THE GENUS GOULDIA (RUBIACEAE)*

BY
F. RAYMOND FOSBERG

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The Genus Gouldia (Rubiaceae)*

By F. Raymond Fosberg

INTRODUCTION

The genus *Gouldia* Gray, a member of the family Rubiaceae, is prominent in most of the Hawaiian moist or wet forests. In such areas as the higher portion of eastern Molokai, the west slope of Mount Kaala and the crests of the Koolau Range, Oahu, it forms a considerable component of the forest. It has proved a stumbling block in classification ever since extensive plant collecting began in the Hawaiian islands.

Dr. Harold St. John of the University of Hawaii and Bernice P. Bishop Museum suggested to me that the problem of the classification of the genus *Gouldia* was greatly in need of solution. I have worked on the problem under his direction, and I take this opportunity to thank him for giving me the benefit of his extensive experience with Hawaiian plants and taxonomic methods, for his efforts in collecting plants of this genus, and for making it possible for me to collect intensively.

I also wish to thank Dr. H. E. Gregory, former Director of Bernice P. Bishop Museum, for permission to use the herbarium, the library, and other research facilities of that institution. Thanks are due also to Mr. E. H. Bryan, Jr., Curator of Collections, to Mr. E. Y. Hosaka, Assistant to the Curator, and to Miss Marie Neal, Curator of the Herbarium, for their unfailing kindness and help in this work. For the privilege of examining the type specimens of the species and varieties described by the older workers on this genus, I desire to express my indebtedness to the Berlin Botanical Garden, the Vienna Natural History Museum, and the Royal Botanic Gardens, Kew, England. Finally I would express my appreciation to my many friends who have collected and turned over to me specimens of the genus for study, particularly to Mr. Glenn Russ, who allowed me to examine his collections, and to Mr. Otto Degener of Honolulu, who generously presented me with duplicates of some of the specimens in his valuable collection of Hawaiian plants.

Unless otherwise stated, specimens of all collections cited are preserved in the herbarium of Bernice P. Bishop Museum. A rather full set of duplicates will be presented to the Field Museum Herbarium in Chicago. The several type specimens which are not in Bernice P. Bishop Museum Herbarium are represented there by photographs of the originals.

The relative meagerness of the collections from the islands other than Oahu makes it practically certain that many undescribed varieties remain to

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be collected on all of them. Further collecting will also undoubtedly prove that certain of the described varieties and forms are merely hybrids, or have not been given the correct rank. It remains for further collecting to give a satisfactory picture of the relationships of the groups within the genus, and of its phylogenetic and geological history.

History of the Genus

Asa Gray (3)[1] described the genus Gouldia in 1860, naming it after Dr. A. A. Gould, a Boston zoologist, who worked up some of the mollusks collected by the United States Exploring Expedition.

Gray made two species in the genus: *Gouldia romanzoffiensis,* based on *Kadua romanzoffiensis* Chamisso and Schlechtendal, from the coral islands of the south Pacific, and *Gouldia sandwicensis,* based on a "Kadua affinis" which he credited to Chamisso and Schlechtendal. Under *G. sandwicensis* he recognized three varieties, *coriacea* and *terminalis* from Hooker and Arnott's (6) *Petesia coriacea* and *P. terminalis,* and the new variety *hirtella,* which was published with no description.

Chamisso and Schlechtendal made no species "Kadua affinis" (4, p. 896). They mentioned (1) a "Kaduae affinis", in other words a relative of *Kadua,* and gave a rather full description. Hooker and Arnott (6) described this same plant three years later as *Petesia coriacea.* De Candolle (2), in 1830, a year after the publication of Chamisso and Schlechtendal's work, credited the latter with a "Kadua ? affinis Cham. and Schlecht.", appending a description which is an obvious condensation of the description published by Chamisso and Schlechtendal. De Candolle's entire treatment of *Kadua* is based directly on the original treatment of this genus by Chamisso and Schlechtendal, with the same species, arranged in the same order and with descriptions which are identical but somewhat condensed. Two species of *Kadua* proper are accompanied by the remark that he had seen specimens from the collection of Chamisso and Schlechtendal. The others have no such evidence whatever. It is obvious that "Kadua affinis" is the result of a misinterpretation of the intent of the original authors of the genus *Kadua,* as De Candolle added nothing to the descriptions and no discussion. Therefore it is evident that De Candolle did not have any intention of making a new species "Kadua affinis", making it possible to judge it on the basis of Chamisso and Schlechtendal's original intent. The Cambridge Rules of 1930, in article 68, state that terms which are merely words, not intended as names, should be rejected; thus fortunately a means is provided for disposing of this meaningless name.

Wawra (11), in 1874, recognized Gray's Hawaiian species and varieties, added to *Gouldia sandwicensis* seven varieties and three forms, and described

[1] Numbers in parentheses refer to Literature Cited, p. 181.

one new species, *Gouldia axillaris.* His treatment is the most usable that has appeared up to the present time, and probably could have been little improved upon with the material available to him, except in his interpretation of the older varieties.

Hillebrand reduced *Gouldia sandwicensis* Gray, recognized *Gouldia axillaris* Wawra, raised *coriacea, terminalis,* and *hirtella* to species, and made one new species, *Gouldia macrocarpa.* Under *Gouldia coriacea* he made four varieties, under *G. terminalis* two, and under *G. hirtella* and *G. axillaris* one. He ignored Wawra's varietal names with the exception of variety *stipulacea,* which he placed under *Gouldia hirtella.* He designated all varieties with Greek letters, even those which he considered identical with Wawra's varieties.

Heller (4), in 1897, raised Wawra's varieties *arborescens* and *lanceolata* to specific rank, making *Gouldia macrocarpa* Hillebrand a synonym of *Gouldia arborescens.* He also described two new species, *Gouldia elongata* and *G. sambucina.*

Léveillé (7), in 1911, described one new species, *Gouldia cirrhopetiolata,* with an inadequate and inaccurate description, which does not even fit his type specimens.

Wernham (12), in 1918, described a fruiting plant from H. O. Forbes' collection from Sojere, New Guinea, as *Gouldia papuana.*

Relationships of the Genus

Gouldia is a genus of the family Rubiaceae in the subfamily Cinchonoideae. Schumann (10) placed it in the tribe Mussaendae on the basis of the fleshy fruit. This view seems to be untenable. The fruit of *Gouldia* has usually been called a berry. But if the term berry is to be limited to a fruit in which the seeds are embedded in a fleshy endocarp, then the fruit of *Gouldia* is not a berry. Because of its sclerified endocarp it should probably be considered a drupe.

Gouldia differs from *Hedyotis,* in the broad sense as used by Endlicher, in only one essential respect; *Gouldia* has a fleshy, indehiscent fruit, while *Hedyotis* has a dehiscent capsule. Contrary to the accepted view, fleshiness in *Gouldia* does not seem to be a fundamental character. The outer layers of the fruit in *Hedyotis* are as fleshy as those in *Gouldia* until they are almost mature. Then in *Gouldia* they become more fleshy; in *Hedyotis,* they dry up. The plant which has been called *Kadua romanzoffiensis* Chamisso and Schlechtendal or *Gouldia romanzoffiensis* (Chamisso and Schlechtendal) Gray has a fleshy fruit which is dehiscent. The aggregation of its minor characters seems to place it with *Hedyotis.*

There is a marked resemblance between *Gouldia* and the American Genus *Pentagonia,* which, however, is 5-merous. The difference between a 4-merous

and a 5-merous flower seems a sufficient distinction, at least until I have opportunity to examine more critically the various species of the American genus.

The obvious relationships of *Gouldia* are with *Hedyotis* in the neighborhood of the supposed genus *Kadua*. The resemblance is very marked in several species that have been placed in *Kadua*. Therefore, if tribes are at all natural divisions, *Gouldia* should belong in the Hedyotidae rather than the Mussaendae.

Criteria Used in Classification

When the study of the genus *Gouldia* was first undertaken, there seemed, within certain definite limits, to be continuous variation in size, shape, texture, and vesture of all parts. It seemed impossible to draw any lines whatever between the multitudinous forms represented. Not until the abundant Oahu material had been intensively studied was it discovered that this variation was apparently largely the result of hybridization between species, varieties, and forms which grow in the same or immediately adjacent localities. With this interpretation in mind, it has been possible to segregate rather definite forms on the basis of a number of characters of greater or less importance.

It has been found that certain differences, apparently minor in phylogenetic significance, produce very definite and obvious differences in the appearance of the plant. These are used in many places in the keys, as they are easier to use than other characters which seem of more fundamental importance though much more intangible.

The habit of the plant, though it may show some genetic differences, is so influenced by environment and age that any fundamental differences are totally obscured. This is probably true even where habit is constant enough to characterize a group. Apparent constancy is generally parallel with a marked uniformity in the environment.

The surface of the bark varies with the age of the plant and with the humidity of the environment; it is smooth when young and cracked when older, the cracking taking place much sooner in a dry locality.

The color of the bark varies from almost white through a light brownish gray to a decided rose-pink. This variation seems to correlate only very slightly with any other characters. The very light extreme is confined to one or two varieties; the rose color is more common. This is probably not a genetic difference, but environmental factors affecting it are not at all evident.

The degree of angling of the cross sections of young branchlets, though perhaps not fundamentally important, is rather constant and is a good character for distinguishing forms. It varies, in different forms, from a definitely and sharply 4-sided stem to 4-sided with blunt angles, to subterete, to terete with four ridges, to absolutely terete.

In a few varieties and forms the branchlets are definitely fleshy, the cortex evidently being relatively thick. This manifests itself in dried specimens in an irregular longitudinal wrinkling of the bark.

In almost all groups the young portions of the branchlets are to some degree fistulose; that is, they collapse when dried. It is not evident from dried material whether this is due to the stems being actually hollow or to their being filled with a watery pith which dries up and practically disappears when the specimens are dried. In the few living specimens where it has been particularly noticed, it has been filled with pith except in a few of the most extreme cases. This is a useful distinguishing character in groups where it is extreme, although it is considerably influenced by humidity and by the rate of growth of the branchlet. It is most pronounced in plants from very wet places and in fast-growing branchlets, vines, and sucker shoots.

Although the length of the internodes varies tremendously, even on the same plant, depending upon the rate of growth of the branchlets, most of them are within certain limits and since a difference in the length of the internodes produces a conspicuous difference in the appearance of the plant, making the leaves close together or remote, this character has been frequently used to differentiate varieties. It is apparently genetically important, as it runs fairly constant, except for obvious fluctuations, in the groups segregated. When it is referred to in the key the length of the majority of internodes is indicated. In some of the vinelike varieties the internodes on the small side branchlets are much shorter than those in the main vine itself.

The thickness of the branchlets before secondary thickening has taken place is of some use, at least in the extreme cases. Slender refers to 3 mm or less and thick to 5 mm or more.

Prominent nodes and leaf scars are mentioned only in a few cases where they are particularly noticeable.

Vesture is one of the most useful characters in the separation of groups. It is apparently purely genetic (at least I have been unable to discover any instances where environmental factors have definitely influenced it) and it behaves as a hereditary character in hybrids. The hairs are always simple, varying somewhat in thickness and greatly in length. Usually they are the same thickness throughout, though in certain groups they are more or less pointed. They may be straight or curly, erect, spreading, or appressed. Ordinarily they are minute, though in some groups they are long enough to be easily seen. Commonly dull grayish or brownish, in a few groups they are a beautiful golden yellow, and in certain others almost white. The distribution of pubescence is very definite for most varieties and forms. The corolla lobes and upper surfaces of the leaves are almost never hairy. The corolla tube is hairy in only a few varieties. The calyx lobes are practically always glabrous, except that in a number of varieties they are ciliolate.

The ovary is rarely completely, sometimes partly, hairy. The branches of the inflorescence and the peduncle are very often hairy, usually more so on the peduncle and larger branches. The terminal internodes of the branchlets are often hairy but the hair is usually lost when the bark becomes very corky. Most individuals have their leaves hairy along the lower surface of the midrib, more frequently so along the sides. Very rarely the blade and more rarely still the petioles are sparsely hairy, in one or two varieties densely so. On the lower side of the blade the hairs are in some cases in little tufts of two or three hairs each, or scattered along the veins. Some leaves have hairs when young, but lose them when mature. Little attempt has been made to distinguish in keys or descriptions between different types of hairiness, as all the types here represented are derivatives of the same one and the differences are not very constant. In general, hairiness is referred to by the term hirtellous; if long, pilose; if quite stiff, hispidulous; if shorter than the thickness of the hairs, papillose; and if conspicuously curled and tangled, woolly.

The general size and shape of mature leaves seems to be fundamentally important, though useless when applied to a very few leaves. The variability between individual leaves on the same tree is enormous. However, on most trees the majority of leaves are of approximately the same size and shape. A few are usually stunted. Shaded leaves are ordinarily large. Leaves on sucker shoots are often enormous. In a few groups the nodes near the inflorescences produce definitely reduced leaves. The first pair produced on a young branchlet are minute and early deciduous.

The length and thickness of the petiole also seem important but vary a great deal. Some of this variation is parallel with the size of the leaves; some is not. Any comparison must be between ranges of variation of the majority of petioles. There is some variation in the thickness of different parts of the petioles and in degree and type of curvature, but attempts to use these characters in classification were not successful. Wings on the sides of the petioles, slight continuations of the blade, in some groups completely absent, in others merely ridges, seem quite constant. In extreme cases (sometimes they are as much as 1.5 mm wide) they are used in the key. Where present they are mentioned in the description.

The venation in this genus is always along the same general plan, but the slight variations seem absolutely individual with the leaves. The only general tendencies noted are differences in the angle of the secondary veins with the midrib, and those variations which would naturally follow variations in leaf shape.

Differences in thickness and stiffness of the leaves are very noticeable. Hooker and Arnott (6) note some of these differences and base one of their names on them. However, the leaves of their two species were merely sub-

coriaceous to different degrees. In the genus are leaves ranging from membranous to extremely coriaceous. This character is useful in the segregation of groups, but does not make a very good key character. Stiffness is usually, though not always, parallel with thickness.

The upper surface of the leaves is more or less glossy, but in only a few forms does this persist after drying. In one variety a scurfy appearance is produced upon drying by the exfoliation or scaling off of the epidermis, both upper and lower. It is probably not very important, but is almost constant, obvious, and useful as a recognition character.

The secondary veins range from almost invisible to very prominent below. In certain groups this is converse to the thickness of the leaves and quite variable, but this is by no means always the case, and in any event when extreme either way it is a good recognition character.

The shade and intensity of the green of the leaves varies quite definitely with the different groups, but as it is affected strongly by the environment and is lost on drying, this character has been generally ignored. The same is true of the anthocyanin pigments, present in most groups, though in a few they are prominent enough to be of some descriptive value.

The stipules vary greatly in size, shape, carination, apex, degree of adnation, venation, toothing of the keel, and persistence, but attempts to correlate these differences with those of other parts of the plant have been unsuccessful.

The thickness of the peduncle and branches of the inflorescence certainly seem to be fundamental characters, but these, again, are difficult to describe. Slender and heavy are used in this connection, but they cannot be defined or limited as the thickness varies with the length of the internodes, the age of the inflorescence, and the position of the internodes in the thyrse.

The degree of branching, the length of the peduncle, and the length of the internodes in the branches seem to be of rather fundamental importance, but these also vary with the age of the inflorescence and their position in it, and can not be well described except in terms of the size and proportions of the whole inflorescence. When the peduncle is unusually long it is mentioned individually. Whether the peduncle and inflorescence branches are corky or not seems to be rather constant and of some importance, though evident only in mature fruiting inflorescences.

The shape of the inflorescence can be only very roughly expressed and its variation seems to be quite parallel with size and proportions of the inflorescence.

The reduction of leaves to form the bracts of the inflorescence varies greatly but is approximately proportionate to the size of the inflorescence though the differences are sometimes marked in plants otherwise identical.

There seem to be no significant variations in the size and shape of the calyx and ovary of the flower.

The length and thickness of the corolla tube and lobes, the length of the appendages on the lobes, the length of the free portion of the filament, the length and thickness of the anthers, the length of the anther appendages, the length of the pistil, and the length of the style and of the lobes, and the ratios between these dimensions vary tremendously between flowers of the same inflorescence as well as between those of different varieties. Variation between perfect and pistillate flowers is not significant except between the well-developed anthers of the perfect flowers and the sterile ones of the pistillate flowers, and between the long pistils of the pistillate flowers and the short pistils of the perfect flowers. Significant differences or correlations in the flower structure can apparently be obtained only by biometrical methods which are very difficult and not completely trustworthy.

The immature fruits vary greatly with age, which is impossible to determine. Normal mature fruits vary only slightly in size. The shape of the fruit is more or less spherical.

In *Gouldia St.-Johnii* the calyx lobes are fleshy and their top surface is perpendicular to the axis of the fruit. This difference seems important enough to justify segregation of the forms possessing it as a separate species. Other than this there is little difference in the calyx lobes except slight differences in their size and the degree to which they are appressed to the disk. The disk itself varies in size as much as 300 percent in one inflorescence.

In one group of varieties the endocarp is more or less irregularly thickened. This is very definite and constant, though it varies in degree in the different varieties concerned.

There are certain minute but definite differences in the external appearance of the fruits in different varieties which have so far proved impossible to describe. What is responsible for these is not known.

The seeds grow crowded together on the placenta, and, due to pressure, no two are exactly alike. Their size varies greatly, and the number in a cell varies with both the size of the seed and the size of the fruit. No significant differences have been discovered.

All measurements except those of size of plant have been made on dried material and in all except size of leaves and woody parts this factor will have to be taken into consideration. Particularly is this true of the thickness of petioles, herbaceous stems, and inflorescence branches.

Hybridism

Interspecific hybridism is by no means a new concept. Many workers, however, have been very reluctant to accept it as existing outside the garden

and greenhouse. Certain groups have always been puzzling because of their extreme variability. Lines could not be drawn between species without resorting to purely arbitrary limits, and here no limits could be drawn in several different characters which would coincide in different specimens. Particularly was this true when there had been a great deal of collecting in a group in a limited area. In such cases more and more workers have been forced to admit that natural hybrids do exist and that they are responsible for the variation in many groups.

The concept has in some cases been carried entirely too far. It certainly cannot be true, except perhaps in very rare cases, that hybrids exist between parents whose ranges are hundreds of miles apart at their nearest approach. Hybrids between genera, also, may well be regarded with suspicion. If intergeneric hybrids are established beyond a doubt, as in certain experimental cases with orchids, I would suggest that the status of the genera themselves needed a critical investigation.

The treatment of *Gouldia* in the days of Hooker, Gray, and Wawra was a relatively simple matter. With a very few collections from scattered localities it was easy to make a species or variety for each specimen. Hillebrand, however, with rather more extensive collecting, began to find trouble. Several varieties approached each other rather closely and some specimens he placed between two of them. Heller, with a very narrow species concept, had little difficulty. He described several species, and was amazingly lucky in collecting actual entities and apparently disregarding intergrades between any particular groups where their ranges overlapped. A detailed analysis of this material brought out the fact that by considering the intergrades as the results of hybridization, definite and rather sharply marked groups could be worked out. All degrees of intermediacy in numbers of characters were found, and new elements did not enter in at random.

Once the concept was admitted, its application was rather simple. It is not at all difficult to conceive of hybridism among a group of species and varieties as closely related as all included in this group seem to be. In fact, the chief difficulty is in understanding how groups that are present in the same area have maintained themselves without becoming completely submerged. It could possibly be interpreted as indicating that the present ranges of some of the groups have been attained at a comparatively late date.

A simple concept of a hybrid as merely the result of the crossing of two groups is not sufficient for the hybrids in this genus. Apparently the hybrids are fully as fertile as the pure groups. This has led to a tremendous amount of back-crossing with both parents and inter-crossing between hybrids. Naturally every possible combination to every degree with every character exists.

The mechanism of pollination of *Gouldia* is not yet known. The stigmas on the pistillate flowers are exserted, suggesting that wind may be responsible. The small quantity of pollen produced and the high percentage of fertilization that is evident makes the wind as the only agent rather doubtful. However, no insects have been observed visiting the flowers. The fact that the flowers are decidedly inconspicuous and have no noticeable odor makes the agency of insects also rather doubtful. In the perfect flowers the very short pistils and narrow, pollen-filled throats make self-fertilization probable. In self-fertilization is probably to be found the reason for the persistence of pure species and varieties in regions populated by other species and varieties and great numbers of hybrids.

On the islands other than Oahu, due to the meagerness of the collections, it has not been so easy to determine which are actual species, varieties, and forms and which are the hybrids. In general the practice has been followed of not considering a plant a hybrid when it is growing in a locality outside the known, or at least logical, range of both of its parents. Because of this practice several varieties and forms are described in this paper which may very possibly be proved by future collections to be hybrids, either between varieties now known or others yet to be discovered.

In the keys, the hybrids naturally will not run down. It would be impossible to construct a key that would identify them all. By running a specimen through the key to the groups on the island from which it came, in some cases an idea may be gained as to its parentage, in other cases not. In any event, before describing as new a plant which does not run down in the keys, it should be thoroughly studied and compared with all related forms with the idea in mind that it may be a hybrid.

I have not given names to the hybrids because such names would contribute nothing to the understanding of the group and would further complicate the nomenclature. I have disregarded names given by authors to groups which they did not consider hybrids but whose type specimens have proved to be hybrids. These are included in the list of rejected names (p. 63).

Every specimen which I consider a hybrid is listed under the appropriate combination of names of species, varieties and forms, with remarks as to its resemblances to and differences from these groups.

Geographical Distribution

When this genus is fully known, that is, when sufficient collecting has been done on the Hawaiian islands other than Oahu, its distribution may throw some light on its phylogeny. It may also contribute to the knowledge of the geological history and relative age of the islands. At present such

speculation seems fruitless. However, a general summary of the distribution of the species and the important varieties may be of some value.

Gouldia terminalis is present on the six largest of the Hawaiian islands. Only two of its varieties are found on more than one island. These, var. *cordata* and var. *ovata,* are found on both Maui and Molokai. Both are represented by different forms on these two islands, only one form, var. *ovata* f. *santalifolia,* being known from both Maui and Molokai. Most of the Kauai varieties are not closely related to those of any other island. The other islands all show obviously related series of varieties from one island to the other. In most varieties the forms are rather localized and the most closely related forms are adjacent in their distribution, although in several varieties, such as *typica, arborescens,* and *macrocarpa,* one form occupies most of the range of the variety with localized forms within and adjacent to this range.

Gouldia Hillebrandii presents a series of three varieties, one on each island of its range. From Molokai to Hawaii they become progressively more hairy and the inflorescences become progressively more reduced. On Molokai and Maui the varieties are divided into several closely related forms.

The typical variety of *Gouldia St.-Johnii* is limited to the highest parts of the Koolau Range of Oahu. Var. *Munroi* occurs in the higher mountains of Lanai.

On the island of Oahu, where the distribution is best known, several facts become evident. *G. terminalis* var. *typica* and var. *Wawrana,* two closely related varieties, occupy more or less superimposed ranges, confined to the Koolau Range. *G. St.-Johnii* is confined to the higher portions of the Koolau Range. *G. terminalis* var. *coriacea* occurs throughout the Koolau Range with one collection from the corner of the Waianae Mountains nearest to the Koolau Range. The variety most closely related to it, var. *kaala,* is confined to the Waianae Mountains, its typical form to Mount Kaala above 800 meters. *G. terminalis* var. *Degeneri* is localized in the southeastern end of the Koolau Range. *G. terminalis* var. *macrothyrsa* occurs throughout the portions of the Waianae Mountains where there is moisture enough for Gouldias to grow up to 1,000 meters altitude. It also occurs in the northwest corner of the Koolau Range.

ARTIFICIAL KEYS

Two series of keys are presented for the identification of the species, varieties, and forms. The first series consists of a key to the species followed by an individual key for each species to the varieties and forms of that species. The second series consists of six keys, one to the species, varieties, and forms found on each of the Hawaiian islands where the genus is found. This series will no doubt be much more easily used and more satisfactory

in making accurate determinations. This is quite to be expected, as far less forms are dealt with in each case, and a long key to closely related forms is naturally the more confusing and inaccurate.

It must be understood that the key is purely artificial to enable the student to identify his plants, and that the groups used in the keys are of no phylogenetic significance.

The measurements used in the keys are those of the main mass of material; extremes are not taken into consideration. Where internodes are mentioned, the measurements apply to the majority of internodes on an ordinary twig of the tree. Sucker and leading shoots are particularly not to be considered, as their internodes are much longer than the ordinary ones. This applies likewise to leaf measurements. Extremes might be found on almost any plant that would not come within the ranges given in the keys.

No claim is made that these keys will make possible the determination of all specimens of Gouldia. A considerable portion of the specimens collected in almost any locality will prove to be hybrids. In the case of hybrid plants the key will at best only suggest what the probable ancestors might be. A consideration of the distribution of suspected parents and of the combination of characters involved is the only method which I can suggest for the determination of the ancestry of a hybrid plant. And a casual study is by no means sufficient for this. Only by study of a painstaking nature will many mistakes be avoided.

Key to Species

A. Thyrses axillary, none terminal.....86. **G. Hillebrandii**
AA. Thyrses mainly terminal.
  B. Leaves more or less concave beneath, veins very prominent beneath, impressed above, fruits with calyx lobes fleshy, at right angles to the axis of the fruit.....95. **G. St.-Johnii**
  BB. Not as above.....1. **G. terminalis**

Key to Gouldia Terminalis

A. Whole plant glabrous.
  B. Leaf bases cordate or subcordate.....Group 1
  BB. Leaf bases not cordate or subcordate.
    C. Internodes mostly over 2.5 cm long.....Group 2
    CC. Internodes mostly under 2.5 cm long.....Group 3
AA. Plant hairy in some parts.
  B. Leaf bases cordate or subcordate.....Group 4
  BB. Leaf bases not cordate or subcordate.
    C. Branchlets glabrous.....Group 5
    CC. Branchlets hirtellous.....Group 6

Group 1

A. Leaves conspicuously venulose beneath.....35. var. **Degeneri**

AA. Leaves not conspicuously venulose beneath.
B. Thyrse usually under 3 cm long.....50. var. **purpurea**
BB. Thyrse usually over 3 cm long.
C. Peduncle at least half the length of thyrse.....49. var. **pedunculata**
CC. Peduncle under half the length of the thyrse.
D. Leaf bases subcordate.....4. var. **typica** f. **robusta**
DD. Leaf bases cordate.
E. Thyrse usually over 5 cm long, leaves sharply acuminate.....
.....46. var. **cordata** f. **acuminata**
EE. Thyrse usually under 5 cm long, leaves usually not sharply acuminate....
.....45. var. **cordata** f. **eucordata**

Group 2

A. Petioles ordinarily under 10 mm long.
B. Leaves near the thyrses reduced and elliptical.....84. var. **pseudodichotoma**
BB. Leaves near the thyrses not reduced, usually obovate or oblanceolate.....
.....3. var. **typica** f. **eutypica**
AA. Petioles ordinarily over 10 mm long.
B. Leaves elliptical to slightly obovate.
C. Branchlets sharply angled.....12. var. **elongata** f. **euelongata**
CC. Branchlets not sharply angled.
D. Internodes on small branchlets mostly under 3 cm long.....30. var. **Hosakai**
DD. Internodes on small branchlets mostly over 3 cm long.....15. var. **osteocarpa**
BB. Leaves strongly obovate, base more or less cuneate.
C. Thyrse usually under 4 cm long.....25. var. **glabra** f. **parvithyrsa**
CC. Thyrse over 4 cm long.
D. Petiole winged, under 15 mm long.....23. var. **glabra** f. **euglabra**
DD. Petiole not winged, 20-30 mm long.....24. var. **glabra** f. **waipioensis**

Group 3

A. Thyrse usually over 3 cm long.
B. Branchlets strongly angled.
C. Leaves membranous, elliptical, acuminate.....65. var. **ovata** f. **membranacea**
CC. Leaves not as above.
D. Leaves conspicuously venulose, branchlets almost white.....
.....9. var. **arborescens** f. **albicaulis**
DD. Leaves not conspicuously venulose, branchlets darker.
E. Petiole usually over 1 mm thick, leaves with a tendency to be cuneate
.....62. var. **ovata** f. **Storeyi**
EE. Petiole not over 1 mm thick, leaves rounded to acute at base.....
.....56. var. **ovata** f. **euovata**
BB. Branchlets not strongly angled.
C. Leaves somewhat venulose, decidedly cuneate.
D. Petioles up to 10 mm long, branchlets fleshy.....
.....8. var. **arborescens** f. **euarborescens**
DD. Petioles over 10 mm long, branchlets not fleshy.....
.....33. var. **kapuaensis** f. **pittosporoides**
CC. Leaves only slightly venulose, usually not strongly cuneate (except sometimes f. gracilis).
D. Petiole under 6 mm long.....5. var. **typica** f. **gracilis**
DD. Petiole over 6 mm long.
E. Internodes more or less the same length on larger and smaller branchlets.....20. var. **macrocarpa** f. **sambucina**
EE. Internodes much longer on main branchlets than on smaller ones.....
.....30. var. **Hosakai**

AA. Thyrses usually under 3 cm long.
B. Leaf bases strongly cuneate.
C. Leaves thin....66. var. **ovata** f. **Lydgatei**
CC. Leaves subcoriaceous to coriaceous.
D. Leaves somewhat venulose, petiole over 1 mm thick....26. var. **bobeoides**
DD. Leaves not at all venulose, petiole under 1 mm thick....51. var. **coriacea**
BB. Leaf bases not strongly cuneate.
C. Leaves lanceolate to oblanceolate.
D. Branchlets very fleshy....76. var. **crassicaulis**
DD. Branchlets not very fleshy.
E. Branchlets slightly fleshy, leaves often strongly curved and folded....58. var. **ovata** f. **santalifolia**
EE. Branchlets not at all fleshy, leaves plane.
F. Internodes mostly under 1.5 cm long....51. var. **coriacea**
FF. Internodes mostly over 1.5 cm long....73. var. **antiqua** f. **acuta**
CC. Leaves obovate or elliptical.
D. Leaves mostly more than half as wide as long....74. var. **antiqua** f. **kauensis**
DD. Leaves mostly less than half as wide as long.
E. Internodes on main branchlets about 6 cm long, those on smaller ones under 3 cm....30. var. **Hosakai**
EE. Internodes on all branchlets mostly short.
F. Petiole noticeably winged.
G. Leaf bases acute, epidermis not exfoliating in dried material....26. var. **bobeoides**
GG. Leaf bases rounded to obtuse, epidermis exfoliating in dried specimens....53. var. **kaala** f. **eukaala**
FF. Petiole not noticeably winged.
G. Branchlets slender, not presenting a fleshy or gnarled appearance....54. var. **kaala** f. **Russii**
GG. Branchlets appearing somewhat fleshy or gnarled.
H. Internodes mostly under 1 cm long, leaves mostly plane....70. var. **antiqua** f. **euantiqua**
HH. Internodes mostly over 1 cm long, leaves mostly curved or folded....58. var. **ovata** f. **santalifolia**

Group 4

A. Branchlets glabrous.
B. Branchlets distinctly 4-sided....83. var. **quadrangularis**
BB. Branchlets terete or very soon becoming so.
C. Leaves subcordate at base, thyrse hirtellous, at least when young....43. var. **subcordata**
CC. Leaves cordate at base, thyrse glabrous....48. var. **cordata** f. **molokaiensis**
AA. Branchlets at least slightly hirtellous.
B. Branchlets terete or soon becoming so, or only slightly angled.
C. Leaves strongly venulose....39. var. **stipulacea**
CC. Leaves not strongly venulose.
D. Thyrse under 1.5 cm long....81. var. **pubescens**
DD. Thyrse over 3 cm long....43. var. **subcordata**
BB. Branchlets distinctly angled.
C. Internodes usually under 3 cm long.
D. Leaf rounded, only midrib hirtellous....37. var. **rotundifolia**
DD. Leaf obovate, blade hirtellous beneath....38. var. **Skottsbergii**
CC. Internodes usually over 3 cm long.
D. Thyrse 3 cm or under long.
E. Leaf oblong, stiff....82. var. **Forbesii**
EE. Leaf obovate, not particularly stiff....38. var. **Skottsbergii**

