. The banks near the head of Waialae stream are covered with this species their palm-like stems gracefully waving in the wind. Also near Waiakealoha waterfalls (Rock no. 5365, Waiakealoha, Sept., 1909, flowering, and Waialea stream; Rock no. 9010 flowering and fruiting Oct 15, 1911). Abundant in company with *Lobelia hypoleuca, Cyanea Gayana,* etc.

Cyanea atra Hbd. var. **lobata** Rock v. nov.

Erect single stemmed with subentire and lobed leaves, petiole muricate, 6-7 cm, leaves coriaceous, when not lobed the margin is almost fringed; or lobed iregularly deeply but not to the rhachis; tuberculate above, covered with an olivaceous tomentum underneath; peduncle longer than in the species, 3-4 cm, many flowered bracts and bractlets as in species; pedicels 15-18 mm; calyx and corolla as in the species, the staminal column and anthers glabrous.

Maui:—Upper ditch trail leading from Ukulele, elevation 5000 ft. to Waikamoi gulch in dense rain forest. Only few plants observed, when in company with Mr. L. v. Tempsky of Makawao, (Rock no. 8337, flowering October, 1910).

Clermontia multiflora var. **micrantha** Hbd.

forma **montana** Rock f. n.

A shrub 2-3 m high, many branched; leaves smaller than in the variety, thick coriaceous, veins and denticulate margins pink as is the petiole; flowers somewhat larger, pinkish-purple, calyx lobes glabrous, corolla slightly hirtellous, peduncle usually 2-flowered. berry 1.5 cm or more long, not subglobose, but ovoid oblong.

Maui:—On the highest ridge leading to Puukukui, West Maui Mountains, in swampy forest at an elevation of 4600 ft. Rock and Hammond, flowering and fruiting, August, 1910, no. 8179, in Herbarium, College of Hawaii. Differs from var. *micrantha* in the two-flowered peduncle and in the larger ovoid-oblong fruits.

Clermontia parviflora Gaud. var. **calycina** Rock v. nov.

A shrub; leaves as in the species on somewhat longer petioles; flowers usually three on a peduncle, calyx lobes subulate 5 mm long, corolla larger than in the species, bluish gray, pubescent.

Hawaii:—High plateau of Kohala Mts., back of Waimea along Alakahi ditch trail, elevation 4000 ft. (Rock no. 4793, flowering July 12, 1909).

The plant has decidedly the aspect of *C. parviflora*, but differs from it in its larger flowers and short calycine lobes.

Clermontia Gaudichaudii Hbd.

Var. γ **singuliflora** Rock v. nov.

A shrub 1.5-2 m high, glabrous throughout, leaves coriaceous, coarser dentate, veins dark prominent, flowers somewhat larger single on long pedicels; calyx-lobes dentate, anthers glabrous, the lower ones penicillate.

Hawaii:—Not uncommon on the northern slope of Mauna Kea, Hamakua, on trees, usually Cheirodendron or Cibotium, upper forest of Paauhau No. 1, (Rock no. 3252, flowering June 1909).

Differs from the species in its single flowers and long pedicels.

INDEX TO THE SCIENTIFIC NAMES OF INDIGENOUS TREES.

All adopted genera, with their species, are preceded by an asterisk, while generic synonyms are without such. All plants described by the author in this book as new, are in bold type.

INDEX TO THE HAWAIIAN AND ENGLISH NAMES OF TREES.

ERRATA.

Page 76, line 28, and page 79, line 15, for *Styphelia imbricata* read *Styphelia Grayana.*
Page 97, line 3 from bottom, for *Gynopogon oliviformis* read *Alyxia olivaeformis.*
Pages 160, 162, 163, for **longifolia** read **longifolium.**
Page 191, line 10, for **monosperum** read **monospermum.**
Page 225, line 10, for **Waileale** read **Waialeale.**
Page 231, line 7, for **Wawreana** read **Wawraeana.**
Page 242, line 7 from bottom, and page 243, line 5, should read *macrophyllum.*
Page 242, line 9 from bottom, should read *pallidum.*
Page 243, line 13, for *sessilifolia* read *sessilifolium.*
Page 252, for **Mehane** read **Mehame.**
Page 285, lines 36 and 38, for **Zizphoides** read **Zizyphoides.**
Page 295, lines 19 and 35, for *Kokia* read *Kokio.*
Page 347, line 35, for δ read ε.
Page 366, line 7 from bottom, for *Olelo* read *Ohelo.*

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