DD. Thyrse over 3 cm long.
E. Midrib of leaf more or less hirtellous along the sides....36. var. **macrothyrsa**
EE. Leaf glabrous....47. var. **cordata** f. **Nealae**

Group 5

A. Leaves near the thyrses strongly reduced....64. var. **ovata** f. **heterophylla**
AA. Leaves near the thyrses not strongly reduced.
B. Branchlets only weakly angled or terete.
C. Thyrse usually under 3 cm long....72. var. **antiqua** f. **hirtellifolia**
CC. Thyrse usually over 3 cm long.
D. Internodes usually over 3 cm long....85. var. **lanai**
DD. Internodes usually under 3 cm long.
E. Branchlets conspicuously fleshy....10. var. **arborescens** f. **macrophylla**
EE. Branchlets not conspicuously fleshy.
F. Leaves thin, petiole up to 10 mm long, 1 mm thick....32. var. **kapuaensis** f. **eukapuaensis**
FF. Leaves stiff-coriaceous, petiole up to 5 mm long, 1.5-2.5 mm thick....34. var. **kapuaensis** f. **rigidifolia**
BB. Branchlets sharply angled.
C. Leaves under 3.5 cm long, internodes under 2 cm long....77. var. **parvifolia** f. **euparvifolia**
CC. Leaves over 3.5 cm long, internodes over 2 cm long.
D. Peduncle hirtellous.
E. Petiole not over 5 mm long....83. var. **quadrangularis**
EE. Petiole over 8 mm long.
F. Branches of thyrse and corolla-tubes glabrous.
G. Leaves cuneate at base....59. var. **ovata** f. **kalaupapa**
GG. Leaves not cuneate....60. var. **ovata** f. **maunahui**
FF. Branches of thyrse and corolla-tube hirtellous....68. var. **ovata** f. **petiolata**
DD. Peduncle glabrous.
E. Leaves membranous, strongly acuminate....42. var. **angustifolia**
EE. Leaves neither membranous nor strongly acuminate.
F. Thyrses usually over 5 cm long....13. var. **elongata** f. **hirtellicostata**
FF. Thyrses under 5 cm long.
G. Leaves narrowly elliptical, not cuneate at base....60. var. **ovata** f. **maunahui**
GG. Leaves obovate to oblanceolate, usually cuneate at base....61. var. **ovata** f. **wailauensis**

Group 6

A. Thyrses terminal and on many small axillary branchlets near the ends of the main branchlets.
B. Leaves glabrous beneath....75. var. **congesta**
BB. Leaves hirtellous beneath, at least on midrib....21. var. **macrocarpa** f. **teres**
AA. Thyrse only strictly terminal.
B. Leaves hirtellous, at least on midribs.
C. Only the midribs of the leaves hirtellous.
D. Leaves narrowly elliptical....60. var. **ovata** f. **maunahui**
DD. Leaves not narrowly elliptical.
E. Leaves broadly obovate or elliptical, base round....37. var. **rotundifolia**
EE. Leaves obovate to oblanceolate, base acute or cuneate.
F. Branchlets sharply angled....14. var. **elongata** f. **kahili**
FF. Branchlets not sharply angled....18. var. **macrocarpa** f. **cuneata**
CC. Secondary veins and blade hirtellous.
D. Leaves obovate-cuneate, strongly venulose, corolla-tubes minutely hirtellous in lower two thirds....6. var. **Wawrana**

DD. Not as above.
E. Branchlets decidedly angled, not soon becoming terete.
F. Thyrse usually under 2 cm long, leaves hairy only on midrib and secondary veins .....79. var. **parvifolia** f. **subpilosa**
FF. Thyrse usually over 2 cm long, leaves hairy all over the under side .....67. var. **ovata** f. **punaula**
EE. Branchlets not strongly angled, soon becoming terete.
F. Thyrse usually over 1.5 cm long.....80. var. **tenuicaulis**
FF. Thyrse under 1.5 cm long.....81. var. **pubescens**
BB. Leaves glabrous.
C. Internodes mostly over 5 cm long.
D. Leaves mostly over 5 cm wide, petiole 3 mm thick.....
.....29. var. **konaensis** f. **latifolia**
DD. Leaves mostly under 5 cm wide, petiole 2 mm thick.....
.....28. var. **konaensis** f. **eukonaensis**
CC. Internodes under 5 cm long.
D. Thyrse glabrous.....57. var. **ovata** f. **makawaoensis**
DD. Thyrse hirtellous.
E. Leaves narrowly lanceolate, acuminate.....63. var. **ovata** f. **Suehiroae**
EE. Leaves not as above.
F. Leaves narrowly elliptical to broadly oblanceolate, branchlets and thyrse only very slightly hirtellous.....71. var. **antiqua** f. **kehena**
FF. Leaves broadly elliptical or obovate, branchlets and thyrse decidedly hirtellous.
G. Leaves mostly under 6 cm long.....19. var. **macrocarpa** f. **sclerophylla**
GG. Leaves mostly over 6 cm long.....17. var. **macrocarpa** f. **eumacrocarpa**

Key to Gouldia St.-Johnii

A. Leaves hispidulous, branchlets terete or almost so.....96. var. **typica**
AA. Leaves hirtellous, branchlets distinctly angled.....97. var. **Munroi**

Key to Gouldia Hillebrandii

A. Branchlets hirtellous.....94. var. **hawaiiensis**
AA. Branchlets glabrous.
B. Thyrse glabrous or practically so.
C. Leaves acute, not acuminate.....92. var. **nodosa** f. **eunodosa**
CC. Leaves acuminate.....93. var. **nodosa** f. **lancifolia**
BB. Thyrse hirtellous.
C. Leaves under 5 cm long, 1.5 cm wide, internodes mostly under 1 cm long.....
.....90. var. **typica** f. **microphylla**
CC. Leaves larger.
D. Corolla-tube minutely hirtellous in the lower part....88. var. **typica** f. **eutypica**
DD. Corolla-tube glabrous.....89. var. **typica** f. **glabriflora**

Keys to the Varieties and Forms on Individual Islands

Kauai

A. Plants entirely glabrous.
B. Internodes mostly over 4 cm long.
C. Branchlets sharply angled, endocarp of fruit not thickened.....
.....12. **G. terminalis** var. **elongata** f. **euelongata**
CC. Branchlets not sharply angled, endocarp of fruit irregularly thickened, hard and bony.....15. **G. terminalis** var. **osteocarpa**

BB. Internodes under 4 cm long.
C. Branchlets decidedly fleshy and fistulose, fruiting thyrses more or less pendulous....8. **G. terminalis** var. **arborescens** f. **euarborescens**
CC. Not as above.
D. Branchlets very light colored, internodes 0.5-1.5 cm long....9. **G. terminalis** var. **arborescens** f. **albicaulis**
DD. Branchlets not conspicuously light colored, internodes 1-3 cm long....20. **G. terminalis** var. **macrocarpa** f. **sambucina**
AA. Some part of the plant hirtellous.
B. Leaves not at all hirtellous beneath.
C. Branchlets fleshy and fistulose....10. **G. terminalis** var. **arborescens** f. **macrophylla**
CC. Branchlets not fleshy and fistulose.
D. Leaves mostly under 6 cm long....19. **G. terminalis** var. **macrocarpa** f. **sclerophylla**
DD. Leaves mostly over 6 cm long....17. **G. terminalis** var. **macrocarpa** f. **eumacrocarpa**
BB. Leaves hirtellous beneath, at least on the midrib.
C. Petioles mostly under 5 mm long and 1 mm thick.
D. Leaves venulose, cordate at base.
E. Flowers glabrous....40. **G. terminalis** var. **stipulacea** f. **eustipulacea**
EE. Corolla tube minutely hirtellous....41. **G. terminalis** var. **stipulacea** f. **Rockii**
DD. Leaves not venulose, rounded at base....77. **G. terminalis** var. **tenuicaulis**
CC. Petioles mostly over 5 mm long.
D. Leaves decidedly obovate or broadly oblanceolate.
E. Inflorescence open, apex of leaves mostly acute....14. **G. terminalis** var. **elongata** f. **kahili**
EE. Inflorescence compact, apex of leaves mostly obtuse....18. **G. terminalis** var. **macrocarpa** f. **cuneata**
DD. Leaves ovate or elliptical.
E. Thyrse glabrous....13. **G. terminalis** var. **elongata** f. **hirtellicostata**
EE. Thyrse hirtellous....21. **G. terminalis** var. **macrocarpa** f. **teres**

Oahu

A. Leaves, branchlets or both somewhat hairy.
B. Internodes mostly under 2 cm long.
C. Leaves strongly venulose beneath, concave beneath....96. **G. St.-Johnii** var. **typica**
CC. Leaves not strongly venulose, almost plane....54. **G. terminalis** var. **kaala** f. **Russii**
BB. Internodes mostly over 2 cm long.
C. Leaf bases cordate or subcordate, peduncles of fruiting thyrses corky....36. **G. terminalis** var. **macrothyrsa**
CC. Leaf bases cuneate or acute, peduncles of fruiting thyrses not corky....6. **G. terminalis** var. **Wawrana**
AA. Plant completely glabrous.
B. Internodes mostly under 2.5 cm long.
C. Thyrse over 4 cm long....5. **G. terminalis** var. **typica** f. **gracilis**
CC. Thyrse under 4 cm long.
D. Leaves elliptical to obovate, fruiting thyrse with corky peduncle.
E. Petiole winged....53. **G. terminalis** var. **kaala** f. **typica**
EE. Petiole not winged....54. **G. terminalis** var. **kaala** f. **Russii**
DD. Leaves lanceolate to oblanceolate, fruiting thyrse with peduncle not becoming corky....51. **G. terminalis** var. **coriacea**
BB. Internodes mostly over 3 cm long.
C. Leaves strongly venulose beneath, fruiting thyrse with a corky peduncle....35. **G. terminalis** var. **Degeneri**

CC. Leaves not strongly venulose, peduncle of fruiting thyrse not corky.
D. Leaves subcoriaceous, base cuneate or acute.....
.....3. **G. terminalis** var. **typica** f. **eutypica**
DD. Leaves thick-coriaceous, base subcordate.....
.....4. **G. terminalis** var. **typica** f. **robusta**

Molokai

A. Plant entirely glabrous.
B. Thyrse usually over 2.5 cm long, branchlets strongly angled, not fleshy, leaves obtuse.....58. **G. terminalis** var. **ovata** f. **Storeyi**
BB. Thyrse under 2.5 cm long, branchlets rather weakly angled, fleshy, leaves usually acute.....62. **G. terminalis** var. **ovata** f. **santalifolia**
AA. Plant not entirely glabrous.
B. Thyrses never terminal.
C. Leaves narrowly obovate or broadly oblanceolate, apex not acuminate.....
.....92. **G. Hillebrandii** var. **nodosa** f. **eunodosa**
CC. Leaves elliptic-lanceolate or oblanceolate, apex acuminate.....
.....93. **G. Hillebrandii** var. **nodosa** f. **lancifolia**
BB. Thyrses terminal.
C. Branchlets hirtellous, at least near tips.
D. Leaf blade hairy beneath.....67. **G. terminalis** var. **ovata** f. **punaula**
DD. Only the midribs of the leaves hairy beneath.
E. Leaves narrowly elliptical or lanceolate, base usually acute.
F. Thyrse glabrous or slightly hirtellous.....
.....60. **G. terminalis** var. **ovata** f. **maunahui**
FF. Thyrse decidedly hirtellous, at least on the peduncle and larger branches .....63. **G. terminalis** var. **ovata** f. **Suehiroae**
EE. Leaves broadly elliptical or obovate, base subcordate or rounded, rarely cordate.....37. **G. terminalis var. rotundifolia**
CC. Branchlets glabrous.
D. Leaves cordate at base.....48. **G. terminalis** var. **cordata** f. **molokaiensis**
DD. Leaves not cordate at base.
E. Leaves strongly reduced near the thyrse.....
.....64. **G. terminalis** var. **ovata** f. **heterophylla**
EE. Leaves not strongly reduced near the thyrse.
F. Peduncle decidedly hirtellous.
G. Secondary internodes of thyrse and lower portion of the corolla-tube minutely hirtellous....68. **G. terminalis** var. **ovata** f. **petiolata**
GG. Secondary internodes of thyrse and lower portion of corolla-tube glabrous.....59. **G. terminalis** var. **ovata** f. **kalaupapa**
FF. Peduncle glabrous or only slightly hirtellous.
G. Leaves membranous.....42. **G. terminalis** var. **angustifolia**
GG. Leaves not membranous, usually subcoriaceous.
H. Leaves narrowly elliptical.....
.....60. **G. terminalis** var. **ovata** f. **maunahui**
HH. Leaves obovate to oblanceolate.....
.....58. **G. terminalis** var. **ovata** f. **wailauensis**

Lanai

A. Plants glabrous or practically so.
B. Thyrse under 3 cm long.....26. **G. terminalis** var. **bobeoides**
BB. Thyrse over 3 cm long.....84. **G. terminalis** var. **pseudodichotoma**

AA. Plants hirtellous to pilose in some parts.
B. Branchlets strongly angled.....82. **G. St.-Johnii** var. **Munroi**
BB. Branchlets terete or very soon becoming so.
C. Leaf bases not subcordate, some thyrses on short lateral branchlets.....
.....85. **G. terminalis** var. **lanai**
CC. Leaf bases subcordate, thyrses always terminal.....
.....40. **G. terminalis** var. **subcordata**

Maui

A. Thyrses axillary, below the leaves, never terminal.
B. Corolla-tube minutely hirtellous outside..88. **G. Hillebrandii** var. **typica** f. **eutypica**
BB. Corolla-tube glabrous.
C. Internodes on branchlets mostly under 1 cm long, leaves under 5 cm long.....
.....90. **G. Hillebrandii** var. **typica** f. **microphylla**
CC. Internodes mostly over 1 cm long, leaves mostly over 5 cm long.....
.....89. **G. Hillebrandii** var. **typica** f. **glabriflora**
AA. Thyrses terminal.
B. Whole plant glabrous.
C. Leaves distinctly cordate.
D. Leaves sharply acuminate, at least 4 times as long as broad.....
.....46. **G. terminalis** var. **cordata** f. **acuminata**
DD. Leaves not acuminate, or if so, less than 4 times as long as broad.....
.....45. **G. terminalis** var. **cordata** f. **eucordata**
CC. Leaves not cordate.
D. Branchlets thick, fleshy, wrinkled when dry.....
.....76. **G. terminalis** var. **crassicaulis**
DD. Branchlets not as above.
E. Leaves membranous.
F. Base and apex of leaf acute.....66. **G. terminalis** var. **ovata** f. **Lydgatei**
FF. Base of leaf rounded, apex acuminate.....
.....65. **G. terminalis** var. **ovata** f. **membranacea**
EE. Leaves not membranous.
F. Internodes mostly over 2 cm long, thyrse over 3 cm across.....
.....56. **G. terminalis** var. **ovata** f. **euovata**
FF. Internodes under 2 cm long, thyrse under 2.5 cm across.....
.....58. **G. terminalis** var. **ovata** f. **santalifolia**
BB. Branchlets or under side of leaves or thyrse hirtellous or pilose.
C. Leaves under 3.5 cm long, internodes of smallest branchlets extremely condensed, mostly under 3 mm long.....
.....78. **G. terminalis** var. **parvifolia** f. **euparvifolia**
CC. Leaves and internodes mostly longer than the above.
D. Whole under side of leaf pilose-pubescent.....81. **G. terminalis** var. **pubescens**
DD. Under side of leaf only slightly or not at all hairy.
E. Leaves cordate.....47. **G. terminalis** var. **cordata** f. **Nealae**
EE. Leaves not cordate.
F. Thyrse over 2.5 cm across.....
.....57. **G. terminalis** var. **ovata** f. **makawaoensis**
FF. Thyrse under 2.5 cm across.
G. Apex of leaves acute, branchlets glabrous.....
.....66. **G. terminalis** var. **ovata** f. **Lydgatei**
GG. Apex of leaves obtuse to rounded, branchlets minutely hirtellous.....
.....79. **G. terminalis** var. **parvifolia** f. **subpilosa**

Hawaii

A. Plant entirely glabrous.
  B. Leaves stiff-coriaceous, base cordate or subcordate.
    C. Thyrse not over 4 cm long.....50. **G. terminalis var. purpurea**
    CC. Thyrse over 4 cm long.....49. **G. terminalis var. pedunculata**
  BB. Leaves not stiff-coriaceous, base not cordate or subcordate.
    C. Thyrse mostly over 6 cm long and wide.
      D. Petiole somewhat winged, under 1.5 cm long.....
      .....23. **G. terminalis var. glabra f. euglabra**
    DD. Petiole not winged, over 1.5 cm long.....
      .....24. **G. terminalis var. glabra f. waipioensis**
    CC. Thyrse under 5 cm long.
      D. Leaves cuneate at base.
        E. Internodes mostly over 2 cm long.....
        .....25. **G. terminalis var. glabra f. parvithyrsa**
      EE. Internodes mostly under 2 cm long.....
        .....33. **G. terminalis var. kapuaensis f. pittosporoides**
      DD. Leaves not cuneate at base.
        E. Leaves lanceolate or oblanceolate, acute.....
        .....73. **G. terminalis var. antiqua f. acuta**
      EE. Leaves elliptical or obovate, obtuse or acute.
        F. Leaves mostly over 7 cm long.....30. **G. terminalis var. Hosakai**
        FF. Leaves mostly under 7 cm long.
          G. Leaves mostly less than half as broad as long.....
          .....70. **G. terminalis var. antiqua f. euantiqua**
          GG. Leaves mostly more than half as broad as long.....
          .....74. **G. terminalis var. antiqua f. kauensis**
AA. Plant not entirely glabrous.
  B. Thyrses entirely axillary.....94. **G. Hillebrandii var. hawaiiensis**
  BB. Thyrses not entirely axillary.
    C. Leaves not at all hairy beneath.
      D. Petiole under 8 mm long.
        E. Leaves stiff-coriaceous.....34. **G. terminalis var. kapuaensis f. rigidifolia**
        EE. Leaves not stiff-coriaceous.....71. **G. terminalis var. antiqua f. kehena**
      DD. Petiole over 10 mm long.
        E. Leaves mostly under 7 cm long, branchlets distinctly angled.....
        .....75. **G. terminalis var. congesta**
        EE. Leaves mostly over 7 cm long, branchlets terete or almost so.
          F. Leaves under 6 cm broad..28. **G. terminalis var. konaensis f. eukonaensis**
          FF. Leaves mostly over 6 cm broad.....
          .....29. **G. terminalis var. konaensis f. latifolia**
    CC. Leaves more or less hairy beneath.
      D. Branchlets strongly angled.
        E. Branchlets glabrous.....82. **G. terminalis var. quadrangularis**
        EE. Branchlets hirtellous.
          F. Leaves obovate, not densely hirtellous.....
          .....38. **G. terminalis var. Skottsbergii**
          FF. Leaves oblong, densely hirtellous.....81. **G. terminalis var. Forbesii**
      DD. Branchlets not strongly angled.
        E. Leaf bases not cuneate.....72. **G. terminalis var. antiqua f. hirtellifolia**
        EE. Leaf bases cuneate.
          F. Leaves thin.....32. **G. terminalis var. kapuaensis f. eukapuaensis**
          FF. Leaves stiff-coriaceous.....34. **G. terminalis var. kapuaensis f. rigidifolia**

SYSTEMATIC TREATMENT

In order to avoid unnecessary repetition in descriptions, material in the generic description is not repeated in the specific, nor material in the specific description in the varietal. Descriptions of varieties other than the typical one merely enumerate the points of difference from the typical variety.

Species, varieties, and forms are numbered consecutively so as to facilitate location of descriptions after the number has been found in the key. The numbers have no other significance. A Latin diagnosis is included wherever a species, variety, or form is described which is not based upon a previously described and named entity.

Within the species *G. terminalis* there are several series of closely related varieties which, however, are not clear-cut enough to form sub-species. These varieties are arranged so that as far as practical those most closely related are nearest together in the series.

I have examined all the specimens cited, with one or two exceptions. In each named group a type specimen is designated and deposited in Bernice P. Bishop Museum. Duplicates of this, termed isotypes, will be distributed to various institutions. All other collections cited are termed cotypes. Except as otherwise indicated a specimen or photograph of each of these is deposited in Bernice P. Bishop Museum. Specimens cited and marked (AF) are in the herbarium of the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii. The condition and sex of the specimens cited are shown in parentheses by the following abbreviations:

s.—sterile.
b.—budding.
fl.—flowers, sex undeterminable.
h.fl.—perfect, or hermaphrodite flowers.
p.fl.—pistillate flowers.
i.fr.—immature fruit.
m.fr.—mature fruit.

The names used are the earliest names applied to the groups which are valid under the International Rules for Botanical Nomenclature. Names based upon hybrid types are excluded. Where no valid name exists, one is here proposed. These names are descriptive adjectives applying to morphological or other characteristics, names of other plants ending in *oides,* personal names with genitive Latin endings, or geographic names. Geographic names have been made either by adding the termination *ensis* to the full Hawaiian place name, or the name has been used in its original form as an appositive in the nominative case. Manuscript names found in the herbarium have been disregarded.

In a recent list of vascular plants from the Hawaiian islands (Goteb. Bot. Tradg., vol. 10, pp. 179-180, 1936), Dr. Carl Skottsberg published the following names, credited to me, but without descriptions, based upon determina-

tions which I made for him in October, 1935: *Gouldia terminalis* (Hooker and Arnott) Hillebrand, emend. Fosberg var. *typica* Fosberg f. *gracilis* Fosberg; var. *antiqua* Fosberg; var. *antiqua* Fosberg f. *euantiqua* Fosberg and f. *kauensis* Fosberg; var. *cordata* (Wawra) Fosberg; var. *cordata* (Wawra) Fosberg f. *Nealae* Fosberg and f. *eucordata* Fosberg; var. *Kaalae* Fosberg f. *Russii* Fosberg; var. *konaensis* Fosberg f. *eukonaensis* Fosberg; var. *purpurea* Fosberg; var. *Skottsbergii* Fosberg; *Gouldia Hillebrandii* Fosberg. He also published the following hybrids which I determined for him: *G. St.-Johnii* Fosberg var. *typica* × *terminalis* var. *coriacea* Fosberg; *G. St.-Johnii* var. *Rockii* Fosberg × *terminalis* var. *macrocarpa* Fosberg f. *sclerophylla* Fosberg; *G. terminalis* var. *antiqua* × var. *konaensis* f. *eukonaensis*; *G. terminalis* var. *macrothyrsa* Fosberg × var. *Kaalae* f. *Russii*; and *G. terminalis* var. *Hosakai* Fosberg × var. *konaensis* f. *eukonaensis*.

Further field studies on Kauai have shown that *Gouldia St.-Johnii* var. *Rockii* is in reality a form of *G. terminalis* var. *stipulacea*, so the name *Gouldia St.-Johnii* var. *Rockii* Fosberg ex Skottsberg must remain a *nomen nudum*.

The publication of these names by Skottsberg is invalid under the rules of nomenclature, so that their valid publication dates from the present paper.

Genus GOULDIA Gray

Gouldia Gray: Am. Acad., Proc., vol. 4, p. 306, 1860.

Trees, shrubs, or woody vines, branchlets more or less 4-sided, first internode of branch never becoming more than a few mm long, first node very soon losing its pair of reduced leaves; leaves opposite, simple, entire, petioled to nearly sessile; stipules interpetiolar and intrapetiolar, attached at the sides to the upper side of the petiole, with the attachment more or less parallel to the side of the stem, meeting at the center of the petiole and being connate to each other for a short distance above the petiole, forming a short or subcylindric collar or stipular ring, with a triangular or blunt-acuminate lobe on each side between the petioles, the whole deciduous before the leaves, usually very early, leaving a V-shaped scar on the base of the petiole, and a scar shaped like a section of a concave lens across the side of the stem between the petioles, as much as 2 mm wide in the middle and 3 mm wide at the ends; inflorescence a simple or compound thyrse, with branches at right angles to the main axis, bracteate, with stipules at the lower nodes, these becoming vestigial and finally absent distally, thyrses usually terminal on the ordinary branchlets or on somewhat shortened lateral ones along the ordinary ones, or sometimes axillary (really terminal on very much condensed axillary branchlets but apparently axillary); flowers polygamous (gyno-dioecious), the perfect flowers having the anther appendages exserted and the pistil included, the pistillate flowers having well formed, but sterile, anthers included, and the stigma lobes ex-

serted; ovary inferior, urn-shaped, 2-celled, hypanthium becoming fleshy and dark blue or black at maturity, lower third of free portion of calyx connate into a shallow cup, the upper two thirds produced as four minute, triangular lobes, contiguous in flower, widely separated in fruit; corolla salverform with no distinction between tube and throat except where the throat is distended by the anthers, 4-lobed, valvate in bud, lobes linear to oblong, fleshy, at right angles to throat, the distal portion of the lobe somewhat reflexed at full maturity, usually bearing a short fleshy appendage on the dorsal side just below the tip, causing the bud to appear as though the tips of the lobes were free, corolla deciduous shortly after pollination, lobes and inside of the tube always glabrous; stamens inserted alternately with the lobes, in the throat of the corolla, filaments very short, anthers attached near the middle, anther linear or narrowly oblong, with a narrow apical sterile portion, or appendage, these not always the same length, even in all four anthers of the same flower, the appendage sometimes exserted, otherwise the whole anther included, anther 2-celled, each cell dehiscing by a longitudinal slit the full length of the fertile portion, the cell opening out wide; pollen grains spherical, minutely pitted, the pits sometimes running together, giving a rugulose appearance; style linear, bifid into two linear stigma-lobes, from half to fully as long as the style, the lobes at least partially exserted in pistillate flowers and included in perfect flowers, style deciduous with or shortly after the corolla; fruit spherical, dark blue to purplish black with anthocyanin pigment, crowned with the remains of the calyx, which forms a thin circular strip of tissue bearing four tiny remote teeth, the calyx lobes, or the scar left by this strip, with the scar of the corolla just inside this, the outer layers of the fruit fleshy, the inner layer hard and resembling a capsule, 2-celled, placentae axile, fleshy, shaped like flattened hemispheres, attached peltately, midway between top and bottom of the septum; seeds 4 to 40 (or more) in a cell, attached peltately, not so high as wide or long, compressed, through crowding, into irregular, angular shapes, endosperm horny, embryo straight, or almost so.

The genus, as here treated, consists of three closely related species, all confined to the Hawaiian islands.

It may be easily recognized in the field by its opposite, ordinarily large, bright green-glossy leaves; thyrses with branches at right angles to the main axis, pale greenish or purplish-green flowers and spherical, many-seeded fruits, the size of a large pea, bluish- or purplish-black, fleshy, and crowned with a low calyx ring with four minute triangular teeth.

1. **Gouldia terminalis** (Hooker and Arnott) Hillebrand (fig. 1, *a-d*).

Gouldia terminalis (Hooker and Arnott) Hillebrand: Fl. Haw. Is., p. 168, 1888.

Petesia terminalis Hooker and Arnott: Bot. Beechey's Voy., p. 85, 1832.

Gouldia sandwicensis Gray var. *terminalis* (Hooker and Arnott) Gray: Am. Acad., Proc., vol. 4, p. 310, 1860.

Kadua affinis Chamisso and Schlechtendal (name credited to these authors by De Candolle: Prodr., vol. 4, p. 431, 1830, but apparently never intended by the original authors as more than an expression of relationship, as it was published *Kaduae affinis*. See Heller, 4, p. 896.)

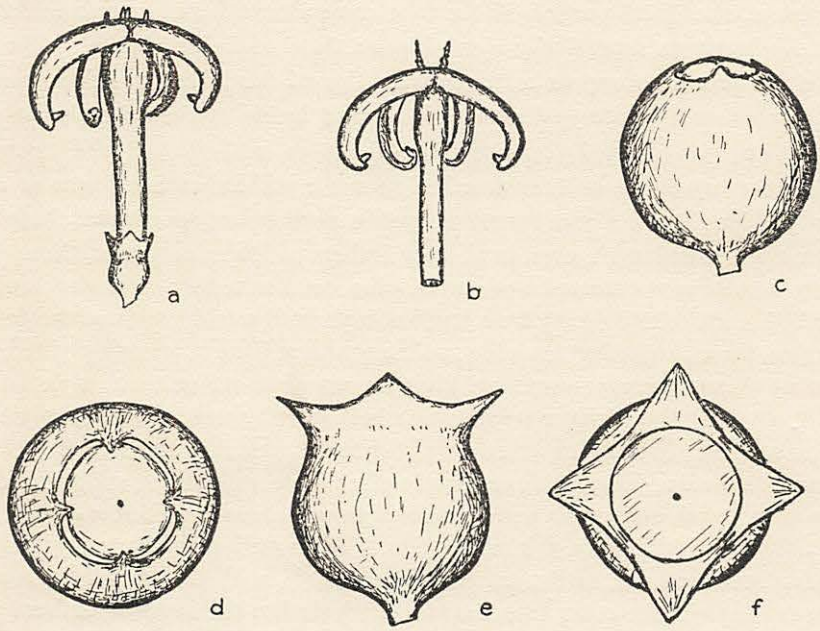


FIGURE 1.—Features of *Gouldia*: *a-d, Gouldia terminalis*; *e-f, G. St.-Johnii*: *a*, perfect flower; *b*, corolla and stigma of pistillate flower; *c, e*, fruit, side view; *d, f*, fruit, top view. (Approximately 2½ times natural size.)

Leaves never strongly convex above, or concave beneath, secondary veins never noticeably impressed above; thyrses terminal, rarely terminal and axillary; fruit with the calyx lobes never fleshy, usually appressed inward, rarely erect or to some degree spreading.

Gouldia terminalis seems to be the oldest valid name for the aggregation of varieties and forms here included. It is closely related to both *G. Hillebrandii* and *G. St.-Johnii* and may possibly have given rise to them. Of the many varieties included under this species, many would be, and some have been, made species by botanists who have a narrow species concept. Owing to the insignificant characters separating them, I have ranked them lower than species.

G. terminalis is found in some of its varieties on all of the larger Hawai-

ian islands, except Niihau and Kahoolawe. It is certain that it does not exist on Kahoolawe. Due to lack of specimens from Niihau it is uncertain whether or not it occurs there.

2. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **typica,** new variety (pl. 1).

Petesia terminalis Hooker and Arnott: Bot. Beechey's Voy., p. 85, 1832 (in part).

Frutex vel arbor parvum glabrum, ramuli subangulati, folia obovata plerumque cuneata non venulosa, petioli breves crassi, thyrsi ampli pyramidales nutantes.

Sprawling or erect shrub or small tree up to 5 meters tall, glabrous, branchlets 4-sided but weakly angled, fistulose, at least at tips, light gray or gray to pink; leaf blades usually obovate, sometimes broadly oblanceolate, oblong or elliptical, ordinarily more or less cuneate, acute or acuminate to obtuse at the apex, margins slightly but closely revolute, midrib heavy, prominent beneath, blade not at all venulose in fresh material, slightly so beneath in dried material, petiole up to 3 mm thick, occasionally as much as 13 mm long, but ordinarily much shorter, more or less winged; stipules with the lobe as wide as the distance between the petioles at a node, as long as this or less, triangular to ovate, margins entire to minutely erose or minutely serrulate, some with one or two teeth on each side, the lobe carinate with the carina prolonged at the apex of the lobe into a thick, blunt mucro, usually less than 1 mm long, sometimes almost absent, sometimes slightly reflexed, stipules not usually found below the second node from the apex of the branchlet, rarely persisting on 3 or 4 nodes; thyrses bluntly pyramidal, increasing in size somewhat between flowering and maturity, the ratio between length and width varying considerably, ordinarily more or less nodding, bracts at first node merely reduced leaves, retaining more or less the normal leaf shape, stipules normal but rather small, bracts at secondary nodes very much reduced, ovate-lanceolate, sessile, up to 5 mm long, stipules vestigial, reduced to a low membrane stretching between the bracts, with a tiny mucro in the center, bracts of more distal nodes reduced to tiny ovate-acuminate, carinate scales, usually under 3 mm long, stipules missing; flowers with ovary 1-2 mm long, free part of calyx 1-2 mm long, the lobes making up 0.5-1.2 mm of this, lobes spreading, triangular, acute or obtuse, corolla tube slender, 1 mm or less thick, 5-14 mm long, lobes broadly linear, 1.7-7 mm long; fertile anthers 2.3-4 mm long, fertile portion 2-4 mm, appendage from almost absent to 1 mm long, sterile anthers 2 mm long; style of perfect flowers 1.7-3.2 mm long, stigma lobes 1.1-3.3 mm long, style of pistillate flowers 4.5-5 mm long, stigma lobes 1.5-3 mm long, not quite completely exserted; fruit 5-10 mm in diameter, ordinarily 6-8 mm, calyx collar and teeth thin, appressed to the fruit.

Confined to the Koolau Range, Oahu, in moist and wet forested regions. Three more or less distinct forms are known, one fairly common over the whole range, the other two rather localized.

This variety is closely related to var. *Wawrana,* but not particularly closely to any other variety. There is apparently some affinity with var. *glabra* of Hawaii, and through some of the Molokai forms (particularly f. *wailauensis* and f. *Storeyi*) with var. *ovata.*

3. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **typica** Fosberg f. **eutypica,** new form.

Petesia terminalis Hooker and Arnott: Bot. Beechey's Voy., p. 85, 1832 (in part).

Gouldia terminalis (Hooker and Arnott) Hillebrand: Fl. Haw. Is., p. 169, 1888 (combination made here but applied to var. *macrothyrsa* and various varieties from other islands).

Gouldia coriacea (Hooker and Arnott) Hillebrand: Fl. Haw. Is., p. 168, 1888.

Gouldia sandwicensis Gray var. *terminalis* (Hooker and Arnott) Gray: Am. Acad., Proc., vol. 4, p. 310, 1860.

Gouldia sandwicensis Gray var. *coriacea* (Hooker and Arnott) Gray f. *α* Wawra and f. *β* Wawra: Flora, no. 19, pp. 294-295, 1874.

Internodi plerumque 2-4 cm longi, folia 4-16 cm longa 1.5-6 cm lata subcoriacea plerumque obovata valde cuneata, thyrsi ampli aliquanto robusti.

Internodes 1.5-4.5 cm long, commonly 2-4 cm; leaves 4-16 cm long, 1.5-6 cm wide, usually obovate, rarely broadly oblanceolate or elliptical, base cuneate, usually contracted to the petiole at the base, sometimes cuneate the whole way, petiole 4-13 mm long, usually 4-8 mm, 1.5-3 mm thick, usually 2 mm, thyrses 2-6.5 cm long and wide in flower, 3-8 cm long and wide in fruit, moderately heavy.

Oahu, Koolau Range: Beechey (larger twig), (Kew, photo at B. P. Bishop Mus.), (b.-i.fr.) type; Pupukea-Kahuku Trail, May 28, 1932, Otto Degener, Kwan Kee Park, and Y. Nitta 9441, (i.fr.); along divide overlooking Kahuku near Pupukea-Kahuku Trail, January 24, 1932, Degener, Park, and Kwon 9445, (i. fr.); near Honolulu, in valley east of Wilhelmina Rise, July 7, 1923, Degener 9497, (i. fr.); Wilhelmina Rise, June 18, 1923, Degener 9498, (i. fr.); Pauoa Flats, November 22, 1925, Degener 9499 (m. fr.); Kuliouou Valley, June 23, 1935, Degener and Park 9917, (p. fl.-i. fr.); Waimano Ridge, October 27-30, 1914, C. N. Forbes and Dean Lake 1991.O., (i. fr.); ridge south of Kipapa Gulch, Waipio, alt. 550 meters, September 18, 1932, Fosberg 8666, (i.fr.), and Fosberg 8668, (i.fr.); south ridge of South Opaeula Gulch, Paalaa, alt. 550 meters, September 25, 1932, Fosberg 8724, (i. fr.), and Fosberg 8733, (i. fr.); same locality and date, alt. 575 meters, Fosberg 8742, (i.fr.), alt. 560 meters, Fosberg 8757, (i. fr.); Waikane-Schofield Trail, Waikane, alt. 280 meters, October 16, 1932, Fosberg 8784, (i. fr.-m. fr.); ridge south of South Opaeula Gulch, Paalaa, alt. 500 meters, September 25, 1932, Fosberg 8848, (i. fr.); head of Pauoa Flats, Pauoa, alt. 600 meters, October 30, 1932, Fosberg 8969, (i. fr.); Pupukea-Kahuku Trail, Kaunala, alt. 460 meters, February 19, 1933, Fosberg and Duker 9205, (i.fr.-m.fr.); same locality and date, alt. 470 meters, Fosberg and Duker 9217, (i. fr.); Laie-Malaekahana Ridge, alt. 585 meters, April 15, 1933, Fosberg 9398, (b.-i. fr.); Laie-Waimea divide, alt. 660 meters, April 15, 1933, Fosberg 9413, (b.-h. fl. -m. fr.); Kipapa Gulch, Waipio, alt. 860 meters, August 6, 1933, Fosberg 9722, (h. fl.); same locality and date, alt. 850 meters, Fosberg 9724, (b. -m. fr.); Waikane-Schofield Trail, Waikane, alt. 300 meters, February 10, 1935, Fosberg and V. M. Oliveira 10797, (m. fr.); Konahuanui Trail beyond Pauoa, January 4, 1920, D. Wesley Garber 127, (i. fr.); Palolo Crater Ridge, April 25, 1920, Garber 393, (b. -i. fr.); Kalauao-Waimalu Ridge, alt. 500 meters, March 29, 1933, Fosberg 9348, (b.); Kalauao Ridge, Ewa Forest Reservation, alt. 520 meters, March 29, 1933, Fosberg 9355, (b. -fl.); Kalauao Ridge, alt. 500 meters, March 29, 1933, Fosberg 9325, (b.-p. fl.-m. fr.); Kalauao Ridge, alt. 540 meters, April 30, 1933, Fosberg 9467, (b. -h. fl. -m. fr.); ridge southeast of Maakua Gulch, Hauula, alt. 430 meters, October 15, 1933, Fosberg 10348, (i. fr.); Kalauao-Waimalu Ridge, alt. 540 meters, April 30, 1933, Fosberg 9463, (b. -h. fl. - i. fr.); south ridge of Kipapa Gulch, Waipio, alt. 1800-2,000 feet, May 15, 1932, M. Yamaguchi 1233, (fl.); Poamoho Trail, Laie, August 18, 1935, Degener, Park, Potter, Bush, and Topping 10011, (fl. -i. fr.); Waimano Trail, toward summit, October 6, 1935, Degener, Park, and Shigeura 10016; lower slopes of Konahuanui, above Manoa, May 13, 1895, A. A. Heller 2301, (i. fr.), and Heller 2301, (b.

-i. fr. -m. fr.) ; Wailupe, Hillebrand (in part), (p. fl. -h. fl.), (photo in B. P. Bishop Mus.) ; Kipapa Gulch, south ridge, Waipio, alt. 1200 feet, May 15, 1932, E. Y. Hosaka 514, (h. fl. -i. fr.) ; Kipapa Gulch, north ridge, Waipio, alt. 1,000 feet, May 29, 1932, Hosaka 560, (i. fr. -h. fl.) ; Kipapa Gulch, second north fork, alt. 1,000 feet, November 13, 1932, Hosaka 831, (m. fr.) ; Kipapa Gulch, alt. 1700 feet, May 6, 1933, Hosaka 1022, (h. fl.) ; Kipapa Gulch, Waipio, alt. 1700 feet, Hosaka 1114, (h. fl. -i. fr.) ; Kaluanui Valley, alt. 1800 feet, May 8, 1932, Hume 560, (b.) ; Pupukea-Kahuku Trail, alt. 1400-1600 feet, December 17, 1933, N. H. Krauss, (i. fr.) ; H. Mann and W. T. Brigham 489, (p. fl.) ; Punaluu, alt. 1500-2,000 feet, May 1932, A. Meebold, (h. fl.) ; ridge between Waimalu and Waimano, alt. 450 meters, March 27, 1933, W. Meineke, (h. fl.) ; Koolau, December 3-14, 1908, J. F. Rock 103, (i. fr.) ; Punaluu, December 7, 1908, Rock 106 and 107, (i. fr.) ; Pauoa Trail, January 7, 1909, Rock 992 (153), (i. fr.) ; head of Pauoa Valley, January 7, 1909, Rock 986 (153), (i. fr.) ; trail to Konahuanui, January 7, 1909, Rock 1076, (p. fl. -i. fr.) ; U. S. Exploring Expedition, (i. fr.) (U. S. Nat. Herbarium, no. 42355, photo seen) ; "ex herb. Hillebrand" Wawra 2390, (i. fr.), type of Wawra's *G. sandwicensis* var. *coriacea* form β, said by Hillebrand (5, p. 168) to come from Oahu! Wailupe and Niu, and from Maui! Hamakua; this specimen is obviously an Oahu plant and is possibly a duplicate of the Hillebrand collection cited above; Kipapa Gulch, south ridge, Waipio, alt. 1200 feet, May 15, 1932, Hosaka 513, (b. -h. fl.), this collection probably belongs here although the buds are very strange, having no appendages, thus resembling the buds of *Hedyotis* (*Kadua*).

F. *eutypica* is the common form throughout the range of *G. terminalis* Hillebrand var. *typica*. It is quite variable in many respects. Due to the fact that Hooker and Arnott drew up their description of *Petesia coriacea* from an obtuse-leafed specimen and their description of *Petesia terminalis* from an acute-leafed one, contrary to the common condition in each, Wawra and Hillebrand both applied the name *coriacea* to this plant. Later authors have followed them, except Heller, who correctly identified his specimens of this form as *Gouldia terminalis*.

4. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **typica** Fosberg f. **robusta,** new form.

Folia valde coriacea, basa subcordata, thyrsi valde robusti.

Leaves very heavy, coriaceous, blade up to 23 cm long, 6 cm wide, ordinarily smaller, oblong-lanceolate to obovate, apex slightly acuminate, base subcordate, petiole 5 mm or less long, very thick, winged; thyrses very heavy.

Oahu, higher portions of Koolau Range: Waiolani Ridge, (Lanihuli Trail), December 10, 1908, Forbes, (i.fr.), type; Waikane-Schofield Trail, Waikane, alt. 370 meters, May 14, 1933, Fosberg 9539, (h.fl.) ; Waikane-Schofield Trail, Kahana, alt. 700 meters, September 22, 1933, Fosberg 10283, (b.-fl.-i.fr.) ; Waikane-Schofield Trail, head of Kahana Valley, Kahana, alt. 750 meters, December 2, 1934, Fosberg 12180, (s.) ; same locality and date, alt. 730 meters, Fosberg 12181, (s.) ; Niu, April 1930, G. W. Russ, (h.fl.), (AF).

F. *robusta* grows with f. *eutypica* on the steep slopes near the crests of the mountains in very wet, brushy forests. Named *robusta* because of the characteristic heavy, robust leaves and thyrses.

5. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **typica** Fosberg f. **gracilis,** new form.

Frutex gracilis aliquanto scandens, internodi plerumque 1-1.5 cm longi, folii parvi, thyrsi graciles.

Slender shrub up to 3 meters tall, more or less scandent, branchlets only fistulose near the tips, internodes 1-4 cm long, usually 1-1.5 cm; leaves under 9 cm long and 3.5 cm wide, similar to small leaves of f. *eutypica,* petiole under 6 mm long, only very slightly winged; thyrse 6-7 cm long, 3.5-6 cm wide, slender.

Oahu, Koolau Range between Nuuanu and Manoa: Pauoa Flats, July 3, 1933, Degener 9474, (b.); Nuuanu, Hillebrand? (i.fr.); Manoa Cliff Trail, alt. 1800 feet, December 28, 1931, E. P. Hume 345, (b.-i.fr.), type; upper Pauoa Valley, August 2, 1922, Carl Skottsberg 67, (p.fl.-m.fr.); Manoa Valley, alt. 300-500 meters, August 18, 1922, Skottsberg 248, (b.-p.fl.); Manoa Cliff Trail, Manoa Valley, alt. 425 meters, July 15, 1933, Fosberg 9699 (b.-p.fl.); Manoa Cliff Trail, July 13, 1933, Duker, (b.-i.fr.).

A slender form much resembling f. *eutypica* except for the short internodes. Named *gracilis* because of its slender habit.

6. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **Wawrana,** new variety.

Gouldia coriacea (Hooker and Arnott) Hillebrand var. γ Hillebrand: Fl. Haw. Is., p. 168, 1888.

Ramuli hirtelli, folia tenuia infra venulosa infra hirtella, calyces ciliolati, ovaria hirtella, tubi corollarum hirtelli.

Branchlets curly hirtellous, not strongly angled, fistulose; leaves thin, conspicuously venulose beneath, usually curved at apex, producing on drying an apical fold, midrib hirtellous beneath on sides or throughout, secondary veins and blade more or less so, petioles ordinarily hirtellous, slightly winged; stipules hirtellous; thyrse less dense than in var. *typica,* with more slender peduncle and branches, peduncle strongly hirtellous, branches less so, pedicels only very minutely so; ovary usually more or less hirtellous, rarely glabrous, if hirtellous always much more so on the lower, contracted portion, almost universally glabrous or almost so on the upper portion, calyx lobes glabrous except for ciliolated margins, corolla tube puberulent on the lower two thirds, usually glabrous or nearly so on the upper third.

Oahu, Koolau Range: Kalihi Valley, October 22, 1908, Forbes, (b.); Waikane-Schofield Trail, divide between Wahiawa and Waianaeuka, alt. 700 meters, May 14, 1933, Fosberg 9529, (p.fl.), type; Kipapa Gulch, Waipio, alt. 500 meters, June 12, 1933, Fosberg 9546, (m.fr.); Kipapa Gulch, Waipio, alt. 700 meters, August 7, 1933, Fosberg 9762, (p.fl.-i.fr.); same locality and date, alt. 500 meters, Fosberg 9776, (b.); Hawaii (or Niu, Oahu), (no doubt the latter is correct), Hillebrand, (b.-i.fr.) (type of *G. coriacea* var. γ Hillebrand); Kipapa Gulch, south ridge, alt. 1700 feet, September 18, 1932, Hosaka 751, (p.fl.-i.fr.); Kipapa Gulch, alt. 1,000 feet, Hosaka 1052, (h.fl.-i.fr.); Kipapa Gulch, alt. 1800 feet, August 7, 1933, Hosaka 1183, (b.-i.fr.); Hauula, August 1908, Rock, (b.); Punalou Mt. (Punaluu), August 23, 1908, Rock, (b.); December 3, 1908, Rock 126, (i.fr.); December 3-14, 1908, Rock 153 (125), (i.fr.); Punaluu, December 3-14, 1908, Rock 755 (153), (i.fr.); Waiawa, near top of range, February, 1930, Russ, (b.-m.fr.). A specimen from Kaluanui, alt. 2300 feet, October 14, 1934, E. H. Bryan, Jr., (h.fl.) probably belongs here, though the leaves are more elliptical and the calyx lobes and upper third of the corolla tube are hirtellous, with a few hairs even on the under sides of the corolla lobes.

Var. *Wawrana* differs from var. *typica,* to which it is probably most closely related, chiefly in the thinner, venulose leaves and in being hirtellous, while var. *typica* is entirely glabrous. In the shape of the leaves and in the size of the inflorescence it resembles var. *arborescens* of Kauai, but var.

arborescens is glabrous and has very different branchlets. In leaf form and hairiness var. *Wawrana* resembles *G. Hillebrandii* var. *hawaiiensis,* but it differs strongly in other respects.

Var. *Wawrana* is named for Dr. Heinrich Wawra, whose *G. sandwicensis* var. *suffruticosa* is nearest to this variety but is based upon a hybrid type specimen.

7. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **arborescens** (Wawra), new combination.

Gouldia sandwicensis Gray var. *arborescens* Wawra: Flora, vol. 57, no. 18, p. 276, 1874.

Not *Gouldia arborescens* (Wawra) Heller: Minn. Bot. Stud., vol. 1, p. 896, 1897.

Woody vine, shrub, or slender tree; internodes 0.5-3 cm long; leaves obovate, strongly cuneate, usually curved at the apex, decidedly venulose beneath, secondary veins forming a small angle with the midrib, thus appearing close together, petioles 8-20 mm long, mostly about 15 mm; 1 mm or less thick; thyrse loose, usually somewhat drooping.

Confined to the eastern half of the Kauai mountain mass.

This variety is apparently not closely related to any other. In leaf form and size of thyrse it resembles var. *Wawrana,* but the latter is very hairy and has a different type of branchlets. In leaf form and also in the structure of the branchlets, to some extent, it resembles *G. Hillebrandii* var. *hawaiiensis,* but this also is hairy and very different in the type and placement of the thyrses.

8. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **arborescens** (Wawra) Fosberg f. **euarborescens,** new form.

Gouldia sandwicensis Gray var. *arborescens* Wawra: Flora, vol. 57, no. 18, p. 276, 1874.

Not *Gouldia arborescens* (Wawra) Heller: Minn. Bot. Stud., vol. 1, p. 896, 1897.

Ramuli carnosi fistulosi, internodi 1.5-3 cm longi, folia 7-10 cm longa, 3-5 cm lata, thyrsi maxime 15 cm longi latique.

Branchlets fleshy, fistulose, internodes 1.5-3 cm long; leaves up to 11 cm long and 7.5 cm wide, usually 7-10 cm long and 3-5 cm wide, usually curved at the apex; thyrse up to 15 cm long and wide when spread out, rather loose, more or less pendulous or drooping when in fruit.

Kauai, approximately the range of the variety: Hali Valley, June 11, 1926, Degener 9493, (i.fr.); Kaloko Reservoir (Kilauea), October 7, 1916, Forbes 513.K., (m.fr.); same locality, October 8, 1916, Forbes 538.K., (m.fr.); Hii Mts., October 22, 1916, Forbes 658.K., (p.fl.); Kalihiwai, 1913, Lydgate, (b.-h.fl.); Lihue, Mann and Brigham, (b.), (photo seen); Kahili bog, Wahiawa, alt. 2100 feet, December 24, 1933, St. John and Fosberg 13554, (i.fr.); trail to Kahili bog, Wahiawa Valley, Wahiawa, alt. 1800 feet, December 24, 1933, St. John and Fosberg 13602, (p.fl.-i.fr); Hanalei, Wawra 2185, (m.fr.), (Vienna, photo in B. P. Bishop Mus.), type; Pohakupili, Wawra 2052 (in part), (m.fr.?-b.), (Vienna, photo in B. P. Bishop Mus.).

The common form. Easily recognized by the very fleshy branchlets and the glabrous thyrse.

9. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **arborescens** (Wawra) Fosberg f. **albicaulis,** new form.

Ramuli albescenti angulati non carnosi, internodi 0.5-1.5 cm longi, thyrsi 3.5 cm longi 4 cm lati.

Branchlets very light colored, only the smallest fleshy or fistulose, internodes 0.5-1.5 cm long; thyrse small, 3.5 cm long, 4 cm wide (half-grown fruit).

Kauai: ridge west of Waiali Valley, July 29, 1909, Forbes 98.K., (i.fr.), type.

Named *albicaulis* because of the very light colored branchlets.

10. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **arborescens** (Wawra) Fosberg f. **macrophylla,** new form.

Folia magna plerumque 10-12 cm longa 5-6 cm lata, thyrsi hirtelli.

Leaves larger than in the other forms, blades up to 17 cm long and 8 cm wide, ordinarily 10-12 cm long, 5-6 cm wide, apex not much curved, petioles up to 2.5 mm thick; thyrse hirtellous.

Kauai, trail to Kahili bog, Wahiawa Valley, Wahiawa, December 24, 1933: alt. 2,000 feet, St. John and Fosberg 13585, (b.-i.fr.); alt. 1900 feet, St. John and Fosberg 13597, (b.-i.fr.-m.fr.), type; alt. 1700 feet, St. John and Fosberg 13603, (b.i.fr.) and 13605, (b.-i.fr.-p.fl.).

F. *macrophylla* is very close to the typical form and grows with it in the one locality from which this form is known. Named *macrophylla* from the large leaves.

11. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **elongata** (Heller), new combination.

Gouldia elongata Heller: Minn. Bot. Stud., vol. 1, p. 897, 1897.

Scandent shrub, branchlets slender, sharply angled, not at all fleshy; leaves elliptical to oblanceolate, somewhat venulose beneath, petioles 5-15 mm long, 1.5 mm or less thick; thyrse up to 24 cm long and 21 cm wide, open, rather stiff, not at all drooping.

Kauai, eastern half of the main mountain mass.

Var. *elongata* includes three forms, apparently not closely related to any others. Resembles var. *cordata* and its relatives only in habit and in the large, open thyrse.

12. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **elongata** (Heller) Fosberg f. **euelongata,** new form.

Gouldia elongata Heller: Minn. Bot. Stud., vol. 1, p. 897, 1897.

Internodi plerumque 5-10 cm longi, folia elliptica, petioli 10-15 mm longi, thyrsi maxime 24 cm longi 21 cm lati.

Internodes 2-14 cm long, ordinarily 5-10 cm; leaves elliptical, ordinarily obtuse at base and apex, petiole 10-15 mm long, 1.5 mm or less thick; thyrse up to 24 cm long, 21 cm wide, peduncle corky when in fruit.

Kauai, eastern half of the main mountain mass: Waiole Valley, August 2, 1909, Forbes 119.K., (b.); Power Line Trail, August 6-9, 1909, Forbes 148.K., (h.fl.-i.fr.); between the Hanapepe and Wahiawa Rivers, alt. 2500 feet, July 25, 1895, Heller 2606, (i.fr.), type; Kahili swamp, Wahiawa, Lihue-Koloa Forest Reserve, alt. 2100 feet, December 29, 1930, St. John and others[2] 10858¼, (i.fr.); trail to Kahili bog, Wahiawa Valley, Wahiawa, alt. 1600 feet, December 24, 1933, St. John and Fosberg 13611, (m.fr.).

Distinguished by very long internodes and by being completely glabrous.

13. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **elongata** (Heller) Fosberg f. **hirtellicostata,** new form.

Costae foliarum novellarum infra leviter hirtellae.

Internodes usually somewhat shorter; under side of midrib of young leaves minutely and sparsely hirtellous.

Kauai: Wahiawa Mts., August 1909, Forbes 233.K., (i.fr.); slopes of Kahili, above Kalihi bog, Kalaheo, alt. 2200 feet, December 24, 1933, St. John and Fosberg 13550, (i.fr.), type; trail to Kahili bog, Wahiawa Valley, Wahiawa, alt. 2,000 feet, December 24, 1933, St. John and Fosberg 13593, (i.fr.); same locality and date, alt. 1,650 feet, St. John and Fosberg 13607, (i.fr.).

Known only near the type locality. Named *hirtellicostata* because of the characteristic hairiness on the midrib.

14. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **elongata** (Heller) Fosberg f. **kahili,** new form.

Ramuli hirtelli, costae infra hirtellae, thyrsi hirtelli, internodi 1-3 cm longi, folia oblanceolata, petioli 5-10 mm longi.

Branchlets, petioles, lower sides of the midribs, and branches of thyrse decidedly hirtellous, internodes 1-3 cm long; leaf blades up to 9.5 cm long, 3.5 cm wide, broadly oblanceolate, petioles 5-10 mm long, peduncle and secondary branches of thyrse decidedly corky in fruit.

Kauai: slopes of Kahili, above Kahili bog, Kalaheo, alt. 2400 feet, December 24, 1933, St. John and Fosberg 13532, (m.fr.), type.

Somewhat doubtfully of this affinity. Named *kahili* for the mountain upon which it was collected.

15. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **osteocarpa,** new variety.

Gouldia arborescens (Wawra) Heller: Minn. Bot. Stud., vol. 1, p. 896, 1897.

Not *Gouldia sandwicensis* Gray var. *arborescens* Wawra: Flora, vol. 57, no. 18, p. 276, 1874.

Ramuli subteretes, internodi plerumque 5 cm longi, folia elliptica, petioli 10-30 mm longi, thyrsi ampli, endocarpi ossei.

[2] Collections labeled St. John and others, if from Kauai, were collected by Harold St. John, Edward Y. Hosaka, Edward Hume, Raymond Inafuku, James C. Lindsay, Robert Masuhara, Donald D. Mitchell, and William Wong; if from Hawaii, by H. St. John, R. S. Bean, J. W. Coulter, E. Y. Hashimoto, E. Y. Hosaka, J. C. Lindsay, and D. D. Mitchell; and if from Molokai, by H. St. John, R. J. Baker, J. W. Coulter, F. R. Fosberg, and T. G. Yuncker.

Scandent shrub or slender tree, up to 5 meters tall, branchlets angled, but inconspicuously so, almost terete, internodes 2-10 cm long, mostly about 5 cm; leaves elliptical, large, blades up to 13 cm long, 5 cm wide, not conspicuously venulose, secondary veins 10-15 mm apart, forming a very wide angle with the midrib, apex bluntly obtuse or rounded, base obtuse or acute, petiole 10-30 mm long, less than 1.5 mm thick; thyrse rather loose; fruit with corolla scar very conspicuous, and with endocarp irregularly thickened, hard and bony.

Kauai, at comparatively low altitudes, apparently around the entire mountain mass: between the Hanapepe and Wahiawa Rivers, July 15, 1895, Heller 2566, (b.-m.fr.) and Heller 2568, (b.-i.fr.-m.fr.); Laaukahi (Hoary Head Range), Haiku, alt. 1300 feet, December 22, 1933, St. John and Fosberg 13486, (i.fr.); Milolii Ridge, Waimea, alt. 1800 feet, December 27, 1933, St. John, Fosberg, and Oliveira 13746, (i.fr.); Wainiha Valley, Wainiha, alt. 500 feet, January 1, 1934, St. John, Fosberg, and Oliveira 13904, (i.fr.-m.fr.); same locality and date, alt. 850 feet, St. John, Fosberg, and Oliveira 13936, (b.-h.fl.-i.fr.), 13938, (i.fr.), and 13943, (i.fr.), type.

Extreme in the development of a hard endocarp. This variety is closely related to var. *macrocarpa,* which shows this same character to a lesser degree. A thickened endocarp may be most easily detected by pressing the mature fruit between the fingers, when it does not crush as easily as ordinary fruits. Named *osteocarpa* because of the bonelike endocarp.

16. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **macrocarpa** (Hillebrand), new combination.
Gouldia macrocarpa Hillebrand: Fl. Haw. Is., p. 170, 1888.

Shrub or small tree up to 5 meters tall; leaves broadly elliptical or obovate, rather glossy above, even when dry; thyrses compact, somewhat pyramidal, peduncle corky in fruit; endocarp somewhat irregularly thickened in mature fruit.

A loose aggregation of forms found in the high mountains of western Kauai.

Obviously related to var. *osteocarpa* by the thickening of the fruit and the form of the leaves. Not closely related to any other group.

17. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **macrocarpa** (Hillebrand) Fosberg f. **eumacrocarpa,** new form.
Gouldia macrocarpa Hillebrand: Fl. Haw. Is., p. 170, 1888.

Ramuli angulati hirtelli, internodi plerumque 2-5 cm longi, thyrsi 3-7 cm longi 2-6 cm lati hirtelli, ovaria aliquanto hirtella.

Branchlets distinctly angled, hirtellous, internodes 1.5-5 cm long, mostly 2-5 cm; leaves somewhat coriaceous, somewhat venulose beneath, broadly elliptical or obovate, rarely broader near the base, obtuse or rounded or slightly blunt-acuminate at the apex, sometimes curved at the apex or throughout, glabrous, secondary veins forming a very wide angle with the midrib, often almost or quite 90°, petiole 5-15 mm long, usually about 10 mm, about 1 mm thick; thyrse compact, in fruit 3-7 cm long, 2-6 cm wide, the only flowering ones available 1.5-2.3 cm long, 1.5 cm wide (fruiting thyrses on this plant very small also), peduncle corky in fruit, branches sometimes slightly so, all branches, peduncles and pedicels hirtellous, also the outside of the ovary; calyx lobes glabrous except for ciliolate margins.

Kauai, the prevailing form in the high mountains west of Waimea Canyon: Halemanu, Kokee, June 27, 1926, Degener 9486, (i.fr.); Kaholuamanu, above Waimea, September 1909, Forbes 433.K., (i.fr.-m.fr.); Knudsen, (b.-fl.-i.fr.-m.fr.), (Berlin, photo in

B. P. Bishop Mus.), type; Kaholuamanu, (J. F. Rock?) 96, (i.fr.); Kaholuamanu, March 3-10, 1909, Rock 1911 (154), (i.fr.); Kaholuamanu, September 1909, Rock 5539 (155), (i.fr.); September 1909, Rock 5883 (155)-5884 (155), (i.fr.); Kokee, Waimea, Na Pali-Kona Forest Reserve, December 26, 1930, St. John and others 10696, (m.fr.); same locality, alt. 3600 feet, December 27, 1933, St. John, Fosberg, and Oliveira 13693, (i.fr.-m.fr.), and 13696, (i.fr.-m.fr.); Kokee, Waimea, alt. 3300 feet, December 28, 1933, St. John, Fosberg, and Oliveira 13777, (h.fl.-m.fr.); Kumuwela Ridge, Waimea, alt. 3600 feet, December 28, 1933, St. John, Fosberg, and Oliveira 13808, (b.-i.fr.-m.fr.); same locality and date, alt. 3700 feet, St. John, Fosberg, and Oliveira 13816, (i.fr.-m.fr.), alt. 3500 feet, St. John and Fosberg 13845, (i.fr.), and alt. 3800 feet, St. John and Fosberg 13846, (i.fr.). A collection from Halemanu, February 14-26, 1909, Rock 2146, (b.-p.fl.), probably belongs here but the internodes are unusually short.

A large percentage of the fruits are attacked by insects causing enlargement.

18. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **macrocarpa** (Hillebrand) Fosberg f. **cuneata,** new form.

Gouldia sandwicensis Gray var. *hirtella* Gray f. α Wawra: Flora, vol. 57, no. 19, p. 295, 1874.

Not *Gouldia sandwicensis* Gray var. *hirtella* Gray: Am. Acad., Proc., vol. 4, p. 310, 1860.

Costae hirtellae, folia cuneata, ramuli subteres.

Hirtellous even on the midribs of the leaves, leaf bases cuneate or almost so, branchlets not so sharply angled, internodes tending to be short.

Kauai, most abundant on the west slope of the mountains: Halemanu, February 14-26, 1909, Rock 1848 (154)-1857 (154), (i.fr.), and 1872 (157)-1874 (157), (i.fr.); Milolii Ridge, Waimea, alt. 2500 feet, December 27, 1933, St. John and Fosberg 13766, (p.fl.-m.fr.); same locality and date, alt. 3100 feet, St. John and Fosberg 13769, (p.fl.-i.fr.), type; Lehua Macanoi (Lehuamakanoi) over Waimea, Wawra 2132 a, (b.).

Since Wawra misapplied Gray's name, var. *hirtella,* it seems best to discard *hirtella* altogether. Gray's name, as is proved by his specimen, applies to a plant from Hawaii. It was published as a *nomen nudum,* and, though Wawra's description might be said to validate it, its continued use would only perpetuate a confusion. Therefore the form here described is called f. *cuneata,* from the cuneate bases of the leaves, which distinguish it from the other forms of this variety.

19. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **macrocarpa** (Hillebrand) Fosberg f. **sclerophylla,** new form.

Folia parva maxima 7 cm longa, 4 cm lata, coriacea, revoluta.

Leaves small, up to 7 cm long and 4 cm wide, very coriaceous, more conspicuously revolute at the margins, stems decidedly square when young, usually soon becoming nearly terete (not in St. John, Fosberg, and Oliveira 13824).

Kauai, head of Waimea Canyon: Waimea drainage basin, west side, July 3-August 18, 1917, Forbes 807.K., type, and 1089.K.; "Kauai", October 1916, Rock; Kumuwela Ridge, Waimea, alt. 3700 feet, December 28, 1933, St. John, Fosberg, and Oliveira 13824; same locality and date, alt. 3500 feet, St. John, Fosberg, and Oliveira 13848.

Very close to f. *eumacrocarpa,* possibly a form of it resulting from growth in exposed situations. Named *sclerophylla* from the hard, coriaceous leaves.

20. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **macrocarpa** (Hillebrand) Fosberg f. **sambucina** (Heller), new combination.

Gouldia sambucina Heller: Minn. Bot. Stud., vol. 1, p. 898, 1897.

Very similar to f. *eumacrocarpa* but entirely glabrous, branchlets less conspicuously angled, internodes mostly short, 1-3 cm long.

Kauai, known only from Kaholuamanu: Kaholuamanoa (Kaholuamanu) above Waimea, September 10-16, 1895, Heller 2883, (i. fr.); Kaholuamanu, March 3-10, 1909, Rock 1935, (m. fr.).

21. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **macrocarpa** (Hillebrand) Fosberg f. **teres,** new form.

Folia ovata infra venulosa hirtellaque thyrsi terminales lateralesque.

Branchlets angled at first, soon becoming terete, leaves with a tendency to be ovate, rather venulose beneath, sparsely hirtellous on under side of midrib and usually on under side of blade also; thyrse up to 6 cm long and wide, terminal and on numerous small side branchlets near the ends of the main branchlets.

Kauai, Kaholuamanu: March 3-10, 1909, Rock 1905, (h. fl.), and 1944-1945, (i. fr.); September 1909, Rock 5529(157)-5535(157) (apparently all the same collection), (b.-i.fr.), type (5535 is the type sheet).

Named *teres* from the terete branchlets.

22. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **glabra,** new variety.

Ramuli subteretes, folia obovata cuneata non venulosa, thyrsi ampli.

Branchlets scarcely angled, fistulose, internodes 1-5 cm long, mostly 2-4 cm; leaves obovate, base cuneate, apex rounded but somewhat acuminate, not ordinarily strongly venulose, veins at a very wide angle with midrib; thyrse loose, often drooping or pendulous, often very large.

Hawaii, Hamakua coast to Kilauea region.

Related to var. *konaensis,* var. *Hosakai,* and perhaps var. *kapuaensis* of the southern and western regions of Hawaii. Distinguished by its strongly cuneate leaves, loose inflorescence, and by being glabrous in all parts. Named *glabra* because it is glabrous.

23. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **glabra** Fosberg f. **euglabra,** new form.

Frutex, petioli alati 8-13 mm longi 1-2 mm crassi, thyrsi maxime 18 cm longi latique.

Shrub up to 4 meters tall; leaves up to 15 cm long, 5 cm wide, petiole winged, 8-13 mm long, 1-2 mm thick; thyrse up to 18 cm long and wide, very loose, internodes of branches of thyrse very long, the whole often pendulous.

Hawaii, region between Hilo and Kilauea: between Glenwood and 29 Miles, June 15, 1929, Degener 9456, (i.fr.); Puu Oo Trail above Olaa Flume, Hilo District, alt. 800

meters, December 10, 1933, Fosberg 10434, (b.-p.fl.-i.fr.-m.fr.), type; Puu Oo Trail above Olaa Flume, Hilo District, alt. 760 meters, December 10, 1933, Fosberg 10438, (p.fl.-i.fr.); Hilo, 1862, Hillebrand (in part, only two right hand twigs on sheet, (i.fr.).

24. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **glabra** Fosberg f. **waipioensis,** new form.

Gouldia coriacea (Hooker and Arnott) Hillebrand var. ϵ Hillebrand: Fl. Haw. Is., p. 168, 1888.

Folia magna venulosa, petioli 30 mm longi non alati.

Leaf blades large, 12.5 cm long, 9 cm wide, venulose, petiole not winged, 30 mm long.

Hawaii: Waipio, Hillebrand, (Berlin, photo and fragment in B. P. Bishop Mus.), (i.fr.), type.

Named for Waipio Valley, the type locality.

25. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **glabra** Fosberg f. **parvithyrsa,** new form.

Folia curvata, thyrsi parvi maxime 4 cm longi latique.

Leaves curved, petioles scarcely winged; thyrses small, up to 4 cm long and wide.

Hawaii, central part of Hamakua coast: Kalua, June 1909, Abbé Faurie 356, (b.-fl.), type.

Named *parvithyrsa* because it has much smaller thyrses than the other forms of this variety.

26. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **bobeoides,** new variety.

Internodi 0.5-4 cm longi, folia maxime 12.5 cm longa 6 cm lata obovata subcuneata vel cuneata subcoriacea, petioli 3-10 mm longi, 1-2 mm crassi, thyrsi 1-2 mm longi latique, pedunculi in fructubus suberosi.

Branchlets weakly angled, scarcely fistulose, internodes 0.5-4 cm long; leaves up to 12.5 cm long, 6 cm wide, obovate, rounded at the apex, cuneate to gradually contracted at the base, subcoriaceous, somewhat venulose beneath, petiole 3-10 mm long, 1-2 mm thick, somewhat winged; thyrse roughly spherical, 1-2 cm across, peduncle corky in fruit.

Lanai: Kaiholena Valley, June 1913, Forbes 6.L., (i.fr.), type; August 1913, Munro 40, (i.fr.).

Apparently somewhat closely related to var. *glabra* and var. *kapuaensis* of Hawaii. Named *bobeoides* because of its resemblance in aspect to some members of the genus *Bobea.*

27. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **konaensis,** new variety.

Ramuli teretes fistulosi hirtelli, folia obovata coriacea, thyrsi 3-7 cm longi 3-6 cm lati hirtella.

Branchlets terete, fistulose, internodes 3-9 cm long, usually 5-8 cm, branchlets hirtellous; leaves obovate, often somewhat curved, base more or less cuneate, apex obtuse, coriaceous; thyrse 3-7 cm long, 3-6 cm wide, hirtellous.

Hawaii: Kona and Kau to Kilauea, in moist forests.

Related to var. *glabra,* var. *Hosakai,* and var. *kapuaensis.* Named for the Hawaiian district of Kona.

28. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **konaensis** Fosberg f. **eukonaensis,** new form.

Frutex, folia maxime 13 cm longa 6 cm lata, petioli 10-15 mm longi 2 mm crassi.

Weak shrub 5 meters tall, leaves up to 13 cm long, 6 cm wide, obovate, often somewhat curved, base cuneate, apex obtuse, often somewhat acuminate, varying greatly in width, the wider leaves having the veins at a wide angle with the midrib, somewhat venulose, petiole 10-15 mm long, 2 mm thick (winged in Fosberg 10090); thyrse becoming compact at maturity because of the rather large size of the fruit, (a few stunted thyrses in an axillary position in St. John 11291).

Hawaii, South Kona and Kau, to the Kilauea region, in moist to almost dry forest: edge of Napau Crater, January 25, 1930, Degener, Iwasaki, Brumaghim, and Bartram 9453, (i.fr.?-m.fr.); near Kilauea, September 22, 1926, Skottsberg 1918, (i.fr.-m.fr.); rim of Napau Crater, Kilauea, alt. 800 meters, August 29, 1933, Fosberg 10090, (i.fr.); Kilauea, April 1911, Rock 8785, (b.-i.fr.); Manuka, Kau, January 28, 1912, Rock 10031, (in part), (m.fr.), type; South Kona, lava flows beyond Kapua, August 1917, Rock 17116, (i.fr.); Manuka Mauka, alt. 1900 feet, December 24, 1931, St. John and others 11291, (b.-i.fr.-m.fr.).

29. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **konaensis** Fosberg f. **latifolia,** new form.

Folia magna 13 cm longa 8 cm lata robusta, petioli 10 mm longi 3 mm crassi subalati.

Leaves large, 13 cm long, 8 cm wide, heavy, petioles 10 mm long, 3 mm thick, slightly winged.

Hawaii, North Kona: Puuwaawaa, June 18, 1909, Rock 3866, (b.-p.fl.), type.

Known only from the type collection. Named *latifolia* because of the broad leaves.

30. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **Hosakai,** new variety.

Frutex, internodi 1.5-6 cm longi, folia elliptica, petioli 10-15 mm longi 1-1.5 mm crassi, thyrsi maxime 4 cm longi latique.

Shrub 3 meters tall, branchlets scarcely angled, internodes 1.5-6 cm long, 6 cm on main branches of specimen, 1.5-3 cm on small branchlets; leaves up to 13 cm long, 4.5 cm wide, blade elliptical to slightly obovate, apex obtuse to acute, base acute, not conspicuously venulose, petiole 10-15 mm long, 1-1.5 mm thick, slightly winged; thyrse hemispherical, up to 4 cm long and wide, flowers not numerous but fruits so large as to make the mature thyrses appear very compact.

Hawaii, Manuka, Kau District: Manuka Mauka, alt. 1600 feet, December 26, 1931, St. John, Hashimoto, Hosaka, Lindsay, and Mitchell 11330, (p.fl.-i.fr.-m.fr.), type.

Named for E. Y. Hosaka, of Bernice P. Bishop Museum, who was one of the collectors of the type collection, and who is actively engaged in Hawaiian botanical work.

31. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **kapuaensis,** new variety.

Ramuli teretes, internodi 0.5-4 cm longi, folia obovata cuneata obtusa, thyrsi maxime 6.5 cm in diametro.

Branchlets almost terete, internodes 0.5-4 cm long, usually 1-2 cm; leaves up to 10 cm long, obovate, apex obtuse, base cuneate, thyrse up to 6.5 cm across, spherical, hirtellous, compact (in large ones rather loose).

Hawaii, South Kona and Kau.

Var. *kapuaensis* includes three closely related forms, related to var. *glabra,* var. *Hosakai,* and var. *konaensis.* Named for the type locality, Kapua, Hawaii.

32. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **kapuaensis** Fosberg f. **eukapuaensis,** new form.

Ramuli subhirtelli, folia infra hirtella, thyrsi hirtelli.

Branchlets almost terete, slightly hirtellous, leaves up to 10 cm long, 4 cm wide, thin, somewhat venulose, under side of midrib hirtellous, petioles up to 10 mm long, 1 mm thick; thyrse hirtellous.

Hawaii, Kapua, Kona: Rock, (m.fr.), and Rock, (b.-i.fr.-m.fr.), type.

33. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **kapuaensis** Fosberg f. **pittosporoides,** new form.

Frutex glabrus, ramuli teretes, folia angusta.

Branches terete, leaves narrower, whole plant glabrous.

Hawaii, Manuka, Kau, January 28, 1912, Rock 10031, (m.fr.), type.

Named *pittosporoides* because in habit and appearance it resembles certain Hawaiian members of the genus *Pittosporum.*

34. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **kapuaensis** Fosberg f. **rigidifolia,** new form.

Arbor, folia parva rigida non venulosa, petioli 5 mm longi 1.5-2.5 mm crassi.

Bushy tree 4 meters tall; leaves mostly small, very stiff, not venulose, midrib usually only slightly hirtellous or not at all so, petioles 5 mm long, 1.5-2.5 mm thick, somewhat winged.

Hawaii: floor of Napau Crater, Kilauea, alt. 750 meters, August 29, 1933, Fosberg 10093, (p.fl.-i.fr.), type, and Fosberg 10109, (i.fr.); Makaopuhi Crater, Hawaii National Park, alt. 880 meters, April 23, 1935, Oliveira 3, (b.-p.fl.-i.fr.-m.fr.).

Named *rigidifolia* because of its stiff leaves.

35. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **Degeneri,** new variety.

Internodi 2.5-8.5 cm longi, folia magna venulosa obovata cordata vel subcordata, thyrsi magni maxime 23 cm longi 14 cm lati.

Branchlets angled but not conspicuously so, quite fistulose, internodes 2.5-8.5 cm long, leaves 15-21 cm long, 5.5-7 cm wide, obovate, apex acute to obtuse, slightly curved, or in dried specimens, folded, gradually tapering toward the base, then abruptly con-

tracted to a cordate or subcordate base, decidedly venulose, petiole 2-7 mm long, 3 mm thick, strongly winged; thyrse large, in flowering specimen 15 cm long, 11 cm wide, in fruiting specimen 23 cm long, 14 cm wide, very loose, peduncle decidedly corky.

Oahu, valleys at the southeastern end of the Koolau Range: western slope of Niu Valley, May 21, 1932, Degener, Park, and Yamamoto 9433, (p.fl.); right fork Wailupe Valley, January 12, 1920, Garber and Forbes 166, (i.fr.), type; Honolulu, Manoa, October 1935, Meebold 20419, (i.fr.-m.fr.).

Closely related to var. *macrothyrsa* of the Waianae Mountains, Oahu. Varieties *stipulacea, Degeneri, macrothyrsa, rotundifolia, Skottsbergii, angustifolia, cordata, subcordata, pedunculata,* and *purpurea* form a series of closely related varieties extending from Kauai to the Kohala Mountains and Mauna Loa, Hawaii. They are perhaps also represented on Kauai by var. *elongata,* but the evidence for this relationship is very weak.

Named for Mr. Otto Degener, who collected one of the three known collections of the variety, and whose work with the Hawaiian flora is well known.

36. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **macrothyrsa,** new variety.

Gouldia terminalis (Hooker and Arnott) Hillebrand: Fl. Haw. Is., p. 169, 1888 (in part).

Gouldia sandwicensis Gray var. *terminalis* (Hooker and Arnott) Gray, of Wawra: Flora, vol. 57, no. 18, p. 278, 1874.

Ramuli angulati, internodi 3-7 cm longi hirtelli, folia oblonga vel ovata vel obovata vel orbiculares, costa hirtella, thyrsi magni maxime 25 cm longi 24 cm lati ampli, pedunculi suberosi in fructubus.

Woody vine, scandent to erect shrub or tree, up to 5 meters tall, branchlets distinctly angled, slightly fistulose, internodes 0.5-15 cm long, usually 3-7 cm, often sparsely, sometimes quite densely hirtellous; leaves up to 14 cm long, 6.5 cm wide, blade oblong, ovate or obovate to almost orbicular, base cordate or subcordate, apex obtuse or rounded to acuminate, secondary veins distinct but not prominent, midrib more or less hirtellous beneath, especially along the sides, blade in some cases sparsely hirtellous beneath, petiole up to 5 mm (rarely 8 mm) long, 1.5-2.5 mm thick, only slightly winged, the leaves often decidedly reflexed; thyrse terminal or on short lateral branchlets, in flower 3.5-11 cm long, 3-5 cm wide, in fruit 3.5-25 cm long, 3-24 cm wide, the ratio between the length and width varying tremendously, peduncle in fruiting thyrse 2.5-12.5 cm long, ordinarily distinctly corky, making the thyrse appear not sharply distinct from the stem, thyrse glabrous to hirtellous, becoming less hirtellous on the smaller divisions; ovary, calyx and corolla glabrous, except for minute ciliolae or papillae on the calyx lobes; calyx lobes tending to be spreading in mature fruits.

Oahu, Waianae Mountains below 1,000 meters altitude, and in the northwest corner of the Koolau Range: trail to Kaala, alt. 1700 feet, February 18, 1928, Bergman, (i.fr.); Kukuiala Valley, alt. 2,000 feet, October 9, 1934, E. H. Bryan, Jr. 825, (i.fr.-m.fr.); near ridge overlooking Makua and Kahanahaiki Valleys, July 10, 1932, Degener, Park, and Nitta 9436, (b.); Makaha Valley, Kaala Range, February 12-19, 1909, Forbes, (m.fr.); Mokuleia, slopes of Kaala, April 26-May 16, 1912, Forbes, 1780.O., (m.fr.); second gulch east of Puu Kaupakuhale, Mokuleia, Puu Kaala, alt. 625 meters, October 23, 1932, Fosberg and St. John 8931, (i.fr.); Ekahanui Gulch, Puu Kaua, Honouliuli, alt. 650 meters, December 6, 1932, Fosberg and Storey 8983, (i.fr.); Puu Kaala, Wai-

anaeuka, alt. 920 meters, November 5, 1933, Fosberg 10378, (s.); Mokuleia Forest Reserve, Mokuleia-Makua divide, alt. 2500 feet, November 25, 1932, St. John 12237, (b.-i.fr.); Piko Trail, Keaau-Makua Forest Reserve, Makua, alt. 2500 feet, November 25, 1932, St. John 12246, (i.fr.); Puu Manawahua, alt. 2500 feet, December 8, 1929, Hosaka 54, (i.fr.); Puu Kanehoa, alt. 2200 feet, March 22, 1931, Hosaka 372, (b.-m.fr.); Puu Kaala, east slope, Waianaeuka, alt. 870 meters, January 8, 1933, Fosberg 9099, (i.fr.-m.fr.); same locality and date, alt. 770 meters, Fosberg 9100, (i.fr.); small canyon above Kaala Trail, Waianaeuka, alt. 675 meters, January 8, 1933, Fosberg 9112, (i.fr.); Kaala Trail above Schofield, Waianaeuka, alt. 620 meters, January 8, 1933, Fosberg 9113, (i.fr.), and Fosberg 9114, (i.fr.-m.fr.); same locality and date, alt. 645 meters, Fosberg 9115, (i.fr.-p.fl.), alt. 615 meters, Fosberg 9116, (i.fr.-m.fr.); Haleauau Valley, Puu Kaala, Waianaeuka, alt. 850 meters, February 24, 1935, Fosberg 10818, (b.-m.fr.), type; Kanehoa, alt. 975 meters, March 22, 1931, Hume 131, (m.fr.); ridge to Puu Kanehoa, alt. 2,000 feet, January 18, 1932, Hume 486, (i.fr.); Makaha Valley, alt. 2,000 feet, April 3, 1932, Hume 523, (p.fl.); Haleauau Valley, Waianaeuka, alt. 2600-2800 feet, October 15, 1933, Krauss, (i.fr.); Puu Kaala, Waianaeuka, January 8, 1933, Krauss, (i.fr.); Kaala Mts., 1911, Rock, (i.fr.); Kaala Mts., August 5, 1908, Rock 23, (h.fl.); Makaleha, April 1918, Rock 17078, (m.fr.); east ridge of Puu Kanehoa, Honouliuli, January 7, 1934, St. John 14033, (i.fr.); same locality and date, alt. 2450 feet, St. John 14038, (i.fr.), alt. 2400 feet. St. John 14045, (i.fr.), and alt. 2300 feet, St. John 14053, (i.fr.); "Berge von Waianae", Wawra 2518, (b.); Mokuleia, alt. 1200 feet, July 18, 1924, Wilder (Brown) 1286, (b.-h.fl.); main divide north of Palikea, Honouliuli, alt. 880 meters, June 30, 1935, Fosberg 10963, (b.-h.fl.); near head of Makaha Valley, south side, alt. 560 meters, March 31, 1935, Fosberg 10892, (b.-m.fr.); same locality and date, alt. 620 meters, Fosberg 10890, (m.fr.); Puu Kawiwi-Puu Kaala Ridge, Makaha-Waianae Kai, alt. 750 meters, March 31, 1935, Fosberg 10836, (b.-i.fr.); near ridge overlooking Makua and Kahanahaiki Valleys, July 10, 1932, Degener, Park, and Nitta 9436, (b.-h.fl.). Koolau Range: south ridge of South Opaeula Gulch, Paalaa, alt. 570 meters, September 25, 1932, Fosberg 8728, (b.); same locality and date, alt. 560 meters, Fosberg, 8744, (b.); same locality, alt. 540 meters, August 25, 1932, Fosberg 8747, (b.-h.fl.); ridge south of South Opaeula Gulch, Paalaa, alt. 615 meters, September 24, 1933, Fosberg 10304, (b.-i.fr.); same locality and date, alt. 610 meters, Fosberg 10306, (p.fl.-i.fr.); alt. 550 meters, Fosberg 10309, (b.-h.fl.-i.fr.); South Opaeula Gulch, September 24, 1933, Muir, (h.fl.). Pupukea-Kahuku Trail, August 12, 1930, Christophersen 1381, (b.-h.fl.-i.fr.); Poamoho Trail, Laie, August 18, 1935, Degener, Park, Bush, Topping, and Potter 10015, (b.-h.fl.); right of ridge to Puu Peahinaia, alt. 1400 feet, October 4, 1931, Hume 206, (i.fr.); ridge to Puu Peahinaia, alt. 1600 feet, October 4, 1931, Hume 207, (i.fr.); south ridge of Kipapa Gulch, Waipio, alt. 1400 feet, October 29, 1929, St. John 9964; Kawailoa, alt. 1,000 feet, November 20, 1934, Welch, (i.fr.); Pupukea-Kahuku region, July 19, 1931, Degener and Park 9447 a and b (from same plant, one sheet teratological), (b.-h.fl.-i.fr.).

Most closely related to var. *rotundifolia* of Molokai; quite close to var. *Degeneri* of Oahu and to var. *angustifolia* of Molokai. Named *macrothyrsa* because of the size of the thyrse.

37. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **rotundifolia,** new variety.

Arbor, ramuli valde angulati, internodi 1-3 cm longi, folia elliptica vel obovata maxime 6 cm longa 4.5 cm lata venulosa hirtella non coriacea thyrsi maxime 4 cm longi 5 cm lati hirtellipilosi.

Tree up to 5 meters tall, branchlets slightly fistulose, sharply angled, terminal internode yellow hirtellous, internodes 1-3 cm long; leaves broadly elliptical or obovate, apex round, base subcordate or round, or rarely cordate, blade up to 6 cm long, 4.5 cm wide,

venulose, not coriaceous, midrib hirtellous-pilose beneath, petiole 5-7 mm long, 1-1.5 mm thick, somewhat winged; thyrse up to 4 cm long, 5 cm wide, loose, peduncle and branches conspicuously yellow hirtellous-pilose; immature fruit with disk conspicuously conical, mature fruit unknown.

Molokai: trail on ridge east of Mapulehu Valley, alt. 1900 feet, December 29, 1932, St. John and Fosberg 12911, (b.-h.fl.-i.fr.), type.

Most closely related to var. *macrothyrsa* of Oahu. Named *rotundifolia* because of the broad, almost round leaves.

38. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **Skottsbergii,** new variety.

Ramuli angulati, folia obovata subcordata non venulosa infra hirtella, thyrsi hirtelli, calyces ciliolati, corollae hirtellae.

Branchlets strongly angled, hirtellous, internodes 2-5 cm long; leaves up to 9 cm long, 4.5 cm wide, obovate-cuneate (upper pair oblong, acute), base subcordate, slightly oblique, apex broadly rounded, very slightly acuminate, blade not venulose, hirtellous beneath, strongly so on midrib, the hairs on the blade in small groups of two or three hairs originating at one point, making it appear stellate, petiole 5 mm long, winged, hirtellous; thyrses small, 3 cm across, hirtellous even to the pedicels, peduncle corky in fruit; ovary hirtellous, calyx lobes glabrous except for ciliolate margins, the entire outside of the corolla, including the lobes, hirtellous; calyx lobes more or less spreading in fruit.

Hawaii: south slope of Mauna Loa, Koa Camp, September 24, 1926, Skottsberg 86, (b.-p.fl.-m.fr.), type, (in herb. Göteborg).

A very distinct, but little known variety, whose relationships are not clear. In most respects it resembles var. *rotundifolia* and var. *macrothyrsa,* but in its extreme hairiness, and its somewhat spreading calyx lobes it suggests *G. St.-Johnii.* For the present it may be placed closest to var. *rotundifolia* and var. *macrothyrsa.*

39. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **stipulacea** (Wawra), new combination.

Gouldia sandwicensis Gray var. *stipulacea* Wawra: in Hillebrand, Flora, vol. 57, no. 19, p. 297, 1874.

Gouldia hirtella Hillebrand var. *stipulacea* Wawra: Fl. Haw. Is., p. 170, 1888.

Gouldia hirtella Hillebrand var. *epiphytica* Hochreutiner: Candollea, vol. 5, p. 254, 1932.

Semiscandent shrub, branchlets slightly angled, hirtellous when young, internodes 1-5 cm long; leaves broadly oblong, elliptical or rarely obovate, apex rounded, base cordate to rounded or rarely acute, subcoriaceous, strongly venulose beneath, hirtellous beneath, particularly on the midrib and main veins, blade 2-6 cm long, 1.5-4 cm wide, petiole up to 5 mm long, 1-2 mm wide, somewhat flattened, hirtellous; thyrse small, up to 2.5 cm across, hirtellous; ovary glabrous, calyx lobes minutely ciliolate; corolla tube rather slender, bright purple, lobes yellowish green.

Found in the wettest parts of the high mountains of Kauai from Waialeale to Kalalau Valley.

Apparently most closely related to var. *rotundifolia.*

40. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **stipulacea** (Wawra) Fosberg f. **eustipulacea,** new form.

Gouldia sandwicensis Gray var. *stipulacea* Wawra: in Hillebrand, Flora, vol. 57, no. 19, p. 297, 1874.

Gouldia hirtella Hillebrand var. *stipulacea* Wawra: in Hillebrand, Fl. Haw. Is., p. 170, 1888.

Thyrsi leviter hirtelli, tubi corollarum glabri.

Thyrses slightly hirtellous, corolla tubes glabrous.

Kauai: "Plateau des Waialeale, 8000'" (?), Wawra 2176, (b.-i.fr.), type; high plateau of Waialeale, Knudsen, (fl.); "Kauai" October 1916, Rock, (fl.-i.fr.); northwest end of Alakai Swamp, Na Pali-Kona Forest Reserve, alt. 3500-4,000 feet, December 27, 1930, St. John and others 10790, (b.-h.fl.); trail from Alakai Swamp to head of Kalalau Valley, alt. 1200 meters, January 3, 1936, Fosberg 12774, (b.-i.fr.); same locality and date, Fosberg 12777, (b.-fl.-i.fr.); near Lehua Makanoi, Alakai Swamp, alt. 1200 meters, January 3, 1936, Fosberg 12784, (b.-fl.-i.fr.-m.fr.), and Fosberg 12763, (b.-p.fl. i.fr.-m.fr.); Kilohana Lookout, head of Wainiha Valley, alt. 1,240 meters, January 3, 1936, Fosberg 12782, (b.-i.fr.).

41. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **stipulacea** (Wawra) Fosberg f. **Rockii,** new form.

Thyrsi valde hirtelli, tubi corollarum breviter hirtelli.

Thyrses strongly hirtellous, corolla tubes very shortly hirtellous.

Kauai: "Kauai, Oct. 1916", Rock, (b.-fl.), type; near Lehua Makanoi, Alakai Swamp, alt. 1200 meters, January 3, 1936, Fosberg 12755, (b.-i.fr.); plateau at head of Kalalau Valley, alt. 1,250 meters, December 29, 1935, Fosberg 12672, (b.-h.fl.-i.fr.).

Named for Mr. J. F. Rock, collector of the type and for many years a student of the Hawaiian flora.

42. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **angustifolia,** new variety.

Gouldia terminalis (Hooker and Arnott) Hillebrand, var. β Hillebrand: Fl. Haw. Is., p. 169, 1888 (in part).

Ramuli valde angulati, internodi plerumque 3-8 cm longi, folia membranosa, acuminata lanceolata vel elliptica non venulosa, costae infra hirtellae, petioli maxime 10 mm longi 1 mm crassi, thyrsi maxime 12 cm longi 9 cm lati pedunculi suberosi.

Branchlets sharply angled, fistulose, internodes 1-12 cm long, mostly 3-8 cm; leaves up to 12 cm long, 3-5 cm wide, lanceolate to elliptic, apex acuminate, base rounded, blade membranous, not venulose, under side of midrib hirtellous, petiole up to 10 mm long, 1 mm thick, only very slightly winged; thyrse up to 12 cm long, 9 cm wide, very loose, peduncle corky, not sharply distinct from branchlet.

Molokai, south slope of mountains: Hillebrand, (i.fr.), (Berlin, photo and fragment in B. P. Bishop Mus.); ridge west of Punaula Valley, alt. 2,000 feet, December 28, 1932, St. John and Fosberg 12803, (b.-m.fr.), type.

Apparently most closely related to var. *macrothyrsa* of Oahu, from which it differs chiefly in the shape and texture of the leaves. Named *angustifolia* because of its narrow leaves.

43. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **subcordata,** new variety.

Ramuli teretes fistulosi, internodi plerumque 2-5 cm longi, folia subcordata oblonga vel elliptica acuta vel acuminata, thyrsi 3-8 cm longi 2.5-7 cm lati hirtelli, pedunculi in fructubus suberosi.

Woody vine, branchlets terete, fistulose, pink, internodes 0.5-7 cm long, usually 2-5 cm, glabrous or upper internodes very minutely hirtellous; leaves up to 13 cm long, 6 cm wide, oblong or elliptical, rarely obovate or ovate, base subcordate, apex acute to acuminate, subcoriaceous, hirtellous on midrib, sparsely so on blade, petiole 3-6 mm long, 1-2 mm thick, winged; thyrse 3-8 cm long, 2.5-7 cm wide, hemispherical to pyramidal, peduncle and branches more or less hirtellous, at least when young, corky in fruit.

Lanai: Mahana Ridge, July 22, 1910, Rock 8069, (p.fl.-i.fr.); Koele Ridge, July 25, 1910, Rock 8075, (i.fr.); Mahana Valley, August 6, 1910, Rock 8098, (i.fr.), type.

Closely related to var. *cordata* of Maui and Molokai. Named *subcordata* because of its subcordate leaves.

44. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **cordata** (Wawra), new combination.

Gouldia sandwicensis Gray, var. *cordata* Wawra: Flora, vol. 57, no. 18, p. 277, 1874.

Scandent shrub or woody vine, internodes 1-10 cm long, usually 4-8 cm on main vine, 1-3 cm on lateral branchlets; leaves up to 12 cm long and 4.5 cm wide, usually oblong, rarely ovate or obovate, varying greatly in shape, base cordate, apex obtuse to acute, rarely somewhat acuminate, coriaceous, petiole 2-8 mm long, 1-2 mm thick; thyrse terminal or very commonly on lateral branchlets, these branchlets usually 10-20 cm long, thyrse loose.

Three forms on Maui and one on Molokai are all very closely related.

45. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **cordata** (Wawra) Fosberg f. **eucordata,** new form.

Gouldia sandwicensis Gray var. *cordata* Wawra: Flora, vol. 57, no. 18, p. 277, 1874.

Planta scandenta vel frutescenta glabra, thyrsi maxime 6 cm longi 4 cm latique hemisphaerici, pedunculi in fructubus suberosi.

Glabrous vine or scandent shrub, thyrses up to 6 cm long, 4 cm wide, hemispherical, peduncle corky in fruit.

Maui, in wet forest: on ridge from Ditch Trail, 2 miles from Pogue's, December 28, 1927, Bergman, (i.fr.-m.fr.); along pipe line trail, Olinda, June 27, 1927, Degener 9474, (b.); Ukulele, July 1919, Forbes, (b.-i.fr.); Maunahooma, May 1910, Forbes and C. M. Cooke, Jr., 15.M., (b.-fl.-i.fr.-m.fr.); Hanakaoo, May 1910, Forbes 39.M., (b.-p.fl.-i.fr.-m.fr.); central ridge of Olowalu Valley, May 12, 1920, Forbes 2323.M., (b.-i.fr.); Haiku-Uka Trail, Haleakala, alt. 950 meters, August 18, 1933, Fosberg 9889, (b.-i.fr.); Puu Kukui, between Haelau and Nakalalua, alt. 1300 meters, August 24, 1933, Fosberg 10043, (b.-i.fr.); same locality and date, alt. 1400 meters, Fosberg 10047, (m.fr.), alt. 1,000 meters, Fosberg 10048, (b.-fl.-i.fr.); Mt. Eka (Eke), Hillebrand, (b.); ridge to Kukui, September 26, 1916, Munro 595, (p.fl.-i.fr.); north slopes of Haleakala, Hamakua, September 1910, Rock 8530, (i.fr.); Haelau, alt. 3700 feet, February 6, 1930, St. John 10227, (h.fl.-i.fr.-m.fr.); Kula Flume Line, Olinda, alt. 4300 feet, February 12, 1930, St. John 10321, (b.-i.fr.); Puu Kukui, October 9, 1922, Skottsberg 759; Olinda, Kula

Pipe Line, October 18, 1922, Skottsberg 861, (p. fl.); along pipe line trail, Olinda, June 18, 1927, Degener 2353, (b.-fl.); same locality, June 20, 1927, Degener 9475, (b.-h.fl.-i.fr.), and June 21, 1927, Degener 9476, (p.fl.-i.fr.); "Maui", Wawra 2526, (i.fr.), type, (Vienna, photo in B. P. Bishop Mus.).

46. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **cordata** (Wawra) Fosberg f. **acuminata,** new form.

Folia angusta acuminata, thyrsi magni raro 5 cm in longitudinibus minoribus.

Leaves narrow, sharply acuminate; thyrse usually over 5 cm long, noticeably loose, in fruit enlarging sometimes to as much as 15 cm long.

Maui, in wet forests on north and northwest slopes of Haleakala: Ukulele, July 1919, Forbes, (h.fl.); woods near Ukulele, above Olinda, July 1910, Forbes 190.M., (b.-m.fr.), type; Ukulele, July 1919, Forbes 934.M., (b.-fl.-i.fr.-m.fr.); east bank of Honomanu Gulch, June 21, 1920, Forbes 2570.M., (h.fl.); "E. Maui", Hillebrand and Lydgate, (i.fr.-m.fr.); below Olinda, April 24, 1918, Munro 645, (i.fr.); Kailua, Haleakala, lower ditch, May 1911, Rock, (b.-p.fl.).

Named *acuminata* because of the acuminate leaves.

47. Gouldia terminalis (Hooker and Arnott) Hillebrand, var. **cordata** (Wawra) Fosberg f. **Nealae,** new form.

Internodi et thyrsi hirtelli.

Similar to f. *eucordata* but with internodes and thyrses hirtellous.

Maui: east of Keanae, ridge between West and East Wailuaiki, July 2, 1920, Forbes, 2668.M., type; Heleehele (?), Upper Ditch Trail, October 13, 1922, Skottsberg 805, (m.fr.).

Named for Miss Marie Neal of Bernice P. Bishop Museum, who has helped materially in interpreting data and making available herbarium material.

48. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **cordata** (Wawra) Fosberg f. **molokaiensis,** new form.

Ramuli teretes fistulosi, folia infra hirtella, thyrsi glabri.

Only the youngest branchlets at all angled, very soon becoming terete, very fistulose, corky branch scars prominent at the nodes, glabrous; leaves hirtellous to shortly pilose on the under side of the midrib, usually sparsely so on the under side of the blade also; thyrse glabrous.

Molokai, in wet forests of the higher mountains: near Pepeopae bog, May 1, 1928, Degener 9459, (b.-i.fr.-m.fr.); Pepeopae bog, April 23, 1928, Degener 9466, (b.); mountains above Puu Kolekole, July 1912, Forbes 139.Mo., (b.-h.fl.-p.fl.-i.fr.-m.fr., two plants represented); Wailau Trail, August 1912, Forbes 331.Mo. (in part), (m.fr.); near Kamoku Camp, March 19, 1910, Rock 6123, (b.); Pelekunu Pali, April 1910, Rock 7015, (i.fr.); head of Waikolu Valley, Hanalilolilo, alt. 3500 feet, December 21, 1932, St. John and others 12369, (i.fr.); same locality and date, alt. 3800 feet, St. John and others 12436, (i.fr.); upper end of Hanalilolilo pipe line, April 24, 1928, Degener 9463, (i.fl.); Puu o Kaeha, Kawela, alt. 4,150 feet, December 23, 1932, St. John and others 12490, (i.fr.), and 12498, (i.fr.); same locality and date, alt. 4100 feet, December 23, 1932. St. John and others 12505, (i.fr.), alt. 4,000 feet, St. John and others 12509, (i.fr.); ridge between Hanalilolilo and Pepeopae, Waikolu Valley, Kawela, alt. 4100 feet, December 25, 1932, St. John and others 12557, (i.fr.-h.fl.); same locality and date, alt. 4,050 feet, St. John and others 12561, (i.fr.); alt. 4,000 feet, St. John and others 12571, (i.fr.), 12575, (i.fr.), 12579, (b.-i.fr.), 12580, (i.fr.), type, 12583, (b.-i.fr.), 12584, (i.fr.),

12589, (i.fr), 12590, (h.fl.-i.fr.), 12592, (i.fr.-m.fr.), 12603, (i.fr.), 12607, (i.fr.), 12610, (i.fr.), 12612, (i.fr.), and 12613, (b. -i.fr. -m.fr.); main divide at head of Wailau Valley, alt. 3,140 feet, December 29, 1932, St. John and Fosberg 12841, (b. -p.fl.-i.fr.); same locality and date, alt. 3,130 feet, St. John and Fosberg 12843, (b.-p.fl.-i.fr.-m.fr.?), alt. 3100 feet, St. John and Fosberg 12849, (b.-h.fl.-i.fr.-m.fr.); trail on ridge east of Mapulehu Valley, alt. 3,050 feet, December 29, 1932, St. John and Fosberg 12850, (b.-p.fl.-i.fr.), and 12860, (i.fr. -m.fr.); same locality and date, alt. 2400 feet, St. John and Fosberg 12886, (b. -m.fr.); Kukuinui Ridge, Wailau Valley, alt. 2400 feet, July 4, 1933, St. John, Dunn, and Storey 13295, (i.fr.).

Named for the island of Molokai, to which this form is limited.

49. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **pedunculata,** new variety.

Ramuli subangulati, internodi longi plerumque 5-8 cm, folia coriacea ovata vel elliptica vel obovata cordata vel subcordata, thyrsi maxime 14 cm longi 6 cm lati, pedunculi longi.

Branchlets fistulose, not sharply angled, internodes 4-10 cm long, usually 5-8 cm, leaves stiff coriaceous, apparently quite purplish, not strongly venulose, acute to obtuse or blunt at the apex, cordate or subcordate at base, petiole short and thick, up to 6 mm long, 4 mm thick; thyrse up to 14 cm long, 6 cm wide, peduncle up to 10 cm, heavy, apparently corky in fruit.

Hawaii, Kohala Mountains: Kohala, July 1910, Rock (p.fl.-i.fr.); Kohala, June 1910, Rock 8363 (in part), (b.), type; 8363 (in part), (b.-p.fl.); Rock 8363 (in part), (b.-h.fl.-i.fr.); Puu Ohia, Kawaihae, alt. 4800 feet, January 2, 1932, St. John and Hosaka 11493, (i.fr.-m.fr.).

Most closely related to var. *purpurea* from the same general region. Named *pedunculata* because of the long, heavy peduncle.

50. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **purpurea,** new variety.

Frutex purpurescens, ramuli angulati, internodi breves, folia parva coriacea cordata ovata vel elliptica non venulosa, thyrsi condensati.

Shrub, 2-3 meters tall, anthocyanin pigments unusually evident, plant therefore purplish, branchlets thick, conspicuously angled, internodes short, 0.5-4 cm long, usually 1-2 cm; leaves small, up to 9 cm long, 4.5 cm wide, usually about 6 cm long, 3 cm wide, blade ovate to elliptical, base cordate, apex acute to obtuse, sometimes slightly acuminate, decidedly coriaceous, veins, except midrib, scarcely visible, petiole up to 6 mm long, 4 mm wide, strongly winged; thyrses much condensed, roughly spherical, in flower up to 2 cm across, in fruit up to 4 cm across.

Hawaii, higher Kohala Mountains and Hamakua coast: Waimea, September 1911, Forbes 500.H., (m.fr.); above Waimea, September 29, 1922, Skottsberg 724, (p.fl.-i.fr.-m.fr.); upper Hamakua Ditch Trail, head of Alakahi Fork of Waipio Valley, alt. 1,075 meters, September 3, 1933, Fosberg 10213, (b.-p.fl.-i.fr.), 10223, (p.fl.-i.fr.-m.fr.), 10224, (b.-h.fl.-i.fr.-m.fr.), type, 10228, (b.-p.fl.-i.fr.-m.fr.), and 10232, (b.-i.fr.-m.fr.); trail from Waimea to upper Hamakua Ditch, alt. 1,075 meters, September 3, 1933, Fosberg 10263, (b.-i.fr.), and 10245, (b.-fl.-i.fr.-m.fr.); Holokaiea Gulch, July 10, 1909, Rock 4243, (b.-i.fr.); Alakahi Gorge, July 12, 1909, Rock 4715, (b.-h.fl.); Alakahi, Kawainui, July 12, 1909, Rock 4727 (151), (b.-h.fl.-i.fr.-m.fr.).

Most closely related to var. *pedunculata* of Hawaii; more remotely related to var. *cordata* of Maui. Named *purpurea* because of its purplish color.

51. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **coriacea** (Hooker and Arnott), new combination (pl. 2).

Petesia coriacea Hooker and Arnott: Bot. Beechey's Voy., p. 85, 1832.

Kaduae affinis Chamisso and Schlechtendal: Linnea, vol. 4, p. 129, 1829. (See p. 4.)

Gouldia sandwicensis Gray, Am. Acad., Proc., vol. 4, p. 310, 1860.

Gouldia sandwicensis Gray var. *coriacea* Gray, Am. Acad., Proc., vol. 4, p. 310, 1861.

Gouldia coriacea (Hooker and Arnott) Hillebrand: Fl. Haw. Is., p. 168, 1888 (in part).

Gouldia sandwicensis Gray var. *lanceolata* Wawra: Flora, vol. 57, no. 19, p. 295, 1874.

Gouldia lanceolata (Wawra) Heller: Minn. Bot. Stud., vol. 1, p. 897, 1897.

Erect, sometimes bushy shrub or tree, up to 12 meters tall, branchlets scarcely angled, somewhat fistulose, internodes short, 2-4 cm long, rarely over 1.5 cm, commonly 0.5-1 cm long; leaf blades 3-11 cm long, 1-2.5 cm wide, commonly 4-8 cm long, 1-2 cm wide, elliptic-lanceolate to somewhat oblanceolate, if oblanceolate, sometimes with a curved apex or in dry material an apical fold, apex from a trifle obtuse to acute or even slightly acuminate, secondary veins scarcely visible beneath, not at all visible above, petiole slender, 4-10 mm long, commonly 5-8 mm, 1 mm or less thick, slightly winged or not at all; flowering thyrses 1-3 cm long and wide, ordinarily 1.5-2 cm long and 1-2 cm wide, irregularly hemispherical, fruiting thyrses 1.5-3 cm long, 1.5-4 cm wide, ordinarily 2-2.5 cm long, 2-3 cm wide.

Two more or less vague forms of this variety are distinguishable. The more material examined the less distinguishable they become. Their only basis is in the size of the leaves. Forms could equally well be distinguished on the basis of elliptic-lanceolate leaves and oblanceolate leaves. The two sets of forms would not coincide. Therefore, I have considered it best not to segregate any forms within this variety. The specimens, however, are cited in three roughly segregated groups, those with long leaves, those with short leaves, and those with leaves intermediate between the other two.

Oahu, Koolau Range and northeast corner of the Waianae Mountains.

Short leafed form. Oahu, Koolau Range: Beechey, (Kew, photo in B. P. Bishop Mus.), (i.fr.), type; head of Kalihi Valley, alt. 300-500 meters, January 25, 1931, Christophersen, Wilder, and Hume 1499, (p.fl.-i.fr.); Konahuanui, May 1913, Abbe Faurie 347, (f.-i.fr.); Koolauloa Mts. between Punaluu and Kaipaupau, November 14-21, 1908, Forbes, (i.fr.-m.fr.); Konahuanui, January 6, 1909, Forbes 1009, (b.); Konahuanui Ridge, January 16, 1909, Forbes 1032.O., (m.fr.-h.fl.); windward side, summit of Koolau Range above Kipapa Gulch, Waiahole, alt. 900 meters, September 18, 1932, Fosberg 8673, (h.fl.); ridge south of Kipapa Gulch, Waipio, alt. 800 meters, September 18, 1932, Fosberg 8696, (i.fr.); summit of Koolau Range above Kipapa Gulch, Waipio, alt. 900 meters, September 18, 1932, Fosberg 8712, (h.fl.-i.fr.); Waikane-Schofield Trail, Kahana, alt. 750 meters, October 16, 1932, Fosberg 8775, (m.fr.); peak at head of Pauoa Flats, Pauoa, alt. 690 meters, October 30, 1932, Fosberg 8961, (i.fr.-m.fr.); Laie-Malaekahana ridge, alt. 520 meters, April 15, 1933, Fosberg 9394, (p.fl.-i.fr.); Waikane-Schofield Trail, Kahana-Waianaeuka divide, alt. 750 meters,

December 2, 1934, Fosberg 12182, (p.fl.-m.fr.), 12184, (m.fr.), and 12185, (h.fl.) ; lower slopes of Konahuanui above Manoa, May 13, 1895, Heller 2315, (b.-h.fl.-i.fr.-m.fr.) ; Kipapa Gulch, south ridge, alt. 1700 feet, July 4, 1932, Hosaka 632, (b.-i.fr.) ; same locality, alt. 1600 feet, March 1, 1933, Hosaka 924, (b.) ; same locality, alt. 2,000 feet, April 2, 1933, Hosaka 953, (b.) ; Kipapa Gulch, south ridge, Waipio, alt. 1800 feet, February 10, 1935, Hosaka 1269, (p.fl.-m.fr.) ; Punaluu, November 14-21, 1908, Rock 155 (304), (m.fr.) ; Waiawa, summit of Koolau Range, March 1930, Russ, (b.-h.fl.), (AF) ; south ridge of Kipapa Gulch, Waipio, alt. 1700 feet, May 15, 1932, St. John 11684, (b.-i.fr.) ; Wawra 1787, (i.fr.), (Vienna, photo in B. P. Bishop Mus.) ; (apparently Tantalus), 1927, Degener 9470, (i.fr.) ; Niu Ridge, September 7, 1924, Topping 2842, (i.fr.).

Long leafed form. Oahu, Koolau Range: head of Kalihi Valley, alt. 400 meters, March 11, 1930, Christophersen 1268, (m.fr.-p.fl.) ; Kahuauli Ridge, alt. 500-750 meters, December 17, 1930, Christophersen and Hume 1404, (i.fr.-m.fr.) ; head of Kalihi Valley, alt. 300-500 meters, January 25, 1931, Christophersen, Wilder, and Hume 1484, (b.-h.fl.-i.fr.) ; ridge to Konahuanui, alt. 450-950 meters, April 23, 1931, Christophersen, Wilder, and Hume 1718, (h.fl.), and 1730, (h.fl.-i.fr.) ; ridge between Niu and Wailupe, April 11, 1917, Forbes and J. C. Bidwell 2464.O., (b.-i.fr) ; ridge south of Kipapa Gulch, Waipio, alt. 520 meters, September 17, 1932, Fosberg 8670, (m.fr.) ; same locality, alt. 750 meters, September 18, 1932, Fosberg 8706, (i.fr.-m.fr.) ; peak at head of Pauoa Flats, Pauoa, alt. 700 meters, October 30, 1932, Fosberg 8959, (m.fr.) ; same locality and date, alt. 650 meters, Fosberg 8963, (i.fr.-m.fr.) ; Waikane-Schofield Trail, Waianaeuka, alt. 2400 feet, April 28, 1935, St. John 17624, (b.) ; south ridge of Kipapa Gulch, Waipio, alt. 1,780 feet, May 15, 1932, M. Hasegawa, (b.-h.fl.) ; Laie-Waimea divide, alt. 650 meters, April 15, 1933, Fosberg and M. Chong 9409, (p.fl.-i.fr.) ; Kainaauika, above Palolo, alt. 770 meters, December 27, 1934, Fosberg 10718, (p.fl.-i.fr.-m.fr.) ; lower slopes Puu Konahuanui above Nuuanu Pali Road, Kailua, alt. 430 meters, January 5, 1935, Fosberg 10739, (p.fl.-m.fr.) ; Waikane-Schofield Trail, Kahana, alt. 700 meters, February 10, 1935, Fosberg and Oliveira 10802, (b.-p.fl.-m.fr.) ; Mt. Konahuanui Trail, November 23, 1919, Garber 90, (m.fr.) ; Kaluanui, alt. 2,000 feet, November 30, 1929, St. John 10098, (m.fr.).

Long leafed form. Oahu, Waianae Mountains: second gulch east of Puu Kaupakuhale, Puu Kaala, Mokuleia, alt. 750 meters, October 23, 1932, Fosberg and St. John 8921, (i.fr.-m.fr.).

Intermediate form. Oahu, Koolau Range: head of Kalihi Valley, alt. 300-500 meters, January 25, 1931, Christophersen, Wilder, and Hume 1482, (b.-i.fr.-m.fr.) ; from Kahana church up ridge to summit of mountain southeast of Kahana Bay, July 3, 1932, Degener 9435, (i.fr.) ; near summit of Pig-god Trail, Punaluu, May 31, 1931, Degener, Park, Topping, and Bush 9450, (i.fr.) ; Waiolani Ridges, September 17, 1908, Forbes, (h.fl.-i.fr.) ; Lanihuli Trail, June 28, 1908, Forbes and Stokes, (i.fr.) ; Wahiawa Gulches, April 9, 1911, Forbes 1709.O., (h.fl.-m.fr.) ; Laie-Malaekahana Ridge, alt. 630 meters, April 15, 1933, Fosberg 9426, (b.-h.fl.-i.fr.) ; Waikane-Schofield Trail, Kahana-Waianaeuka divide, alt. 750 meters, December 2, 1934, Fosberg 12186, (h.fl.) ; Waiahole Ditch Trail, June 1932, A. Meebold, (i.fr.) ; Punaluu, alt. 1800 feet, September 28, 1930, St. John 10580½, (i.fr.) ; Haiku Valley, Waiahole Forest Reserve, Heeia, alt. 900 feet, December 11, 1932, St. John 12263, (m.fr.) ; Mt. Olympus, alt. 2,450 feet, January 6, 1932, St. John 11509, (b.-m.fr.-i.fr.) ; Kipapa Gulch, south side, alt. 2200 feet, July 4, 1932, M. Yamaguchi 1254, (b.-fl.) ; south ridge of Kipapa Gulch, Waipio, alt. 1,675 feet, Inpung Chang, (b.) ; Manoa Cliff Trail, Manoa Valley, alt. 430 meters, July 15, 1933, Fosberg 9700, (b.-h.fl.-i.fr.) ; Kalauao-Waimalu Ridge, alt. 530 meters, April 30, 1933, Fosberg 9459, (b.-fl.-i.fr.) ; same locality and date, alt. 540 meters, Fosberg 9464, (b.-m.fr.), alt. 490 meters, Fosberg 9451, (p.fl.-i.fr.) ; Waikane-Schofield Trail, Waikane, alt. 700 meters, May 14, 1933, Fosberg 9526, (b.-fl.).

Var. *coriacea* forms with varieties *kaala, ovata, antiqua,* and, more remotely, *congesta,* a series of closely related varieties extending from Oahu

to Hawaii. In the most closely related forms these varieties intergrade almost completely.

52. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **kaala,** new variety.

Ramuli subangulati, internodi breves, folia plerumque elliptica maxime 8 cm longa 4 cm lata, petioli gracili alati, thyrsi parvi pedunculi suberosi in fructubus.

Bush or tree up to 6 meters tall, branchlets weakly angled, internodes 0.2-5 cm long, mostly 0.5-1.5 cm; leaves up to 8 cm long, 4 cm wide, blade elliptical to elliptic-lanceolate or obovate, base and apex obtuse or rounded, petiole slender, 5-15 mm long; thyrse small as in variety *coriacea,* peduncle somewhat corky in fruit.

Oahu, Waianae Mountains. Two closely related forms, one in the drier regions and the other limited to the higher portion of Mount Kaala.

Very closely related to var. *coriacea.* Named for Mount Kaala, the highest mountain on Oahu, on the upper portion of which one form of this variety is prominent in the vegetation.

53. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **kaala** Fosberg f. **eukaala,** new form.

Folia plerumque elliptica, in sicco decuticantes, petioli alati.

Branchlets often appearing dichotomous, apparently because of the death of the old inflorescences and their replacement by two branchlets from the terminal node of the old branchlet; leaves elliptical to elliptic-lanceolate or slightly obovate, petiole 0.5-2 mm thick, winged, dried leaves usually appearing scurfy due to exfoliation of the epidermis upon drying.

Oahu, Mount Kaala above 800 meters altitude: east slope, Waianaeuka, alt. 1,030 meters, January 8, 1933, Fosberg 9093, (h.fl.); same locality and date, alt. 1200 meters, Fosberg 9096, (i.fr.-m.fr.), alt. 980 meters, Fosberg 9097, (p.fl.), alt. 1,170 meters, Fosberg 9098, (b.-h.fl.-m.fr.), type; Haleauau Valley, Waianaeuka, alt. 1100 meters, February 24, 1935, Fosberg 10820, (m.fr.-p.fl.); upper slopes of Kaala, along Schofield Trail, Christophersen, Wilder, and Hume 1700, (b.-fl.-i.fr.-m.fr.); Waianaeuka, alt. 920 meters, November 5, 1933, Fosberg 10364, (i.fr.-m.fr.), (this collection has rather narrow leaves and shows no exfoliation); Waianaeuka, alt. 930 meters, November 5, 1933, Fosberg 10365, (b.-h.fl.-i.fr.); main east ridge, Waianaeuka, alt. 950 meters, February 24, 1935, Fosberg 10824, (b.-p.fl.-i.fr.-m.fr.); summit of Puu Kaala, Waianaeuka, alt. 1,230 meters, February 24, 1935, Fosberg 10825, (b.-p.fl.); east ridge, Waianaeuka, alt. 3400 feet, February 3, 1935, St. John 17550, (h.fl.); same locality and date, alt. 3800 feet. St. John 17551 (p.fl.-m.fr.-i.fr.), and alt. 3,850 feet, St. John 17552, (p.fl.-m.fr.); Puu Kawiwi-Puu Kaala ridge, Makaha-Waianae Kai, alt. 750 meters, March 31, 1935, Fosberg 10870, (b.-m.fr.); same locality and date, alt. 1100 meters, March 31, 1935, Fosberg 10854, (h.fl.-i.fr.-m.fr.); Kaala region, June 18, 1932, Meebold (Degener's no.) 9438, (b.-i.fr.).

54. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **kaala** Fosberg f. **Russii,** new form.

Ramuli graciles non fistulosi, folia non decuticantes, petioli graciles non alati, thyrsi graciles.

Branchlets mostly slender, not fistulose, leaves usually narrower than in f. *eukaala,* with more tendency to be obovate, more venulose beneath, usually slightly hirtellous beneath along the sides of the midrib, not scurfy or exfoliating when dry, petioles slender, 1 mm or less thick, not winged; thyrse quite slender.

Oahu, Waianae Mountains, in the drier portions of the native forest: Puu Kapu, alt. 500-600 meters, February 12, 1931, Christophersen, Wilder, and Hume 1567, (i.fr.); second ridge south of Pohakea Pass, alt. 500-750 meters, March 19, 1931, Christophersen, Wilder, and Hume 1650, (m.fr.); east ridge of Puu Kaua, Honouliuli, alt. 850 meters, November 6, 1932, Fosberg 8982, (p.fl.); Kaaikukae, Honouliuli, October, 1929, Russ, (b.-h.fl.-i.fr.), (AF), and Russ, (m.fr.-h.fl.), (AF); Piko Trail, Mokuleia, alt. 2200 feet, February 4, 1934, St. John 14097, (p.fl.-i.fr.); ridge above Kupehau, Honouliuli, alt 700 meters, June 30, 1935, Fosberg 10981, (b.-h.fl.-i.fr.), type; ridge above Forest Reserve House, southeast of Palikea, Honouliuli, alt. 820 meters, June 30, 1935, Fosberg 10934, (b.-h.fl.); Waianae, Palehua, Green Peak, August 23, 1922, Skottsberg 303, (b.-h.fl.), and 309, (i.fr.).

Named for Mr. Glenn W. Russ, who has very kindly lent me for study his collections of this genus.

55. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **ovata** (Wawra), new combination.

Gouldia sandwicensis Gray var. *ovata* Wawra: Flora, vol. 57, no. 18, p. 278, 1874.

Gouldia terminalis (Hooker and Arnott) Hillebrand: Fl. Haw. Is., p. 169, 1888 (in part).

Internodes 0.5-5 cm long, leaves lanceolate or oblanceolate to narrowly elliptical or obovate, petiole slender, 5-20 mm long, usually under 1.5 mm thick; thyrse rather slender, spherical when small, when larger usually hemispherical.

Var. *ovata* has many forms on Maui and Molokai; f. *santalifolia,* common to both islands, closely approaches var. *antiqua,* especially f. *acuta,* on one side, and var. *coriacea,* and var. *kaala,* especially f. *Russii,* on the other.

56. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **euovata,** new form.

Gouldia sandwicensis Gray var. *ovata* Wawra: Flora, vol. 57, no. 18, p. 278, 1874.

Gouldia terminalis (Hooker and Arnott) Hillebrand: Fl. Haw. Is., p. 169, 1888 (in part).

Ramuli angulati graciles, internodi plerumque 2-4 cm longi, folia plerumque 6.9 cm longa 2-3 cm lata non coriacea non venulosa plerumque lanceolata vel oblanceolata, petioli graciles 10-18 mm longi maxime 1 mm crassi, thyrsi 3-5 cm longi latique.

Branchlets rather sharply angled, slender, internodes 1-5 cm long, usually 2-4 cm; leaves lanceolate to oblanceolate, or rarely narrowly elliptical or obovate, not coriaceous, not conspicuously venulose, up to 11 cm long and 4 cm wide, ordinarily 6-9 cm long, 2-3 cm wide, slightly curved apex acute, rarely obtuse, base acute to rounded, petiole slender, 10-18 mm long, up to 1 mm thick; thyrse 3-5 cm long and wide, ordinarily slender and quite loose.

Maui: Maunahooma, May 1910, Forbes and Cooke 26.M. (in part), (b.-h.fl.-i.fr); Olualo (Olowalu), Hillebrand, (i.fr.-m.fr.), (Berlin, photo and fragment in B. P. Bishop Mus.); August 1910, Rock 1868, (i.fr.); Waihee, Wawra 1953, (b.-fl.), type; Hamakua, Hillebrand and Lydgate 126 (in part), (b.-i.fr.).

57. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **makawaoensis,** new form.

Internodi plerumque 1-2 cm longi, ramuli minute hirtelli, folia elliptica subcoriacea.

Internodes mostly 1-2 cm long, branchlets minutely hirtellous, leaves elliptical, subcoriaceous; thyrse more compact.

Maui: Makawao, Haleakala, September 1910, Rock 8531, (i.fr.), type, and Rock 8571, (p.fl.-i.fr.).

Named for the type locality, Makawao, on the northwest slope of Haleakala.

58. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **santalifolia,** new form.

Ramuli subcarnosi, internodi 0.5-2 cm longi, folia plerumque curvata, thyrsi maxime 2.5 cm longi latique.

Branchlets thicker than in f. *euovata,* not so sharply angled, slightly fleshy, internodes 0.5-2 cm long; leaves often curved and folded; thyrse not over 2.5 cm across, (one on one specimen axillary, probably abnormal).

Maui: Olowalu Valley, May 1920, Forbes 2310.M., (i.fr.), type.

Molokai: ravine northwest of Puu Makaliilii (near where precipice makes further descent impossible), May 22, 1928, Degener 9460, (i.fr.); mountains above Puu Kolekole, July 1912, Forbes 216.Mo., (b.-p.fl.-i.fr.); Puu o Kaeha, Kawela, alt. 3700 feet, December 23, 1932, St. John and others 12520, (i.fr.); road to Maunahui from Kaunakakai, alt. 2,000 feet, December 26, 1932, St. John and others 12621, (m.fr.).

Named *santalifolia* because of its resemblance, in dried material at least, to some Hawaiian species of *Santalum.* It is the only form in the genus known from more than one island.

59. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **kalaupapa,** new form.

Ramuli fistulosi angulati, folia plerumque 10-13 cm longa 2-4 cm lata plerumque oblanceolata acuminata, costae infra subhirtellae, thyrsi 2-4 cm longi latique, pedunculi hirtelli.

Branchlets fistulose, strongly angled, glabrous; leaves mostly 10-13 cm long, 2-4 cm wide, mostly oblanceolate, cuneate at base, acuminate at apex, slightly hirtellous beneath along sides of midrib, petiole 10-15 mm long, up to 1.3 mm thick, slightly winged; thyrse 2-4 cm across, hemispherical, peduncle strongly hirtellous, otherwise glabrous.

Molokai, on the cliffs above Kalaupapa: Settlement Trail, June 1912, Forbes 25.Mo., (b.-i.fr.), type.

Named for Kalaupapa, the leper settlement on the north coast of Molokai.

60. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **maunahui,** new form.

Ramuli angulati, folia anguste elliptica curvata, costae infra hirtellae, petioli 5-13 mm longi, thyrsi 1.5-3 cm longi latique, pedunculi suberosi in fructubus.

Branchlets strongly angled, slightly fistulose, glabrous or very slightly hirtellous; leaves usually narrowly elliptical, strongly curved, subcoriaceous, hirtellous beneath along the midrib, petiole 5-13 mm long, slightly winged; thyrse usually 1.5-3 cm across, glabrous or with peduncle very slightly hirtellous, peduncle corky in fruit.

Molokai, in the higher mountains: Near Kamoku Camp, March 19, 1910, Rock 6123, (i.fr.-m.fr.); Maunahui Gulch, March 21, 1910, Rock 6140, (b.-i.fr.-m.fr.); ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, alt. 3,640 feet, December 20, 1932, St. John and others 12284, (i.fr.), type; same locality and date, alt. 3600 feet,

St. John and others 12296, (i.fr.), alt. 3,000 feet, St. John and others 12325, (i.fr.); along road to Maunahui from Kaunakakai, alt. 2200 feet, December 26, 1932, St. John and others 12626, (i.fr.); same locality and date, alt. 2,350 feet, St. John and others 12633, (i.fr.-m.fr.), alt. 2100 feet, St. John and others 12622, (i.fr.-m.fr.) and 12623, (i.fr.), alt. 2200 feet, St. John and others 12632, (i.fr.).

Named for Maunahui, Molokai, from the vicinity of which most of the collections have come.

61. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **wailauensis,** new form.

Ramuli glabri angulati, costae infra hirtellae, thyrsi glabri.

Like f. *maunahui* but with branchlets and inflorescence glabrous; leaves tending to be cuneate at base, obovate to oblanceolate, obtuse to acute or somewhat acuminate at apex, petiole 7-12 mm long, up to 1.5 mm thick, somewhat winged, in some cases hirtellous along the wing; thyrse 2-4 cm across, glabrous, heavier than in f. *maunahui.*

Molokai, Wailau Valley: alt. 180 meters, July 3, 1933, Fosberg 9620, (i.fr.); same locality and date, alt. 150 meters, Fosberg 9625, (i.fr.), type; Wailau Valley, September 1912, Forbes 563.Mo., (i.fr.); Kukuinui Ridge, Wailau Valley, alt. 2400 feet, July 4, 1933, St. John, Dunn, and Storey 13275, (i.fr.-h.fl.); same locality and date, alt. 1800 feet, St. John 13305, (i.fr.).

Named for Wailau Valley, Molokai, the type locality.

62. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **Storeyi,** new form.

Planta glabra, folia obtusa subcoriacea, petioli maxime 2 mm crassi.

Like f. *wailauensis* but entirely glabrous, branchlets more fistulose; leaves always obtuse, subcoriaceous, petioles up to 2 mm thick; thyrse loose, up to 5 cm long, 3.5 cm wide, hemispherical.

Molokai, Wailau Valley: Kukuinui Ridge, alt. 2400 feet, July 4, 1933, St. John, Dunn, and Storey 13266, (i.fr.), type; alt. 130 meters, July 3, 1933, Fosberg 9631, (i.fr.).

Named for Mr. William B. Storey, one of the collectors of the type.

63. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **Suehiroae,** new form.

Ramuli hirtelli fistulosi, folia angustate lanceolata acuminata, costae infra hirtellae, thyrsi hirtelli.

Branchlets somewhat hirtellous, very fistulose; leaves narrowly lanceolate, acute at base, acuminate at apex, hirtellous beneath along the midrib, petioles up to 12 mm long, 1 mm thick, somewhat winged; thyrse up to 4 cm long, 3 cm wide, peduncle and larger branches hirtellous, peduncle apparently not corky.

Molokai, Wailau Valley, alt. 500 feet, July 3, 1933, Suehiro, (i.fr.), type.

Named for the collector, Miss Amy Suehiro.

64. **Gouldia terminalis** (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **heterophylla,** new form.

Folia elliptica vel lance-elliptica plana in amplitudinibus valde variantibus, costae infra hirtellae, thyrsi multi graciles glabri vel subhirtelli.

Many very slender branchlets near the tips of the branches, somewhat fistulose;

leaves varying tremendously in size, the ones near the thyrses being much reduced, all elliptical or elliptic-lanceolate, acute to obtuse, plane, thin, hirtellous beneath along midrib, petiole 7-8 mm long in larger leaves, in proportion in smaller ones; thyrses numerous, slender, glabrous or very slightly hirtellous on larger branches.

Molokai, south slope of the mountains near Mapulehu: trail on ridge east of Mapulehu Valley, alt. 1800 feet, December 29, 1932, St. John and Fosberg 12914, (b.-p.fl.-i.fr.); same locality, alt. 2100 feet, December 29, 1932, St. John and Fosberg 13091, (b.-i.fr.), type.

Named *heterophylla* because of the different sized leaves.

65. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **membranacea,** new form.

Folia membranacea elliptica acuminata.

Leaves membranous, elliptical, apex acuminate, base rounded or acute, otherwise practically like f. *euovata*.

Maui: along pipe line trail, Olinda, June 16, 1927, Degener 9478, (i.fr.-m.fr.), type.

Named *membranacea* because of its membranous leaves.

66. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **Lydgatei,** new form.

Ramuli gracili angulati, internodi 1.5-3 cm longi, folia oblanceolata vel anguste obovata cuneata infra venulosa, thyrsi 1-2.5 cm longi latique.

Branchlets slender, distinctly angled, glabrous, internodes 1.5-3 cm long, leaves up to 11 cm long, 3.5 cm wide, broadly oblanceolate to narrowly obovate, apex acute, base cuneate, thin, glabrous, or very slightly hirtellous along the midrib, venulose beneath; thyrse 1-2.5 cm across, roughly spherical.

Maui: Hamakua, Hillebrand and Lydgate 126 (in part), (b.-i.fr.), type, (photo and fragment in B. P. Bishop Mus.).

Named for one of the collectors, Mr. John Lydgate.

67. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **punaula,** new form.

Ramuli angulati subhirtelli, folia elliptica infra hirtella thyrsi subhirtelli.

Branchlets slightly fistulose near the ends, slightly hirtellous, strongly angled; leaves thin, elliptical, plane, slightly venulose, strongly hirtellous all over the under side, especially on the midrib, petiole 5-8 mm long, up to 1.2 mm thick, hirtellous, not winged; thyrse slightly hirtellous on peduncle and branches, flowers glabrous.

Molokai: ridge west of Punaula Valley, alt. 1900 feet, December 28, 1932, St. John and Fosberg 12797, (b.-p.fl.-i.fr.), type.

Named for Punaula Valley, Molokai.

68. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **ovata** (Wawra) Fosberg f. **petiolata,** new form.

Ramuli angulati glabri, folia ovata vel elliptica vel obovata curvata, costae infra hirtellae, petioli 8-20 mm longi, 1 mm crassi, thyrsi hirtelli, pedicelli glabri, calyces glabrae, tubi corollarum minute hirtelli.

Shrub up to 2 meters tall, branchlets strongly angled, glabrous, somewhat fistulose, internodes 1-6 cm long, mostly 2-4 cm; leaves ovate to elliptical or obovate, base cuneate,

acute or obtuse, apex obtuse or slightly acuminate, somewhat curved, or when dry, folded, subcoriaceous, more or less venulose, hirtellous beneath along sides of midrib, petiole 8-20 mm long, under 1 mm thick, slightly winged, often very slightly hirtellous; thyrse up to 4 cm long, 3.5 cm wide, roughly pyramidal, hirtellous excepting pedicels; ovary and calyx glabrous, corolla tube minutely hirtellous excepting extreme upper portion.

Molokai: ravine just south of Maunahui cabin, April 15, 1928, Degener 9465, (p.fl.-i.fr); Kalamaula, June 5, 1916, Munro 370, (p.fl.), type; above Kolauaula (Kalamaula?), June 5, 1916, Munro 566, (p.fl.); ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, alt. 3600 feet, December 20, 1932, St. John and others 12291, (i.fr.).

The only form in this variety which has hirtellous flowers. Named *petiolata* because of its long slender petioles.

69. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **antiqua,** new variety.

Ramuli non angulati vel subangulati, folia plerumque parva elliptica vel oblanceolata, petioli maxime 10 mm longi graciles; thyrsi maxime 3 cm longi latique.

Branchlets not strongly angled, often gnarled, internodes up to 5 cm long, usually short; leaves ordinarily small, narrowly elliptical to oblanceolate, petioles slender, up to 10 mm long; thyrse roughly spherical, up to 3 cm across, peduncle somewhat corky in fruit.

Hawaii, several forms with wide and very discontinuous distribution.

Most closely related to var. *ovata* of Maui and Molokai. Var. *antiqua* f. *acuta* might fully as well be placed in var. *ovata*. Named *antiqua* because its distribution indicates that it must be an old variety which at one time had a wide distribution, subsequently destroyed over most of its range by volcanic activity or other changes in conditions, leaving it in isolated localities.

70. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **antiqua** Fosberg f. **euantiqua,** new form.

Internodi plerumque maxime 1 cm longi, folia elliptica curvata, petioli graciles maxime 8 mm longi.

Branchlets gnarled, not sharply angled, internodes very short, 0.3-2 cm long, mostly under 1 cm, youngest internode papillose; leaves up to 7 cm long, 2.5 cm wide (leaves of fast growing sprout, Rock 17115, 12 cm long, 4 cm wide), elliptical, curved, rounded to obtuse at base and apex, glabrous, not strongly venulose, petioles slender, up to 8 mm long; thyrse up to 3 cm across.

Hawaii, in widely scattered localities from the Kilauea region to Hualalai: Kipuka Puaulu, September 16, 1922, Skottsberg 549, (b.-h.fl.-i.fr.), and 537, (b.-fl.-i.fr.); Bird Park, Kilauea, July 9, 1929, Degener 9457, (b.-m.fr.); Hanehane (near Hualalai), June 17, 1911, Forbes 192. H., (b.-h.fl.-m.fr.); Kapapala, Kau, August 2-7, 1911, Forbes 401. H., (b.-h.fl.-m.fr.); Kipuka Puaula, April 1911, Rock 8744, (m.fr.), type; lava flows beyond Kapua, South Kona, August 1917, Rock 17115, (m.fr.).

71. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **antiqua** Fosberg f. **kehena,** new form.

Ramuli subhirtelli, thyrsi subhirtelli.

Leaves averaging larger than in f. *euantiqua* and more acute; thyrse and upper internodes of branchlets covered with very short hair, little more than papillae.

Hawaii, Kohala Mountains: toward Waimea, 17 miles north (south ?) of Kohala, July 31, 1926, Degener 9485, (p.fl.-i.fr.-m.fr.); Kehena Ditch Trail, near Kehena, alt. 770 meters, September 2, 1933, Fosberg 10188, (h.fl.-i.fr.), 10191, (p.fl.), 10192, (b.-p.fl.), and 10195, (p.fl.-i.fr.), type; Kohala, June 1910, Rock 8355, (b.-h.fl?-i.fr.).

Named for Kehena, Hawaii, the type locality.

72. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **antiqua** Fosberg, f. **hirtellifolia,** new form.

Ramuli graciles, internodi 2-5 cm longi, costae infra hirtellae, thyrsi subhirtelli.

Slender shrub, 4 meters tall, branchlets very slender, internodes 2-5 cm long, almost terete; leaves with midribs hirtellous beneath; thyrse very slightly hirtellous.

Hawaii: Papaloa, Kona, July 15, 1911, Forbes 327.H., (b.-p.fl.-i.fr.-m.fr.), type.

Named *hirtellifolia* because of the hairy leaves.

73. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **antiqua** Fosberg f. **acuta,** new form.

Arbor, internodi plerumque 1-3 cm longi, folia oblanceolata acuta maxime 9 cm longa, petioli maxime 10 mm longi.

Strong, erect tree, 6 meters tall, 2-3 dm through at base, internodes up to 5 cm long, mostly 2-3 cm; leaves oblanceolate, acute, up to 9 cm long, petiole up to 10 mm long.

Hawaii: Kipuka Puaulu (Bird Park), Kilauea, alt. 1,230 meters, August 30, 1933, Fosberg 10125, (p.fl.-i.fr.-m.fr.), type.

This form might equally well be placed in var. *ovata,* but since it is growing with var. *antiqua,* with which it shows obvious relationship, it seems logical to place it here. Named *acuta* because of the acute apices to the leaves.

74. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **antiqua** Fosberg f. **kauensis,** new form.

Arbor, folia lata maxime 4 cm lata.

Small stiff tree, leaves very broad, some almost orbicular, up to 4 cm wide, branchlets conspicuously gnarled.

Hawaii, Kau Desert: August 2, 1911, Forbes 384.H., (i.fr.-m.fr.), type; September 20, 1922, Skottsberg 608, (i.fr.).

Named for the Kau Desert, Hawaii.

75. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **congesta,** new variety.

Ramuli angulati hirtelli, folia parva maxime 7 cm longa 3 cm lata oblanceolata curvata coriacea, petioli 10 mm longi 1 mm crassi, thyrsi hirtelli congesti in nodibus apicalibus subapicalibusque.

Branchlets distinctly angled, hirtellous, internodes 1-5 cm long, very variable; leaves small, up to 7 cm long, 3 cm wide, broadly oblanceolate, curved, apex acute or obtuse, base acute, stiff coriaceous, not conspicuously venulose beneath, somewhat venulose above, petiole 10 mm long, 1 mm thick; thyrse more or less spherical, up to 4 cm across, hirtellous, several of them congested at the terminal or secondary nodes.

Hawaii, Hualalai: Puuwaawaa, June 8-14, 1911, Forbes 55.H., (b.-p.fl.-i.fr.), type.

Related, but not particularly closely, to var. *antiqua*. Named *congesta* because of the congested thyrses at the ends of the branchlets.

76. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **crassicaulis,** new variety.

Ramuli crassi carnosi, internodi 0.5-2 cm longi, folia lanceolata, petioli graciles 5-10 mm longi maxime 1 mm crassi, thyrsi condensati maxime 3 cm longi latique.

Branchlets thick, fleshy, wrinkling when dry, leaf scars very prominent, internodes 0.5-2 cm long; leaves up to 8 cm long, 3 cm wide, elliptic-lanceolate to oblanceolate, apex rounded to obtuse, base rounded to acute, petiole slender, 5-10 mm long, less than 1 mm thick; thyrse roughly spherical, up to 3 cm across, condensed, compact.

Maui, north slopes of Haleakala: Oopuola Stream in vicinity of Ditch Trail, July 7, 1927, Degener 9473, (p.fl.-i.fr.), type.

Var. *crassicaulis* and var. *parvifolia* are closely related to each other and not particularly closely to any of the other known varieties. In some ways they resemble var. *tenuicaulis* of Kauai and in other ways var. *antiqua* of Hawaii and var. *pubescens* of Maui. Named *crassicaulis* because of the thick branchlets.

77. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **parvifolia** (Wawra), new combination.

Gouldia sandwicensis Gray var. *parvifolia* Wawra: Flora, vol. 57, no. 19, p. 296, 1874.

Gouldia axillaris Wawra, var. β Hillebrand: Fl. Haw. Is., p. 170, 1888.

Shrub or tree, branchlets sharply angled, internodes short, leaves small, more or less pilose beneath; thyrses spherical, very compact and condensed, not over 2 cm across.

Maui, Haleakala, region around Kaupo Gap. Further distribution uncertain.

78. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **parvifolia** (Wawra) Fosberg f. **euparvifolia,** new form.

Arbor, folia maxime 3.5 cm longa 2 cm lata ovata vel elliptica acuta infra pilosa, petioli maxime 3 mm longi 1 mm crassi, thyrsi hirtelli-lanati.

Much branched, stiff tree, smallest branchlets with the internodes extremely shortened, internodes on larger branchlets 0.5-2 cm long; leaves up to 3.5 cm long and 2 cm wide, yellow-green, ovate to elliptical, base and apex acute, blade coriaceous, pilose beneath, especially along veins and midrib, veins few but prominent, petiole up to 3 mm long, 1 mm thick; thyrse in flower not over 2 cm across, roughly spherical, very compact, peduncle and branches, except pedicels, woolly-hirtellous.

Maui: Kaupo Gap, Crater of Haleakala, August 10, 1919, Forbes 1121.M., (b.-h.fl.); "Walder des Haliakala", Wawra 1931, (i.fr.), (Vienna, photo in B. P. Bishop Mus.), type.

79. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **parvifolia** (Wawra) Fosberg f. **subpilosa,** new form.

Internodi 0.5-2.5 cm longi, folia plerumque 5-6 cm longa 2.5 cm lata elliptica vel obovata subcoriacea infra pilosa, petioli 5-10 mm longi, thyrsi subhirtelli.

Internodes not extremely shortened in small branchlets, 0.5-2.5 cm long, mostly 1-1.5

cm, slightly hirtellous; leaves up to 8 cm long, 4 cm wide, mostly about 5-6 cm long, 2.5 cm wide, elliptic to obovate, apex rounded to obtuse, base acute, subcoriaceous, somewhat pilose along the midrib and veins beneath, petioles 5-10 mm long, up to 1 mm thick; thyrse slightly hirtellous.

Maui: Haleakala Crater, rainy region of Kaupo Gap, August 20, 1927, Degener 2570, (i.fr.), type.

Does not show the extreme reduction noticeable in f. *euparvifolia*. Named *subpilosa* because of the slight amount of hair found on the under sides of the leaves.

80. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **tenuicaulis,** new variety.

Ramuli gracili hirtelli, internodi 1.5-3 cm longi, folia parva maxime 7 cm longa 3 cm lata oblonga infra hirtella, petioli maxime 5 mm longi 1 mm crassi hirtelli, thyrsi parvi graciles hirtelli.

Branchlets slender, angled when young, soon becoming terete, densely hirtellous when young, internodes 1.5-3 cm long; leaves small, blades up to 7 cm long, 3 cm wide, oblong, rounded or obtuse at base and apex, sparsely hirtellous beneath, especially along the midrib, petioles up to 5 mm long, 1 mm or less thick, hirtellous; thyrse up to 4 cm long, 3 cm wide, more or less hemispherical, very slender, small but not condensed, larger branches and peduncle hirtellous, pedicels glabrous, very slender.

Kauai, south slope of the main mountain mass, very local: Waimea, alt. 1,000 meters, March 1910, Abbe Faurie 345, (b.-i.fr.), type; Lehua Macanoi over Waimea, Wawra 2132b, (i.fr.-fl.), (Vienna, photo in B. P. Bishop Mus.).

These two collections are with some doubt associated together, but until further collecting is done this seems the most logical treatment. Variety *tenuicaulis* seems closely related to var. *pubescens* of Maui, but differs materially in having a much less condensed thyrse. Named *tenuicaulis* because of the slender branchlets.

81. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **pubescens,** new variety.

Ramuli graciles hirtelli, internodi plerumque 2-4 cm longi, folia elliptica maxime 6 cm longa, 3 cm lata infra pilosa, thyrsi condensati maxime 1.5 cm longi latique.

Branchlets slender, weakly angled, soon becoming terete, hirtellous, internodes 1-5 cm long, usually 2-4 cm; leaves up to 6 cm long, 3 cm wide, elliptical, obtuse to rounded at apex, rounded to subcordate at base, petiole up to 5 mm long, 1 mm thick, slightly winged, whole under side of blade pilose pubescent, with a few hairs on the wings of the petiole; thyrse much condensed, not over 1.5 cm across, hirtellous.

Maui, southwest slope of Haleakala: north of Ulupalakua, July 4, 1927, Degener 9472, (b.-fl.); Puu Poni, south slope of Haleakala, March 8, 1920, Forbes 1898.M., (b.), type.

Apparently related to var. *ovata* of Maui, *tenuicaulis* of Kauai, and possibly *Forbesii* of Hawaii. Named *pubescens* because of the hairy stems, leaves and thyrses.

82. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **Forbesii,** new variety.

Ramuli angulati valde hirtelli, internodi plerumque 2-5 cm longi, folia elliptica vel oblonga valde coriacea infra valde hirtella, petioli hirtelli 2-6 mm longi 1-1.5 mm crassi; thyrsi maxime 3 cm longi latique valde hirtelli, tubi corollae hirtelli.

Branchlets angled, densely woolly-hirtellous, internodes 1-6 cm long, mostly 2-5 cm; leaves elliptical to oblong, base subcordate, apex rounded or obtuse, coriaceous, strongly hirtellous beneath, somewhat venulose, petiole hirtellous, 2-6 mm long, 1-1.5 mm thick; thyrse compact, roughly spherical, not over 3 cm across when in fruit, densely woolly-hirtellous; outside of ovary hirtellous, calyx lobes ciliolate, otherwise glabrous, corolla tube hirtellous.

Hawaii, above Hilo: Kipuka, in 1855 Flow above Halealoha, June 9, 1915, Forbes 780.H., (p.fl.-i.fr-m.fr.); Kiipu, June 26, 1915, Forbes 947.H., (b.-fl.-i.fr-m.fr.), type.

Apparently slightly related to var. *pubescens* of Maui. Named for the late C. N. Forbes of Bernice P. Bishop Museum, whose extensive collections have materially aided in straightening out this genus.

83. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **quadrangularis,** new variety.

Frutex scandens, ramuli quadrilaterales, internodis plerumque 2-3 cm longi, folia oblonga vel elliptica vel leviter obovata infra pilosa, petioli maxime 5 mm longi 1-1.5 mm crassi, thyrsi hirtelli terminales vel axillares.

Half-climbing shrub with glabrous 4-sided branchlets, internodes 1-5 cm long, usually about 2-3 cm; leaves up to 13 cm long, 5 cm wide, oblong or elliptical to slightly obovate, apex acute or obtuse, base rounded to cordate, not conspicuously venulose, minutely pilose on under side of midrib, sparsely so over entire under side of blade, petiole up to 5 mm long, 1-1.5 mm thick; thyrses hirtellous, up to 5 cm long, 4 cm wide, mostly smaller, terminal and axillary or terminal on short lateral branchlets, the true axillary ones much reduced, buds somewhat hirtellous, flowers not known.

Hawaii, Hualalai: Puuki Crater, June 11, 1909, Rock 3711, (b.-m.fr); Puuwaawaa, alt. 5500 feet, December 29, 1931, St. John and others 11378, (i.fr.), type.

There is some question as to where to place this variety. When the region is more thoroughly collected it may be found to be a hybrid with some form of *G. Hillebrandii* as one of the parents or ancestors. Named *quadrangularis* because of its 4-sided branchlets.

84. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **pseudodichotoma,** new variety.

Ramuli subteretes, internodi plerumque 2-6 cm longi, folia maxime 14 cm longi 5.5 cm lata obovata vel elliptica, petioli 3-8 mm longi 1-3 mm crassi non alati, thyrsi terminales raro axillares in nodibus superioribus plerumque 4-6 cm longi 3-4 cm lati ampli graciles, pedunculi in fructubus suberosi.

Terminal inflorescences, after fruiting, often replaced by two strong lateral branchlets at the basal node of the inflorescence, giving the branching a dichotomous appearance, branchlets weakly angled, soon becoming terete or almost so, fistulose, slender, somewhat reddish, internodes 1-11 cm long, ordinarily 2-6 cm; leaves up to 14 cm long, 5.5 cm wide, obovate, those near the inflorescence ordinarily broadly elliptical, apex obtuse to acute, base cuneate or gradually contracted to obtuse, thin, somewhat venulose beneath, petiole 3-8 mm long, 1-3 mm thick, not winged; thyrses terminal, sometimes axillary at upper nodes, up to 8 cm long, 5 cm wide, usually 4-6 cm long, 3-4 cm wide, loose, slender, peduncle corky in fruit.

Lanai: mountains, east end, June 1913, Forbes 253.L., (i.fr), type.

Not closely related to any other variety. Further collecting may reveal that the material studied has a strain of *G. Hillebrandii* in its ancestry. There is no doubt that *pseudodichotoma* is a very distinct variety with entirely new characters not represented in any other variety. Named *pseudodichotoma* because of its appearance of dichotomous branching.

85. Gouldia terminalis (Hooker and Arnott) Hillebrand var. **lanai,** new variety.

Ramuli teretes fistulosi glabri, internodi plerumque 4-8 cm longi, folia maxime 15 cm longa 6 cm lata obovata vel elliptica infra pilosa, petioli 2-3 mm longi 1-1.5 mm crassi valde alati, stipuli pilosi, thyrsi maxime 8 cm longi 4.5 cm lati graciles pyramidales terminales vel axillares subhirtelli, pedunculi in fructubus suberosi.

Branchlets terete, pinkish, very fistulose, glabrous, internodes 1-13 cm long, usually 4-8 cm; leaves up to 15 cm long, 6 cm wide, thin, obovate to elliptical, base gradually, then abruptly contracted or rounded or obtuse, apex acute to acuminate, or rarely obtuse, pilose on lower surface, somewhat but not conspicuously venulose, petiole 2-3 mm long, 1-1.5 mm thick, strongly winged, stipules pilose; thyrse up to 8 cm long, 4.5 cm wide, slender, pyramidal, terminal, or on short lateral branchlets, or more rarely axillary, peduncle and branchlets very sparsely hirtellous, peduncle corky in fruit.

Lanai: mountains near Koele, June 1913, Forbes 80.L., (b.-p.fl.-i.fr.), type.

This variety apparently connects *G. terminalis* with *G. Hillebrandii.* Due to lack of material it is not certain whether it is a good variety of *G. terminalis* or a hybrid of unknown parentage. Named for the island of Lanai.

86. Gouldia Hillebrandii, new name.

Gouldia axillaris Wawra (of later authors, not Wawra: Flora, vol. 57, no. 19, p. 297, 1874, Wawra's species being based upon a hybrid type specimen).

Tree or shrub similar to *G. terminalis* but with tiny branchlets in the leaf axils before or after the leaves have fallen, very much condensed and covered with old leaf bases and stipules. These branchlets appear after the leaves have fallen, or rarely shortly before they fall, and bear the inflorescences. The thyrses are always slender and rather small and never borne terminally on the main branchlets or any smaller branchlets except the tiny axillary one described above (except very rarely on ordinary branchlets in var. *nodosa* f. *lancifolia*). The bracts are all minute and most are subulate. By flowering time the nodes bearing the thyrses are bare of leaves.

Molokai, Maui, and the Hamakua coast of Hawaii, with a different variety for each island.

Hairiness and the reduction of the thyrse seem to become stronger in the varieties from Molokai to Hawaii. Since the name *G. axillaris* cannot be retained I have replaced it, naming the species for Dr. William Hillebrand, author of the Flora of the Hawaiian Islands.

87. Gouldia Hillebrandii Fosberg var. **typica,** new variety (pl. 3).

Ramuli angulati glabri, internodi 0.5-3 cm longi, folia oblanceolata vel obovata vel elliptica non coriacea infra venulosa infra pilosa, petioli 5-10 mm longi 1 mm crassi, thyrsi parvi graciles hirtelli.

Branchlets more or less angled, glabrous, internodes 0.5-3 cm long; leaves up to 15

cm long, 5 cm wide, varying greatly in size and shape, oblanceolate to obovate or elliptical, apex acute, base cuneate or abruptly contracted or gradually contracted, not coriaceous, venulose beneath, pilose beneath, particularly in the midrib and veins, the hairs in bunches of two or three hairs, petiole 5-10 mm long, 1 mm thick, slightly winged; thyrses from minute (under 1 cm across) to 4 cm long and wide, very slender, hirtellous, at least on peduncle and larger branches; lower half of the ovary hirtellous, upper half and the calyx lobes glabrous except for ciliolae on the margin.

Eastern Maui and eastern slope of western Maui, apparently not found on the west slope of western Maui.

88. Gouldia Hillebrandii Fosberg var. **typica** Fosberg f. **eutypica,** new form.

Tubi corollae minute hirtelli, folia plerumque magna.

Lower two thirds of the corolla tube minutely hirtellous, leaves mostly rather large.

Maui: woods near Ukulele, above Olinda, July 1910, Forbes 200.M., (b.-p.fl.-i.fr.-m.fr.); Ukulele, July 1919, Forbes 967.M., (m.fr.); Papaaea, north slope of Haleakala, June 14, 1920, Forbes 2518.M., (p.fl.-i.fr.); Kula Flume Line, Olinda, alt. 4300 feet, February 12, 1930, St. John 10317, (i.fr.-m.fr.?); Olinda, Kula Pipe Line, October 18, 1922, Skottsberg 860, (i.fr.); Haiku-Uka Trail, Haleakala, Makawao District, alt. 950 meters, August 18, 1933, Fosberg 9846, (b.-fl.-i.fr.); Haiku-Uka Trail, Haleakala, Makawao District, alt. 950 meters, August 18, 1933, Fosberg 9836, (p.fl.-i.fr.), 9870, (i.fr.), 9874, (b.-i.fr.), type, and 9894, (p.fl.-i.fr.); Hamakua, September 1910, Rock 8535 (i.fr.).

89. Gouldia Hillebrandii Fosberg var. **typica** Fosberg f. **glabriflora,** new form.

Tubi corollarum glabri.

Like f. *eutypica* but corolla tube glabrous.

Maui: near Mt. Eka (Eke) from Waihee side, July 2, 1927, Degener 9471, (b.-fl.); Iao Valley, June 1910, Forbes 99.M., (b.-i.fr.); West Maui, Hillebrand, (in part), (i.fr.); Hamakua, Hillebrand and Lydgate, (b.-p.fl.?-i.fr.); West Maui, August 1910, Rock 6173, (p.fl.-b.-m.fr.), type.

Named *glabriflora* because of the glabrous flowers.

90. Gouldia Hillebrandii Fosberg var. **typica** Fosberg f. **microphylla,** new form.

Internodi breves, folia parva acuta, tubi corollarum glabri.

Internodes on branchlets very short, leaves under 5 cm long, 1.5 cm wide, acute at apex; corolla tubes glabrous.

Maui: Ukulele, July 1919, Forbes 937.M., (b.-h.fl.), type.

A doubtfully distinct form, whose habit appears noticeably different. Named *microphylla* because of the small leaves.

91. Gouldia Hillebrandii Fosberg var. **nodosa,** new variety.

Ramuli teretes glabri, nodi prominentes, internodi plerumque 1-2.5 cm longi, folia angusta infra sparse hirtella-pilosa, thyrsi glabri maxime 4 cm longi, flores glabri.

Branches terete or almost so, glabrous, nodes prominent, internodes 0.5-3.5 cm long, usually 1-2.5 cm; leaves rather narrow, sparsely hirtellous-pilose beneath, petioles 10-20 mm long, 1 mm or less thick, slightly or not at all winged; thyrses up to 4 cm long, slender, not condensed, glabrous or slightly papillose, calyx lobes not ciliolate, corollas glabrous.

Molokai, of rather general distribution in the higher mountains.

Named *nodosa* because of the prominent nodes with noticeable branch scars.

92. Gouldia Hillebrandii Fosberg var. **nodosa** Fosberg f. **eunodosa,** new form.

Frutex vel arbor, ramuli fistulosi, folia obovata vel late oblanceolata.

Shrub or tree up to 7 meters tall, branchlets fistulose, leaves obovate to broadly oblanceolate, thyrses all or mainly below the leaves on the stem.

Molokai, the common form: Pukoo, May 1910, Abbe Faurie 343, (b.-h.fl.?); head of Waikolu Valley, Hanalilolilo, alt. 3800 feet, December 21, 1932, St. John and others 12416, (b.-h.fl.-i.fr.), type; same locality and date, alt. 3900 feet, St. John and others 12422, (i.fr.); Puu o Kaeha, Kawela, alt. 3700 feet, December 23, 1932, St. John and others 12519, (i.fr.); Punaula Valley, alt. 1600 feet, December 28, 1932, St. John and Fosberg 12814, (s.).

93. Gouldia Hillebrandii Fosberg var. **nodosa** Fosberg f. **lancifolia,** new form.

Ramuli subfistulosi, folia elliptica-lanceolata vel oblanceolata acuminata.

Branchlets not as fistulose as in f. *eunodosa,* leaves elliptic-lanceolate to oblanceolate, acuminate, petioles slender, budding thyrses in axils of leaves which have not yet fallen.

Molokai, highest part of the mountains: near Pepeopae Bog, April 23, 1928, Degener 9467, (b.), and 9468, (b.-p.fl.-i.fr.); upper end of Hanalilolilo Pipe Line, April 24, 1928, Degener 9464, (b.-p.fl.-i.fr.); above Kamalo, near Pelekunu Pali, April 1910, Rock 7016, (b.-i.fr.), type; head of Waikolu Valley, Hanalilolilo, alt. 3,750 feet, December 21, 1932, St. John and others 12387, (i.fr.-m.fr); same locality and date, alt. 3,850 feet, St. John and others 12423, (i.fr.).

Named *lancifolia* because of the lanceolate leaves.

94. Gouldia Hillebrandii Fosberg var. **hawaiiensis,** new variety.

Arbor, ramuli fistulosi hirtelli, internodi plerumque 1.5-2.5 cm longi, folia obovata cuneata curvata infra venulosa infra hirtella vel pilosa, petioli maxime 10 mm longi 2 mm crassi, thyrsi condensati graciles hirtelli, ovaria hirtella, calyces hirtellae, tubi corollarum hirtelli.

Slender erect tree up to 5 meters tall, branchlets fistulose, hirtellous, angled but not sharply so, internodes 0.5-4 cm long, usually 1.5-2.5 cm, much longer on sucker shoots; leaves thin, obovate, cuneate, obtuse to acute at apex, curved, decidedly venulose beneath, especially on the midrib, the hairs having a distinct yellowish cast, petioles under 10 mm long, 2 mm thick, stipules large, usually longer than wide, somewhat persistent; thyrse very slender, much condensed, seldom over 3 cm across, even in fruit, peduncles and branches hirtellous, outside of ovary, calyx lobes and corolla tubes minutely hirtellous.

Hawaii, Hamakua coast from the Kohala Mountains to halfway between Hilo and Kilauea: along road 17 miles from Kohala toward Waimea, August 14, 1926, Degener 9480, (i.fr.); along road from Hilo to Kilauea, July 20, 1926, Degener 9484, (i.fr.); forest between Kaumana and Olaa Flume, right of road, May 4, 1915, Forbes 609.H., (b.); hills above Akaka Falls, Honomu, alt. 435 meters, December 8, 1933, Fosberg 10460, (b.-i.fr.); same locality and date, alt. 460 meters, Fosberg 10464, (b.-i.fr.), and 10466, (i.fr.); Awehi Stream, above Hilo, alt. 520 meters, December 7, 1933, Fosberg 10479, (i.fr.-m.fr.); same locality and date, alt. 485 meters, Fosberg 10486, (p.fl.-i.fr.-m.fr.), alt. 500 meters, Fosberg 10489, (m.fr.), type, alt. 480 meters, Fosberg 10495, (p.fl.-i.fr.-m.fr.); Holokaiea Gulch, July 10, 1909, Rock 4224, (150)-4244(150), (b.-p.fl.-i.fr.) and 4709 (150), 4711 (150)-4716(150), (b.-p.fl.-i.fr); woods above Waimea,

Parker Ranch, July 9, 1909, Rock 4235 (150)-4246 (150), (i.fr.-p.fl.) and 4710 (150), (i.fr.-p.fl.); Parker Ranch, Paauhau 3, July 6, 1909, Rock 4248 (150), (b.-i.fr.) and 4729 (150)-4734 (150), (b.-h.fl.-i.fr.).

Var. *hawaiiensis* is farther removed from *G. terminalis* than any other variety in this species. Named for the island of Hawaii.

95. Gouldia St.-Johnii, new species (fig. 1, *e-f*; see p. 26).

Internodi breves, folia plerumque elliptica cordata vel subcordata infra valde venulosa infra concava supra convexa, thyrsi terminales condensati, lobi calycarum in fructubus carnosi patenti.

Internodes short, 0.5-3 cm long, exceptional ones on fast growing shoots 4-5 cm long, leaf blades up to 6.5 cm long and 4 cm wide, usually 2-5 cm long and 1-2.5 cm wide, very stiff, commonly elliptical, base cordate to subcordate, apex obtuse to rounded, margins closely revolute, very concave beneath and convex above, midrib heavy, secondary veins very prominent beneath, impressed above; thyrse terminal, condensed, not over 1.5 cm across; ovary and calyx glabrous excepting for extremely short ciliolae or papillae on the margins of the calyx lobes; calyx lobes triangular, less than 1 mm long in flower, in fruit enlarging, becoming fleshy, and spreading so as to project at right angles to the axis of the ovary, corolla scar and style scar prominent, edges of calyx lobes forming callouses.

Oahu and Lanai.

Closely related to *G. terminalis,* differing chiefly in the structure of the fruit. Named for Dr. Harold St. John of the University of Hawaii, under whose direction this work has been accomplished.

96. Gouldia St.-Johnii Fosberg var. **typica,** new variety.

Frutex, ramuli hispiduli, folia coriacea infra hispidula, petioli breves crassi, thyrsi plerumque hispiduli valde condensati, flores glabri.

Dense shrub up to 3 meters tall, young branchlets somewhat angled, soon becoming terete, slightly fistulose at tips, internodes short, 0.5-3 cm long, branchlets hispidulous, the hairs often broken off quite early; leaves shortly petiolate, appearing almost sessile, commonly elliptical or oblong but occasionally slightly ovate or obovate, petiole 1-3 mm long, 1.5-3 mm wide or thick, seldom longer than thick, winged, petiole, midrib, and usually the under side of the blade more or less hispidulous, sparsely so on blade; thyrse extremely condensed, pedicels 1 mm long or less, peduncle commonly, secondary internodes less commonly, hispidulous; corolla glabrous, tube 7-11 mm long, 1-1.5 mm thick, lobes fleshy, 3-6 mm long, distal portion reflexed, filaments of perfect flowers less than 1 mm long, fertile portions of anthers 2.2 mm long, appendage 0.1-0.2 mm long, style of perfect flowers 3.7 mm long, stigma lobes 3.2 mm long, filaments of pistillate flowers less than 1 mm long, sterile anthers 2 mm long, style of pistillate flowers 4.5 mm long, stigma lobes 4-4.5 mm long; fruit 5.5 mm high, 7 mm broad, flat topped, urn-shaped.

Oahu, higher portions, especially exposed crests, of the Koolau Range: ridge to Konahuanui, alt. 450-950 meters, April 23, 1931, Christophersen, Wilder, and Hume 1721, (p.fl.-i.fr.), and 1725, (fl.-m.fr.); ridge south of Kipapa Gulch, Waipio, alt. 640 meters, September 18, 1932, Fosberg 8683, (i.fr.-m.fr.); same locality and date, alt. 800 meters, Fosberg 8689, (i.fr.), alt. 750 meters, Fosberg 8691, (i.fr.), type, and 8693, (i.fr.-m.fr.); Waikane-Schofield Trail, divide between Kahana and Waianaeuka, alt. 740 meters, May 14, 1933, Fosberg 9530, (b.-m.fr.-i.fr.) and 9521, (b.-i.fr.-m.fr.); same locality, alt. 740 meters, February 10, 1935, Fosberg and Oliveira 10804, (p.fl.-m.fr.), and Fosberg 10806, (h.fl.); Kipapa Gulch, south ridge, Waipio, alt. 2500 feet, July 4, 1932, Hosaka 680, (h.fl.-i.fr.); Kipapa Gulch, Waipio, alt. 2200 feet, April 2, 1933,

Hosaka 952, (b.-h.fl.-i.fr.) ; Kipapa Gulch, Waipio, alt. 2700 feet, August 7, 1933, Hosaka 1175, (i.fr.) ; Konahuanui, Mann and Brigham (in part, 2 right hand specimens on sheet), (h.fl.-i.fr.) ; Waikane-Schofield Trail, Kahana, alt. 2400 feet, January 19, 1930, St. John 10162, (b.-h.fl.-i.fr.).

97. Gouldia St.-Johnii Fosberg var. **Munroi,** new variety.

Ramuli valde angulati hirtelli, internodi 0.5-3 cm longi, folia plerumque 4-8 cm longa 2-4 cm lata coriacea plerumque elliptica obtusa cordata vel subcordata infra venulosa infra hirtella, petioli 1-5 mm longi, 1-3 mm crassi hirtelli alati, thyrsi 3-5 cm longi, 2-4 cm lati hirtelli, discus parvus.

Branchlets strongly angled, fistulose, hirtellous, reddish in color, internodes 0.5-3 cm long; leaves up to 10 cm long, usually 4-8 cm, up to 5 cm wide, usually 2-4 cm, coriaceous, elliptical or oblong to obovate, usually elliptical or oblong, apex obtuse, base cordate to subcordate, venulose beneath, veins pellucid, margins strongly revolute, hirtellous on under side of midrib, very sparsely so on under side of blade, petiole 1-5 mm long, 1-3 mm thick, hirtellous, winged; thyrse hemispherical, up to 5 cm long, 4 cm wide, peduncle strongly hirtellous, secondary internodes slightly hirtellous; calyx lobes somewhat less fleshy than in var. *typica,* disk somewhat smaller.

Lanai: Kaiholena, June 5, 1913, Forbes 3.L., (b.-p.fl.) ; Kaiholena Ridge, April 3, 1915, Munro, (b.-fl.-i.fr.) ; Lanaihale, May 17, 1914, Munro, (fl.) ; Mountain, Munro 9, (b.) ; ridge northwest of Lanaihale, alt. 950 meters, November 28, 1935, Fosberg 12391, (i.fr.-m.fr.), type, and Fosberg 12390, (b.-i.fr.-m.fr.) ; ridge south of Haalelepaakai, alt. 900 meters, November 28, 1935, Fosberg 12425, (i.fr.) ; Haalelepaakai Ridge, alt. 950 meters, November 29, 1935, Fosberg 12444, (b.-i.fr.), and Fosberg 12438, (b.-fl.-i.fr.) ; Haalelepaakai, alt. 940 meters, November 28, 1935, Fosberg 12407, (b.-i.fr.) ; Lanaihale Ridge, alt. 1,000 meters, November 28, 1935, Fosberg 12399, (b.-p.fl.-i.fr.-m.fr.) ; Puu Aalii, alt. 900 meters, November 28, 1935, Fosberg 12374, (p.fl.-i.fr.-m.fr.) ; same locality and date, alt. 950 meters, Fosberg 12383, (b.-p.fl.-i.fr.) ; ridge below Puu Aalii, between Maunalei drainage and Hauola drainage, alt. 850 meters, November 30, 1935, Fosberg 12461, (b.-fl.-i.fr.) ; same locality and date, alt. 900 meters, Fosberg 12491, (b.-fl.-i.fr.).

This variety differs from var. *typica* in the less rigid habit, less venulose leaves, sparser pubescence throughout, and the much less condensed thyrse. The calyx lobes are usually less fleshy and the disk is usually smaller. Named for Mr. George C. Munro, who has been interested in the vegetation of Lanai for many years, and who has collected many plant specimens from that island.

Rejected and Doubtful Names

Gouldia romanzoffiensis (Chamisso and Schlechtendal) Gray: Am. Acad., Proc., vol. 4, p. 310, 1860. This plant is not a *Gouldia,* but is more closely related to the genus *Hedyotis,* taken in a broad sense, as used by Endlicher.

Gouldia sandwicensis Gray: Am. Acad., Proc., vol. 4, p. 310, 1860. As *terminalis* is the oldest valid specific name in the genus this name cannot be used as a specific name. The description given by Chamisso and Schlechtendal of *Kaduae affinis* upon which this name is based clearly applies to *G. terminalis* var *coriacea. Coriacea* is the oldest name for this variety, so *G. sandwicensis* is a synonym of *G. terminalis* var. *coriacea.* (See p. 4.)

Kadua affinis Chamisso and Schlechtendal of De Candolle and later authors. (See p. 4.)

Gouldia axillaris Wawra: Flora, vol. 57, no. 19, p. 297, 1874. Though this name

has been applied to a well known distinct species, it is based upon a hybrid specimen, and is therefore rejected. The name *Gouldia Hillebrandii* is used here.

Gouldia sandwicensis Gray var. *hirtella* Gray was a *nomen nudum* until used with a description by Wawra: Flora, vol. 57, no. 19, p. 295, 1874. Wawra applied it to Kauai plants which are by no means the same as the specimen from Hawaii which Gray labeled "var. hirtella n. var.". Since Wawra quoted Gray as the author of the name it is obviously a misapplication. Wawra's plants are here designated *G. terminalis* var. *tenuicaulis.*

Gouldia hirtella Hillebrand: Fl. Haw. Is., p. 169, 1888, is evidently a composite of *G. terminalis* var. *macrocarpa, G. terminalis* var. *macrothyrsa,* and some hybrid forms from Oahu and Kauai.

Gouldia sandwicensis Gray var. *suffruticosa* Wawra: Flora, vol. 57, no. 18, p. 277, 1874, is based upon a hybrid type specimen.

Gouldia cirrhopetiolata Léveillé: Fedde Repert. Spec. Nov. Reg. Veg., vol. 10, p. 150, 1911, is based upon two different hybrid specimens.

Gouldia papuana Wernham: Jour. Botany, vol. 56, no. 665, p. 129, 1918. = *Psychotria papuana* (Wernham) St. John: B. P. Bishop Mus., Occ Pap., vol. 12, no. 7, 1936.

HYBRIDS

Oahu

G. terminalis var. **typica** f. **eutypica** × **G. terminalis** var. **Wawrana.**

Kipapa Gulch, Waipio, alt. 600 meters, August 7, 1933, Fosberg 9779, (p.fl.); top of south wall of Kipapa Gulch, Waipio, alt. 550 meters, September 18, 1932, Fosberg 8662, (i.fr.); same locality and date, alt. 600 meters, Fosberg 8664, (h.fl.-i.fr.): like var. *typica* except that the hybrid form is hirtellous on the small branchlets and the branches of the thyrse. Kipapa Gulch, Waipio, alt. 425 meters, June 12, 1933, Fosberg 9553, (p.fl.-i.fr.-m.fr.); Kipapa Gulch, south ridge, Waipio, alt. 1800 feet, July 4, 1932, Hosaka 599, (h.fl.-i.fr.); Punaluu, alt. 1800 feet, September 28, 1930, St. John 10580, (p.fl.-i.fr.-m.fr.): intermediate in every respect, being hirtellous in the same manner as var. *Wawrana* but not to so great a degree; Fosberg no. 9553 has scattered hairs over the under surface of the blades, while the other two have them only along the sides of the midribs. The leaves of St. John 10580 are rather thick and have only a slight tendency to be venulose; the other two show these characters of *Wawrana* more strongly. South ridge of South Opaeula Gulch, Paalaa, alt. 540 meters, September 25, 1932, Fosberg 8740, (i.fr.): like var. *typica* in most respects but slightly hirtellous on the smallest branchlets and has a suggestion of ciliolation on the calyx lobes, leaves somewhat venulose. Ditch Trail, Kahana Valley, Koolau Range, alt. 300 meters, November 26, 1933, Fosberg 10401, (i.fr.): like var. *coriacea* but with broader, somewhat venulose leaves and hirtellous branchlets and peduncles. Manoa Cliff Trail, Manoa Valley, alt. 430 meters, July 15, 1933, Fosberg 9701, (b.-h.fl.-i.fr.-m.fr.): like var. *Wawrana* but with under side of leaves, smaller branches of the thyrse, and the flowers glabrous, the internodes rather short. Manoa Cliff Trail, Manoa Valley, alt. 430 meters, July 15, 1933, Fosberg 9702, (i.fr.): like Fosberg 9701 but slightly more hairy, leaves more acute and with longer petioles. Kalichithal (Kalihi Valley), Wawra 1796, (i.fr.), small branchlets rather hirtellous; the leaves show a slightly developed apical fold, rather thick but somewhat venulose, (type of *G. sandwicensis* var. *suffruticosa* Wawra). Southeast side of Palolo Crater, March 20, 1932, Degener, Park, and Nitta 9442, (b.); summit overlooking Kahuku near Pupukea-Kahuku Trail, January 24, 1932, Degener, Park, and Kwon 9446, (s.); like var. *typica* but with short, stiff, sharp hairs on the internodes and venulose leaves; this may have a strain of *G. St.-Johnii,* suggested by the stiffness of the hairs. Punaluu, November 14-21, 1908, Rock 292, (i.fr.), like var. *Wawrana* but with branchlets only slightly hirtellous and leaves glabrous.

G. terminalis var. **typica** f. **gracilis** × **G. terminalis** var. **Wawrana.**

Manoa Cliff Trail, Manoa Valley, alt. 430 meters, July 15, 1933, Fosberg 9703, (b.-h.fl.-i.fr.) : like f. *gracilis* but with larger, thinner leaves, and with thyrses and branchlets somewhat hirtellous.

G. terminalis var. **typica** f. **eutypica** × **G. terminalis** var. **coriacea.**

Pauoa Valley, alt. 500 meters, October 26, 1925, C. S. Judd, (m.fr.) : internodes 1-4 cm long, mostly about 2 cm, leaves slightly wider in proportion than in var. *coriacea,* petioles slender, up to 1 cm long, thyrse small as in *coriacea.* Laie-Waimea divide, alt. 640 meters, April 15, 1933, Fosberg 9424, (p.fl.-i.fr.) : much like the last except that the leaves are shorter and the internodes very short. Pupukea-Kahuku Trail, Kaunala, alt. 500 meters, February 19, 1933, Fosberg and Duker 9198, (p.fl.) : the internodes are not quite as short as in Fosberg 9424, the apex of the leaves is rounded or obtuse, the thyrse intermediate, up to 3 cm long in flower and 3-5 cm in fruit. Kaluanui, alt. 2300 feet, October 14, 1934, Bryan 838, (i.fr.) : the internodes varying from 1-3 cm long, leaves rather broad, otherwise like leaves of var. *coriacea,* thyrse intermediate. Kaluanui, alt. 2,000 feet, November 30, 1929, St. John 10098, (m.fr.) : similar to Bryan 838 except that the internodes are all long, thyrses both terminal and axillary and slightly larger. Palolo-Waialae Ridge, alt. 1600 feet, March 25, 1932, Hume 521, (p.fl.-i.fr.) : like var. *coriacea* except that the internodes are long. Nuuanu-Kalihi Ridge, alt. 1800 feet, Hume 363, (b.) : like Hume 521 but with leaves more acute. North Fork of Kaluanui Gulch, May 15, 1909, Hosmer and Rock 3043 (155), (p.fl.-i.fr.) : much like long leafed var. *coriacea* except that the internodes are long. Kipapa Gulch, second north fork, alt. 1200 feet, June 26, 1932, Hosaka 592 (i.fr.) : like Hosmer and Rock 3043 (155) except that some of the leaves are as long as 13 cm. Kipapa Gulch, south ridge, Waipio, alt. 2,000 feet, July 4, 1932, Hosaka 626, (b.-i.fr.) : internodes medium length, leaves variable, some like var. *coriacea,* others as wide as 4 cm and elliptical, petioles rather heavy and winged, thyrse as in var. *coriacea.* Waikane-Schofield Trail, alt. 1,525 feet, Hattie Davis, (m.fr.) ; same locality, no alt., Nobue Tsuji, (m.fr.) : like var. *typica* except that most internodes are 1.5-2 cm long, thyrse 3-4 cm long. Waikane-Schofield Trail, Kahana, alt. 500 meters, October 16, 1932, Fosberg and Duker 8804, (i.fr.) : internodes mostly 1-2 cm long, but a few up to 3 cm, branchlets terete or subterete and heavy. Waikane-Schofield Trail, Kahana, alt. 650 meters, October 16, 1932, Fosberg and Duker 8779, (m.fr.) : internodes on some branches rather short, leaves narrow, petioles up to 1.5 cm long, thyrse 1.5-5 cm long. Waikane-Schofield Trail, Kahana, alt. 600 meters, October 16, 1932, Fosberg and Duker 8777, (i.fr.-m.fr.) : similar to Fosberg and Duker 8779, but leaves somewhat broader, petioles up to 1 cm long, thyrse up to 3.5 cm long. Konahuanui-Olympus Trail, February 15, 1920, Garber 243, (b.-m.fr.) ; Pupukea-Kahuku Trail, Kaunala, alt. 470 meters, February 19, 1933, Fosberg and Duker 9204, (b.) ; Kahuauli Ridge, alt. 500-700 meters, December 17, 1931, Christophersen and Hume 1426, (i.fr.-h.fl.) : internodes rather short, leaves as in var. *typica* but with petioles up to 1 cm long, thyrse intermediate in size but like var. *typica* in form. Waikane-Schofield Trail, Kahana-Waianaeuka divide, alt. 750 meters, December 2, 1934, Fosberg 12183, (m.fr.) : much the same, with internodes 0.5-4.5 cm long, thyrse intermediate in size to fully the size of var. *typica.* Waikane-Schofield Trail, Kahana, alt. 2200 feet, January 19, 1930, St. John 10153, (h.fl.) ; same locality, alt. 740 meters, October 16, 1932, Fosberg and Duker 8802, (m.fr.) : much the same with leaves tending to be elliptical. Pauoa Valley, October 24, 1908, Rock, (i.fr.) : like Fosberg and Duker 8802 but with internodes varying from 0.5-4 cm long. Peak at head of Pauoa Flats, Pauoa, alt. 700 meters, October 30, 1932, Fosberg 8957, (m.fr.) : like var. *coriacea* but with broader leaves and a short, heavy petiole, thyrse very dense, with large fruit, 6-8 mm in diameter. Punaluu, alt. 2500 feet, May 1932, Meebold, (i.fr.) : like var. *typica* but leaves tending to be lanceolate, petioles slender, 1-1.5 cm long, thyrse slender. Kalauao-Waimalu Ridge, Koolau

Range, alt. 480 meters, March 29, 1933, Fosberg 9335, (b.-h.fl.-i.fr.) ; Pupukea-Kahuku Trail, alt. 1200 feet, March 6, 1932, Suehiro, (b.) : like var. *coriacea* but leaves broader, thyrse larger. Ridge southeast of Maakua Gulch, Koolau Range, Hauula, alt. 700 meters, October 15, 1933, Fosberg 10337, (m.fr.), and 10339, (i.fr.-m.fr.) ; west of Poamoho Trail, Laie, August 25, 1935, Degener, Park, Potter, Bush, and Topping 10012, (i.fr.) : like var. *coriacea* but with slightly broader leaves, longer internodes, larger thyrse. Kalauao Ridge, Koolau Range, Ewa Forest Reservation, alt. 550 meters, March 29, 1933, Fosberg 9350, (b.-h.fl.-i.fr.) ; ridge southeast of Maakua Gulch, Koolau Range, Hauula, alt. 450 meters, October 15, 1933, Fosberg 10352, (i.fr.-m.fr.) : like var. *typica* but with somewhat shorter internodes, longer petioles and a smaller thyrse. Kalauao-Waimalu Ridge, Koolau Range, alt. 480 meters, March 29, 1933, Fosberg 9346, (b.-p.fl.-i.fr.-m.fr.) : like var. *typica* but with rather narrow leaves and slightly smaller thyrses, the branchlets much like var. *coriacea*. Kipapa Gulch, alt. 2,000 feet, August 7, 1933, Hosaka 1174, (p.fl.) ; Kipapa Gulch, alt. 1,280 feet, August 6, 1933, Hosaka 1134, (b.-p.fl.-i.fr.) ; Kipapa Gulch, Waipio, alt. 800 meters, August 7, 1933, Fosberg 9765, (p.fl.) : internodes short, stems heavy, leaves very thick and heavy, narrow but with a subcordate base, thyrse intermediate in size but very heavy and dense, possibly hybrids with *G. terminalis* var. *typica* f. *robusta*. Head of Kalihi Valley, alt. 300-500 meters, January 25, 1931, Christophersen, Wilder, and Hume 1500, (b.-h.fl.-i.fr.) : internodes rather short, up to 4.5 cm long but mostly about 1 cm, leaves broader than in var. *coriacea*, some thyrses up to 2.5 cm long, otherwise like var. *coriacea*. Head of Kalihi Valley, alt. 300-500 meters, January 15, 1931, Christophersen, Wilder, and Hume 1481, (h.fl.-m.fr.) : like Christophersen, Wilder, and Hume 1500 but leaves broader, shaped like var. *typica*, internodes 1.5-3 cm long, usually 1.5-2 cm. Waipio-Waiawa Ridge, March 5, 1928, Degener and C. L. Shear 9457, (m.fr.) : like var. *typica* but with internodes 1-3 cm long, mostly 1-1.5 cm, stipules persistent on one twig. Waikane-Schofield Trail, Kahana-Waianaeuka divide, alt. 740 meters, February 10, 1925, Fosberg and Oliveira 10807, (h.fl.) : like var. *coriacea* but with internodes mostly 2-5 cm long. Lower slopes of Puu Konahuanui above Nuuanu Pali Road, Kailua, alt. 430 meters, January 5, 1935, Fosberg 10741, (p.fl.-i.fr.) : like var. *coriacea* but with leaves slightly broad in proportion and thyrse up to 4 cm wide and 3.5 cm long, loose as in var. *typica*. Along Waikane-Schofield Trail on Waikane side, April 4, 1931, Degener, Hirai, and Park 9451, (b.) : like var. *typica* but with narrower oblanceolate leaves, long, slender petioles and small thyrses. Koolau Range, Nuuanu, alt. 500-600 meters, August 13, 1922, Skottsberg 174, (b.-i.fr.) : like var. *typica* but with more slender branchlets, oblanceolate leaves, slender petioles and small thyrses. "Oahu", U. S. Exploring Expedition, (i.fr.), (photo seen, U. S. Nat. Herb. 42355) : like var. *typica* but with shorter internodes, slender petioles and narrower leaves.

G. terminalis var. typica × G. St.-Johnii.

Laie-Malaekahana Ridge, alt. 570 meters, March 15, 1933, Fosberg 9396, (m.fr.) : like var. *typica* but with branchlets and peduncles hirtellous, internodes 1.5-4 cm long, mostly 2 cm, leaves tending to be elliptical and more venulose, thyrse 2 cm long, 2.5 cm wide, condensed, but not so much as in *G. St.-Johnii*, fruits apparently intermediate, calyx lobes in fruit somewhat fleshy and erect. Left ridge of Kalihi Valley, November 9, 1916, Forbes and Labouchere 2311.O., (p.fl.) : like var. *typica* but with branchlets hirtellous, leaves tending to be broader at the base and almost subcordate, thyrse less than 2 cm long and 2 cm wide, peduncle and larger internodes hirtellous, calyx lobes somewhat ciliolate. Waikane-Schofield Trail, Kahana, alt. 750 meters, October 16, 1932, Fosberg 8772, (i.fr.) : like var. *typica* but with short internodes, 0.5-3 cm long, mostly about 1-1.5 cm, leaves rather short and broad in proportion, 5 cm long, 3 cm wide; thyrse condensed, especially in the distal portions, 2 cm long and broad, calyx lobes slightly ciliolate. Kipapa Gulch, Waipio, alt. 700 meters, August 7, 1933, Fosberg 9773, (p.fl.-i.fr.) : like var. *typica* except for heavier branchlets with short internodes, 0.5-3.5 cm

long, the upper ones slightly hirtellous, and leaves slightly more elliptical, larger internodes of thyrse hirtellous. Lanihuli Trail, September 17, 1908, Forbes, (b.-i.fr.) : intermediate in most respects; branchlets slender, internodes 1-5 cm long, mostly about 3 cm, leaves glabrous, broadly elliptic-obovate, truncate at base, slightly acuminate at apex, somewhat venulose, thyrse condensed in flower, 2.5 cm long in fruit, hirtellous. Laie-Waimea divide, alt. 650 meters, April 15, 1933, Fosberg 9421, (i.fr.) : internodes 0.5-5 cm long, upper ones hispidulous, leaves as in var. *typica* but decidedly venulose; thyrse extremely condensed, peduncles hispidulous, fruit as in *G. St.-Johnii.* Laie-Waimea divide, alt. 665 meters, April 15, 1933, Fosberg 9411, (h.fl.-i.fr.) : like Fosberg 9421 but thyrse hirtellous, leaves more elliptical, and calyx lobes erect rather than spreading. Laie-Malaekahana Ridge, alt. 615 meters, April 15, 1933, Fosberg and Chong 9428, (b.-i.fr.-m.fr.) : like Fosberg 9411 but internodes with longer and straighter hair, leaves much more venulose, calyx lobes slightly ciliolate. Laie-Waimea divide, alt. 660 meters, April 15, 1933, Fosberg 9415, (i.fr.-h.fl.) : like Fosberg 9411 but leaves larger and thinner, calyx lobes slightly spreading in fruit. Poamoho Trail, summit, Laie, August 18, 1935, Degener, Park, Potter, Bush, and Topping 10014, (i.fr.-m.fr.) : like *G. St.-Johnii,* but internodes very long, leaves quite large. West of Poamoho Trail, Laie, August 25, 1935, Degener, Park, Potter, Bush, and Topping 10013, (b.-i.fr.-m.fr.) : like *G. St.-Johnii,* but some internodes long, plant much less hairy, leaves not so venulose or as convex. Puu Kahuauli, alt. 2500 feet, January 12, 1932, Hume 465, (m.fr.) : like *G. St.-Johnii* in fruit and general appearance but with slender branchlets, internodes 1-3 cm long, mostly 1.5-2 cm, leaves glabrous. Kainaauika, above Palolo, alt. 770 meters, December 27, 1934, Fosberg 10710, (b.-i.fr.-m.fr.) : like *G. St.-Johnii* but with slender branchlets and internodes mostly 1.5-3 cm long, leaves not as venulose or curved. Waiawa, February 1930, Russ, (b.-p.fl.-m.fr.) : like *G. St.-Johnii* but with longer internodes and less hirtellous leaves. Niu, April 1930, Russ, (b.-fl.-i.fr.) : like *G. St.-Johnii* but with longer internodes and glabrous, less venulose, almost plane leaves.

Fosberg 9415 and, to some extent, Fosberg 9411 have leaves like var. *Wawrana* except that they are glabrous. This suggests that var. *Wawrana* may possibly be one of the parents. However, this is hard to determine as leaves intermediate between those of *G. terminalis* and *G. St.-Johnii* might be very closely similar to those of var. *Wawrana.*

G. terminalis var. coriacea × G. terminalis var. Wawrana.

Niu, April 1930, Russ, (i.fr.), (AF) : like var. *coriacea,* in having internodes short, leaves intermediate in shape, thick, petiole slender 10 mm long, and thyrse small, with pronounced apical fold as in var. *Wawrana,* veins more prominent than in *coriacea,* branchlets, and internodes of thyrse hirtellous as in var. *Wawrana,* ovaries and calyx glabrous as in var. *coriacea,* or with only a slight trace of ciliolation on the calyx lobes. Koolauloa Range between Punaluu and Kaipaupau, May 3-8, 1909, Forbes and Cooke, (b.-i.fr.) : like the last but with calyx lobes decidedly ciliolate. Kipapa Gulch, south ridge, Waipio, alt. 1700 feet, July 4, 1932, Hosaka 632A, (i.fr.-p.fl.) : long internodes, branchlets and larger divisions of thyrse hirtellous, under side of midrib and blade of leaves sparsely so, and shape of blade as in var. *Wawrana;* veins rather prominent, petioles slender, 5-7 mm long, and thyrse 1.5-2 mm long as in var. *coriacea;* calyx lobes not ciliolate. Palolo Valley, November 7, 1908, Forbes and Rock, (i.fr.) : internodes short, 1-4 cm long, mostly 1.5 cm, leaves as in var. *coriacea* but broader, with decidedly revolute margins and more prominent veins, thyrse intermediate, peduncles and branchlets hirtellous. Lanihuli Trail, October 14, 1908, Forbes, (i.fr.) : similar to the last but with leaves slightly broader, petioles thick, thyrse larger, as much as 4.5 cm long and wide; these two have, perhaps, a strain of var. *typica* in their ancestry. Wahiawa, north fork of Kaukohahua Gulch, May 15, 1909, Hosmer and Rock 3062 (155)-3064 (155), (p.fl.-i.fr.-m.fr.) : internodes 1-4 cm long, mostly 2 cm, very minutely hirtellous, leaves as in var. *coriacea* but up to 3 cm wide, apical fold noticeable, thyrse minutely hirtellous, calyx lobes ciliolate, corolla tube minutely hirtellous in lower two thirds, thyrse 1.5-3

cm long, 2-4 cm wide, axillary and terminal; one of two collections of this affinity with distinctly axillary inflorescences such as are commonly found in material from the islands farther east. Waikane-Schofield Trail, Waianaeuka-Wahiawa divide, alt. 740 meters, May 14, 1933, Fosberg 9524, (h.fl.) : like var. *Wawrana* but with internodes mostly short, some of the leaves quite narrow, and thyrses rather small. Waikane-Schofield Trail, head of Kahana Valley, alt. 350 meters, May 14, 1933, Fosberg 9537, (h.-i.fr.) : internodes rather short, leaves glabrous and shaped like var. *Wawrana* but with petioles up to 13 mm long, veins not at all prominent, branchlets and thyrses, except the pedicels, densely hirtellous, calyx lobes somewhat ciliolate, corolla glabrous. Waikane-Schofield Trail, Kahana, alt. 730 meters, October 16, 1932, Fosberg 8806, (h.fl.-i.fr.) : internodes 1-4 cm long, mostly 1-2 cm, leaves a trifle wide for var. *coriacea,* petioles up to 2 mm thick, somewhat venulose, thyrse loose, up to 3.5 cm long, whole plant glabrous except that the calyx lobes are slightly ciliolate. South ridge of South Opaeula Gulch, Paalaa, alt. 525 meters, September 25, 1932, Fosberg 8750, (i.fr.) : like var. *Wawrana* but with internodes short, 1-4 cm long, mostly 1-2 cm, leaves glabrous, not conspicuously venulose, petioles 5-7 mm long. Kalauao-Waimalu Ridge, Koolau Range, alt. 470 meters, March 29, 1933, Fosberg 9338, (b.-h.fl.) : like var *coriacea* but leaves slightly more venulose, branchlets and peduncles somewhat hirtellous.

G. terminalis var. coriacea × G. St.-Johnii.

Waikane-Schofield Trail, Koolau Range, Waianaeuka, alt. 2400 feet, April 28, 1935, St. John 17623, (b.-h.fl.-i.fr.) : like *G. St.-Johnii* but leaves elliptic-lanceolate, not much curved, not very venulose, petioles 5 mm long, 1.5 mm thick. Ridge southeast of Maakua Gulch, Koolau Range, Hauula, alt. 750 meters, October 15, 1933, Fosberg 10334, (b.-i.fr.-m.fr.) : like *G. St.-Johnii* but almost glabrous. Ridge southeast of Maakua Gulch, Koolau Range, Hauula, alt. 700 meters, October 15, 1933, Fosberg 10336, (b.-h.fl.-i.fr.-m.fr.) ; west of Poamoho Trail, Laie, August 25, 1935, Degener, Park, Potter, Bush, and Topping 10013 a, (m.fr.) : like Fosberg 10334 but leaves more plane, less venulose, petioles longer, calyx lobes almost erect. Kipapa Gulch, Waipio, alt. 860 meters, August 6, 1933, Fosberg 9736, (b.-i.fr.) : like *G. St.-Johnii* but with leaves more plane, thinner, less venulose, and with rather slender petioles, up to 5 mm long, 1 mm thick. Peak at head of Pauoa Flats, Pauoa, alt. 600 meters, October 30, 1932, Fosberg 8965, (i.fr.) : like *G. St.-Johnii* but with small glabrous leaves, less than 5 cm long and 2 cm wide, narrowly elliptical, sometimes nearly obovate, obtuse, less venulose, petioles up to 3 mm long, 1.5 mm thick. Ridge south of Kipapa Gulch, Waipio, alt. 860 meters, September 18, 1932, Fosberg 8703, (i.fr.) : like Fosberg 8965 but branchlets only slightly hairy, leaves very variable, up to 6 cm long and 3 cm wide, from broadly elliptic-lanceolate, acute, to elliptical or obovate, obtuse, base obtuse to truncate, thyrse glabrous. At summit of Pig-God Trail, Punaluu, January 17, 1932, Degener, Park, and Kwon 9444, (b.) : like *G. St.-Johnii* but leaves plane and glabrous beneath. Koolau Range, Nuuanu, 500-600 meters, August 13, 1922, Skottsberg 144, (fl.) : like var. *coriacea* but branchlets strongly hirtellous, leaves elliptical, thyrse glabrous except peduncle.

G. terminalis var. typica × G. terminalis var. coriacea × G. St.-Johnii.

Laie-Malaekahana Ridge, alt. 550 meters, April 15, 1933, Fosberg 9403, (b.-h.fl.-i.fr.) : internodes 1-5 cm long, mostly 2 cm, hirtellous, leaves shaped as in var. *typica* but tending to be narrow with acute apex and petiole 1 cm long, blade glabrous, somewhat venulose, thyrse somewhat condensed, 2 cm long, 3 cm wide, rather flat-topped in flower, lower internodes of thyrse somewhat hirtellous. "Oahu", Rock? 8355(155a), (b.) : entirely glabrous, internodes very short, mostly less than 1 cm long, leaves as in var. *typica* but with slender petioles 7 mm long, thyrse very much condensed.

G. terminalis var. coriacea × G. terminalis var. macrothyrsa.

Second gulch east of Puu Kaupakuhale, Mokuleia, Puu Kaala, alt. 650 meters, October 23, 1932, Fosberg and St. John 8900, (i.fr.-m.fr.) : like var. *coriacea* but with leaves broader, thyrses with corky peduncles. Pupukea-Kahuku region, November 23, 1924,

Topping 2927, (m.fr.) : like var. *macrothyrsa* but glabrous and with longer petioles, leaves obtuse or rounded at base, not cordate. Kahuku army trail, July 1930, Russ, (b.-i.fr.) : like var. *macrothyrsa* but with longer petioles, acute leaves with rounded bases.

G. terminalis var. **macrothyrsa** × **G. terminalis** var. **kaala** f. **eukaala.**

"Oahu", Meyen, (b.-i.fr.) : like var. *macrothyrsa* but with shorter internodes and slightly winged petioles. From Waianae Valley up toward Mount Kaala, April 24, 1932, Degener 4141, (b.-h.fl.) : like var. *kaala* but with some of the internodes up to 4.5 cm long, leaves large, up to 12 cm long, 5 cm wide, some cordate at base and acuminate at apex, petiole 0.5 cm long, rather thick, only slightly winged, blade very slightly hirtellous along midrib. Ridge on right side of head of Makua Valley, June 26, 1932, Degener, Park, and Nitta 9440, (i.fr.) : like var. *kaala* but with sharply angled branchlets and no sign of exfoliation of leaf epidermis. Makaha Valley, Kaala Range, February 12-19, 1909, Forbes, (h.fl.) : like var. *kaala* but with slender branchlets with internodes 2-5 cm long, petioles slightly winged. Puu Kaala, east slope, Waianaeuka, alt. 870 meters, January 8, 1933, Fosberg 9102, (p.fl.-i.fr.-m.fr.) : like variety *macrothyrsa* but with internodes on some branchlets very short and leaves like those of var. *kaala,* but rather long and narrow, slightly hirtellous along midrib, epidermis not at all exfoliating, petiole only slightly winged. Puu Kaala, east slope, Waianaeuka, alt. 900 meters, January 8, 1933, Fosberg 9094, (i.fr.-h.fl.) : like var. *macrothyrsa* but with internodes mostly about 2 cm long, petioles 5-8 mm long, rather slender. Puu Kaala, east slope, Waianaeuka, alt. 800 meters, January 8, 1933, Fosberg 9101, (i.fr.-m.fr.) : intermediate in most characters, stem angled but not sharply so, internodes mostly 2-3 cm long, leaves like var. *macrothyrsa* but not cordate, usually not even subcordate, thyrse as in var. *macrothyrsa* but rather small. Second gulch east of Puu Kaupakuhale, Puu Kaala, Mokuleia, alt. 900 meters, October 23, 1932, Fosberg and St. John 8907, (h.fl.) : like var. *macrothyrsa* but with internodes mostly 1-1.5 cm long, thyrse small, 4 cm long and 3.5 cm wide. Makaha Valley, Kaala Range, February 12-19, 1909, Forbes, (b.-h.fl.-m.fr.) : similar to the last but with internodes mostly 2-3 cm long. Haleauau Valley, Puu Kaala, Waianaeuka, alt. 900 meters, February 24, 1935, Fosberg 10819, (b.-h.fl.-i.fr.) : like var. *kaala* but internodes 1.5-5.5 cm long, mostly 2-4 cm, leaves mostly 3-4 cm wide, 7-9 cm long. Puu Kaala, eastern slope, Waianaeuka, alt. 870 meters, January 8, 1933, Fosberg 9095, (i.fr.-m.fr.) : like var. *macrothyrsa* but glabrous. Near head of Makaha Valley, south side, alt. 700 meters, March 31, 1935, Fosberg 10894, (m.fr.) : like var. *kaala* but with angled, slightly hirtellous branchlets, leaves hirtellous beneath, only slightly exfoliating.

G. terminalis var. **macrothyrsa** × **G. terminalis** var. **kaala** f. **Russii.**

Lihue (Waianae Mountains south of Schofield), east side, October 1929, Russ, (b.-p.fl.-i.fr.) : like f. *Russii* but with internodes mostly 3-4 cm long and leaves very large, blades up to 9 cm long and 5 cm wide, much more hirtellous beneath and with petioles over 20 cm long. Kaaikukae, (Honouliuli, near south end of Waianae Mountains), July 1929, Russ, (i.fr.) : like f. *Russii* but with internodes 1.5-2.5 cm long, thyrse 7 cm long, sucker shoot much like var. *macrothyrsa.* Palehua, Honouliuli, alt. 2500 feet, November 22, 1931, St. John 11159, (i.fr.) : like var. *macrothyrsa* except for internodes 1-6 cm long, mostly 1-2 cm, leaves with petioles 5 mm long, 1-1.5 mm thick. Puu Hapapa, Waianae Mountains, Honouliuli, alt. 2700 feet, March 16, 1930, St. John 10427, (b.-m.fr.) : like St. John 11159 but with somewhat longer internodes, almost terete branchlets, and rounded leaf bases. Puu Hapapa, Honouliuli, October 20, 1930, S. Nakagawa, (i.fr.) : like var. *macrothyrsa* in every respect except that on the small branchlets the internodes are from 0.5 to 1.5 cm long, and on the main branch, 6 cm long, possibly not a hybrid but pure var. *macrothyrsa.* Kukuiala Gulch, Mokuleia, alt. 2,350 feet, February 4, 1934, St. John 14085, (b.-i.fr.-m.fr.) : like var. *macrothyrsa* but some of the branchlets have internodes mostly as short as 2 cm, thyrses 4.5 cm long or (mostly)

less. Ridge above Kupehau, Honouliuli, alt. 700 meters, June 30, 1935, Fosberg 10976, (i.fr.); ridge above Forest Reserve House, southeast of Palikea, Honouliuli, alt. 880 meters, June 30, 1935, Fosberg 10939, (h.fl.-i.fr.); Palehua, January 1927, Degener 9469, (i.fr.); Palehua, Green Peak, August 23, 1922, Skottsberg 313, (lower twig), (b.-i.fr.-h.fl.): like var. *macrothyrsa* but glabrous, with some of the internodes shorter and the thyrse slightly smaller. Waianae Mountains, Palehua, Green Peak, August 23, 1922, Skottsberg 313, (upper twig): like var. *macrothyrsa* but glabrous. Ridge above Forest Reserve House, southeast of Palikea, Honouliuli, alt. 880 meters, June 30, 1935, Fosberg 10941, (h.fl.-i.fr): like var. *macrothyrsa* but glabrous and leaves shaped like those of f. *Russii*. Near ridge overlooking Makua and Kahanahaiki Valleys, July 10, 1932, Degener, Park, and Nitta 9437, (i.fr.), Kanehoa, July 5, 1931, Degener and Park 9448, (i.fr.): like var. *macrothyrsa* but glabrous and with almost terete branchlets. Mokuleia Forest Reserve, Mokuleia-Makua divide, Waianae Mountains, alt. 2300 feet, November 25, 1932, St. John 12239, (i.fr.): like f. *Russii* but leaves more hairy, branchlets more strongly angled, thyrses larger. Makaha Valley, alt. 1500 feet, March 4, 1932, St. John 11600, (b.-m.fr.): like var. *macrothyrsa* but with internodes 1-4 cm long, mostly 2 cm, thyrse 4 cm long and wide. Kukuiala Gulch, Mokuleia, alt. 2,350 feet, February 4, 1934, St. John 14084, (b.-m.fr.): like var. *macrothyrsa* but with internodes 1-4 cm long, mostly 2 cm, thyrse very small, 2 cm long, leaves not noticeably venulose, (f. *eukaala* possibly one parent instead of f. *Russii*). East ridge of Puu Kaua, Honouliuli, alt. 875 meters, November 6, 1932, Fosberg 8984, (i.fr.-m.fr.): like var. *macrothyrsa* but with internodes very variable in length, from 0.5 to 5 cm. Popoula Ridge, Puu Hapapa, Honouliuli, alt. 2700 feet, January 7, 1934, St. John 13993: like var. *macrothyrsa* but with internodes on some twigs predominantly 1 cm, on others from 2 to 4 cm, leaves rather narrow. "Oahu", U. S. Exploring Expedition, (i.fr.), (photo seen, U. S. Nat. Herb. 42356): like var. *macrothyrsa* but some of the internodes shorter. Small valley northeast of Puu Hapapa, August 7, 1932, Degener and Park 9434, (m.fr.): like var. *macrothyrsa* but with stems not conspicuously angled, internodes 2.5 cm long, leaves oblanceolate to narrowly obovate, thyrse 5 cm long and 3 cm wide. Makaha Valley, Kaala Range, February 12-19, 1909, Forbes, (m.fr.-i.fr.), (fruiting sheet): like f. *Russii* but with internodes 0.5-5 cm long.

Kauai

G. terminalis var. **elongata** f. **euelongata** × **G. terminalis** var. **arborescens** f. **euarborescens.**

Hanalei Valley, Wawra 2005, (fl.), (Vienna, photo in B. P. Bishop Mus.): like var. *arborescens* but with longer internodes and sharply angled branchlets, not at all fleshy. Slopes of Kahili, above Kahili bog, Kalaheo, alt. 2,350 feet, December 24, 1933, St. John and Fosberg 13543, (p.fl.-m.fr.): like var. *arborescens* but with sharply angled branchlets, not fleshy; the secondary veins of the leaves form a wider angle with the midrib. Wainiha Valley, side gulch on west side three fourths of a mile upstream from intake, alt. 850 feet, January 1, 1934, St. John and Fosberg 13981, (i.fr.): like the last but with branchlets a trifle fleshy and leaf margins more revolute. Kahili swamp, Wahiawa, Lihue-Koloa Forest Reserve, alt. 2100 feet, December 29, 1930, St. John and others 10858½, (b.-m.fr.): like St. John and Fosberg 13981 but leaves not revolute. Trail to Kahili bog, Wahiawa Valley, Wahiawa, alt. 1800 feet, December 24, 1933, St. John and Fosberg 13600, (m.fr.); like var. *elongata* but with shorter internodes and peduncle not corky. Kahili swamp, Wahiawa, Lihue-Koloa Forest Reserve, alt. 2100 feet, December 29, 1930, St. John and others 10858, (i.fr.): like var. *elongata* but leaf shape like var. *arborescens*. Trail to Kahili bog, Wahiawa Valley, Wahiawa, alt. 1,650 feet, December 24, 1933, St. John and Fosberg 13608, (i.fr.): like var. *arborescens* but with long internodes and sharply angled branchlets. Power Line Trail, Hanalei-Kalihikai Ridge, alt. 1500 feet, January 21, 1931, St. John and others 10965, (b.-i.fr.): like

var. *elongata* but with shorter internodes and leaves inclined to be obovate. Trail to Kahili bog, Wahiawa Valley, Wahiawa, alt. 1900 feet, December 24, 1933, St. John and Fosberg 13595, (i.fr.-m.fr.) : like var. *elongata* but with some internodes quite short, others long. Hii Mountains, October 20, 1916, Forbes 625.K., (i.fr.-m.fr.) : like var. *arborescens* but with mostly long internodes and sharply angled, non-fleshy branchlets. Hanapepe, December 1909, Abbe Faurie 354, (i.fr.) : like var. *elongata* but with some internodes short, leaves obovate-oblanceolate. Trail to Kahili bog, Wahiawa Valley, Wahiawa, alt. 1700 feet, December 24, 1933, St. John and Fosberg 13604, (i.fr.-m.fr.) : like var. *elongata* but with branchlets somewhat fleshy and some of the internodes short. Trail to Kahili bog, Wahiawa Valley, Wahiawa, December 24, 1933, St. John and Fosberg 13599, (i.fr.-m.fr.) : like var. *elongata* but with branchlets fleshy, a few internodes rather short, thyrse tending to be pendulous. Slopes of Kahili, above Kahili bog, Kalaheo, alt. 2,350 feet, December 24, 1933, St. John and Fosberg 13539, (p.fl.-i.fr.-m.fr.) : like var. *elongata* but with branchlets quite fleshy, not sharply angled, leaves large and obtuse or rounded at the apex. Hanapepe Falls, June 19, 1926, Degener 9490, (i.fr.) : like var. *elongata* but leaves obovate, thyrse less stiff, branchlets somewhat fleshy.

G. terminalis var. **osteocarpa** × **G. terminalis** var. **arborescens** f. **euarborescens.**

Trail to Kahili bog, Wahiawa Valley, Wahiawa, alt. 1600 feet, December 24, 1933, St. John and Fosberg 13610, (p.fl.-i.fr.) : like var. *osteocarpa* but with a fleshy stem and short internodes. Slopes of Kahili above Kahili bog, Kalaheo, alt. 2,350 feet, December 24, 1933, St. John and Fosberg 13535, (i.fr.) : like St. John and Fosberg 13610 but very coriaceous. North of Wahiawa, June 20, 1926, Degener 9487, (m.fr.) : similar to St. John and Fosberg 13535 but leaves rather small, more or less cuneate, curved, veins 7 mm apart, stem not so fleshy. "Kauai", Wawra 2052 (in part, small fruiting twig), (m.fr.) : internodes short, somewhat fleshy, leaves like var. *osteocarpa* but rather venulose, fruits with hard, bony endocarp. Hanapepe Falls, June 19, 1926, Degener 9491, (b.-i.fr.) : like var. *arborescens* but leaves suggest var. *osteocarpa* except in shape, thyrse very small, (placed here with considerable doubt).

G. terminalis var. **osteocarpa** × **G. terminalis** var. **macrocarpa** f. **cuneata.**

Milolii Ridge, Waimea, alt. 3300 feet, December 27, 1933, St. John, Fosberg, and Oliveira 13775, (m.fr.) : like f. *cuneata* but only somewhat hirtellous on the branchlets and thyrse, not at all on leaves, leaf margins conspicuously revolute, upper surface glossy even when dry. Milolii Ridge, Waimea, alt. 2300 feet, December 27, 1933, St. John and Fosberg 13764, (b.-i.fr.) : like var. *osteocarpa* but with the branches of the thyrse sparsely but conspicuously hirtellous, leaf bases somewhat cuneate, calyx lobes ciliolate, endocarp only slightly thickened. Nualolo Trail, Na Pali-Kona Forest Reserve, alt. 2,000-3,750 feet, December 28, 1930, St. John and others 10833, (m.fr.) : like var. *osteocarpa* but branchlets and thyrse very shortly hirtellous, some of the leaves tending to be cuneate, endocarp not as thick as in var. *osteocarpa*. Milolii Ridge, Waimea, alt. 3,000 feet, December 27, 1933, St. John and Fosberg 13768, (p. fl.-i.fr.) : like f. *cuneata* but with a looser thyrse, glabrous leaves and almost glabrous branchlets, leaves glossy above, even when dry. Milolii Ridge, Waimea, alt. 2700 feet, December 27, 1933, St. John and Fosberg 13767, (b.-i.fr.-m.fr) : like var. *osteocarpa* but with hirtellous branchlets, hirtellous and compact thyrse, leaves tending to be cuneate. Milolii Ridge, Waimea, alt. 2,050 feet, December 27, 1933, St. John and Fosberg 13751, (i.fr.) : like var. *osteocarpa* but with compact, slightly hirtellous thyrse and obovate leaves.

G. terminalis var. **elongata** f. **hirtellicostata** × **G. terminalis** var. **arborescens** f. **macrophylla.**

Kahili swamp, Wahiawa, Lihue-Koloa Forest Reserve, alt. 2100 feet, December 29,

1930, St. John and others 10858 3/4, (i.fr.) : like f. *hirtellicostata* but with midribs more strongly hirtellous, branches of thyrse slightly so, and leaf bases decidedly cuneate. Trail to Kahili bog, Wahiawa Valley, Wahiawa, alt. 1900 feet, December 24, 1933, St. John and Fosberg 13597 1/2, (m.fr.) : like f. *macrophylla* but with internodes longer, branchlets more sharply angled, and the under side of midrib decidedly hirtellous.

G. terminalis var. **osteocarpa** × **G. terminalis** var. **elongata** f. **euelongata.**

Power Line Trail, Hanalei-Kalihikai Ridge, January 2, 1931, St. John and others 10959, (m.fr.) : like var. *elongata* but with internodes 1-4 cm long, thyrse up to 4.5 cm long, 6 cm wide, fruit with a very much thickened endocarp.

G. terminalis var. **macrocarpa** f. **eumacrocarpa** × **G. terminalis** var. **macrocarpa** f. **cuneata.**

Milolii Ridge, Waimea, alt. 3400 feet, December 27, 1933, St. John, Fosberg, and Oliveira 13775, (m.fr.) : like f. *eumacrocarpa,* leaves like f. *cuneata* but not hirtellous beneath, branches of thyrse corky. Halemanu, February 14-26, 1909, Rock 1867, (h.fl.) : like f. *cuneata* but not so densely hirtellous, leaves not so strongly cuneate.

G. terminalis var. **macrocarpa** f. **eumacrocarpa** × **G. terminalis** var. **macrocarpa** f. **teres.**

Kaholuamanu, March 10, 1909, Rock 2461 (b.) ; Waikealoha, March 10, 1909, Rock 2469(155), (m.fr.) : like f. *eumacrocarpa* but stems soon becoming terete.

G. terminalis var. **macrocarpa** f. **eumacrocarpa** × **G. terminalis** var. **macrocarpa** f. **sambucina.**

Kaholuamanu, September 1909, Rock 5878-5881 (154), (i.fr.) : like f. *sambucina* but with the thyrse slightly hirtellous. Kaholuamanu, March 3-10, 1909, Rock 1910, (m.fr.) : like f. *sambucina* but leaves rather small, thyrse and branchlets very slightly hirtellous, thyrse rather loose.

G. terminalis var. **macrocarpa** f. **eumacrocarpa** × **G. terminalis** var. **macrocarpa** f. **sclerophylla.**

Kumuwela Ridge, Waimea, alt. 3700 feet, December 28, 1933, St. John, Fosberg, and Oliveira 13821, (i.fr.) ; Kumuwela Ridge, Waimea, alt. 3700 feet, December 28, 1933, St. John and Fosberg 13830, (i.fr.) : like f. *eumacrocarpa* but with coriaceous, glossy leaves. Waimea drainage basin, west side, July 3-August 18, 1917, Forbes 983.K, (p.fl.-i.fr.) : similar to St. John, Fosberg, and Oliveira 13821 but with stems almost terete. Kumuwela Ridge, Waimea, alt. 3700 feet, December 28, 1933, St. John, Fosberg, and Oliveira 13814, (fl.-i.fr.) : like f. *eumacrocarpa* but leaves coriaceous, glossy, stems very conspicuously angled, internodes short.

G. terminalis var. **macrocarpa** f. **sclerophylla** × **G. terminalis** var. **stipulacea.**

Halemanu, February 14-26, 1909, Rock 1892, (i.fr.) : like f. *sclerophylla* but with midribs hirtellous beneath. Waimea drainage basin, west side, July 3-August 18, 1917, Forbes 915(a).K., (b. -i.fr. -h.fl?) : like f. *sclerophylla,* but leaves venulose, midribs hirtellous beneath, thyrse in immature fruit only 2.5 cm long and broad. Waimea, below Kokee Station and Kilohana, October 27, 1922, Skottsberg 958, (b. -p.fl.) : like f. *sclerophylla* but with thinner, more venulose leaves, plant more hairy, thyrse much condensed.

MOLOKAI

G. terminalis var. **ovata** f. **Storeyi** × **G. terminalis** var. **ovata** f. **wailauensis.**

Kukuinui Ridge, Wailau Valley, alt. 1300 feet, July 4, 1933, St. John, Dunn, and Storey 13311, (i.fr.-m.fr.): like f. *Storeyi* but slightly hairy along under side of midrib.

G. terminalis var. **ovata** f. **santalifolia** × **G. terminalis** var. **ovata** f. **maunahui.**

West side of Punaula Valley, alt. 1800 feet, December 28, 1932, St. John and Fosberg 12795, (b.-i.fr.-p.fl.): like f. *santalifolia* but with branchlets more strongly angled and midribs very slightly hirtellous. Puu o Kaeha, Kawela, alt. 3700 feet, December 23, 1932, St. John and others 12523, (i.fr.-m.fr.): like St. John and Fosberg 12795 but branchlets very little angled. Ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, alt. 2900 feet, December 20, 1932, St. John and others 12300, (i.fr.): like f. *maunahui* but branchlets slightly fleshy. Kahuaawi Gulch, May 12, 1928, Degener 9461b, (i.fr.): like f. *santalifolia* but midribs slightly hirtellous. Puu o Kaeha, Kawela, alt. 3700 feet, December 23, 1932, St. John and others 12521, (i.fr.-m.fr.): like f. *santalifolia* but branchlets slightly angled, midribs very slightly hirtellous. Ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, alt. 2800 feet, December 20, 1932, St. John and others 12323, (i.fr.-m.fr.): like f. *maunahui* but leaves glabrous.

G. terminalis var. **ovata** f. **punaula** × **G. terminalis** var. **ovata** f. **maunahui.**

Road to Maunahui from Kaunakakai, alt. 2200 feet, December 26, 1932, St. John and others 12631, (i.fr.): like f. *punaula* but leaves glabrous except for under side of midrib and petiole. Ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, alt. 2900 feet, December 20, 1932, St. John and others 12329, (i.fr.): like f. *punaula* but leaves thicker, not as hairy beneath, apical part of branchlet ramulose, bearing several thyrses.

G. terminalis var. **ovata** f. **maunahui** × **G. terminalis** var. **ovata** f. **kalaupapa.**

Kahuaawi Gulch, May 12, 1928, Degener 9461a, (b.-i.fr.): like f. *kalaupapa* but leaves broader, less acuminate, not so definitely cuneate.

G. terminalis var. **cordata** f. **molokaiensis** × **G. terminalis** var. **angustifolia.**

Trail on ridge east of Mapulehu Valley, alt. 2,000 feet, December 29, 1933, St. John and Fosberg 12867, (i.fr.-m.fr.): internodes short, branchlets angled, leaves small, rather oblanceolate, obtuse, bases rounded or subcordate, under side of midribs hairy, (of rather uncertain ancestry). Ridge west of Punaula Valley, alt. 2,000 feet, December 28, 1932, St. John and Fosberg 12810, (b.-m.fr.): like f. *molokaiensis* but with branchlets distinctly angled, not exceedingly fistulose, leaves thin glabrous. Punaula Valley, alt. 2,000 feet, December 28, 1932, St. John and Fosberg 12806, (b.-i.fr.): like var. *angustifolia* but branchlets less sharply angled, leaves thicker, tending to be subcordate, thyrse small. Punaula Valley, alt. 2,000 feet, December 28, 1932, St. John and Fosberg 12804, (b.-i.fr.-m.fr.): like f. *molokaiensis,* leaves like var. *angustifolia,* but slightly hirtellous beneath along sides of midrib. Trail on ridge east of Mapulehu Valley, alt. 2100 feet, December 29, 1932, St. John and Fosberg 12905, (b.-m.fr.): like f. *molokaiensis* but branchlets sharply angled, leaves thinner, thyrses larger, looser.

G. terminalis var. **ovata** f. **heterophylla** × **G. terminalis** var. **cordata** f. **molokaiensis.**

Trail on ridge east of Mapulehu Valley, alt. 1800 feet, December 29, 1932, St. John and Fosberg 12912, (b.-i.fr.) : like f. *heterophylla* but most of the leaves cordate.

G. terminalis var. **cordata** f. **molokaiensis** × **G. terminalis** var. **ovata** f. **maunahui.**

Ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, alt. 3,000 feet, December 20, 1932, St. John and others 12326, (i.fr.) : like f. *maunahui* but with many leaves cordate or subcordate. Ridge east of Mapulehu Valley, alt. 2500 feet, December 29, 1932, St. John and Fosberg 12879, (b.-p.fl.-i.fr.) : like f. *molokaiensis* but leaves almost glabrous, only subcordate.

G. terminalis var. **cordata** f. **molokaiensis** × **G. terminalis** var. **ovata** f. **Storeyi.**

Main divide at head of Wailau Valley, alt. 3100 feet, December 29, 1932, St. John and Fosberg 12855, (b.-p.fl.-i.fr.) : like f. *molokaiensis* but practically glabrous and with somewhat longer petioles. Kukuinui Ridge, Wailau Valley, alt. 2300 feet, July 4, 1933, St. John, Dunn, and Storey 13261, (i.fr.) : like f. *Storeyi* but internodes longer, branchlets very fistulose, some of the leaf bases subcordate, some apices acuminate.

G. terminalis var. **cordata** f. **molokaiensis** × **G. terminalis** var. **rotundifolia.**

Trail on ridge east of Mapulehu Valley, alt. 2400 feet, December 29, 1932, St. John and Fosberg 12884, (b.-m.fr.) : like f. *molokaiensis* but branchlets sharply angled, only slightly fistulose, terminal internodes, peduncle and larger internodes of thyrse hirtellous, leaf glabrous beneath except midrib. Pukoo, May 1910, Abbé Faurie 344, (b.-m.fr.) : like f. *molokaiensis* but branchlets only slightly fistulose, somewhat angled, leaves mostly subcordate at base, round or obtuse at apex, thyrse rather small. Trail on ridge east of Mapulehu Valley, alt. 2,000 feet, December 29, 1932, St. John and Fosberg 12906, (b.) : like f. *molokaiensis* but branchlets only somewhat fistulose, sharply angled, leaves thin, pubescence yellow. Kaluaha, April 1910, Rock 7040, (fl.-i.fr.) : like f. *molokaiensis* but branches sharply angled, leaves thin, subcordate. Near Kamoku Camp, March 19, 1910, Rock 6123 (in part), (b.) : like var. *rotundifolia* but branchlets very fistulose, leaves sparsely hirtellous on under side of blades, decidedly obovate, base rounded, thyrse slightly hirtellous. Wailau Trail, August 1912, Forbes 331.Mo., (i.fr.-m.fr.) : like f. *molokaiensis* but branchlets somewhat angled, leaves mostly subcordate, thyrse larger and looser. Trail on ridge east of Mapulehu Valley, alt. 2900 feet, December 29, 1932, St. John and Fosberg 12871, (b.-p.fl.-i.fr.-m.fr.) : like f. *molokaiensis* but branchlets somewhat angled, thyrse strongly yellow hirtellous. Near Kamoku Camp, March 19, 1910, Rock 6123 (in part), (b.) : like f. *molokaiensis* but branchlets distinctly angled, thyrse strongly yellow hirtellous. Trail on ridge east of Mapulehu Valley, alt. 2,350 feet, December 29, 1932, St. John and Fosberg 12890, (b.-i.fr.) ; Kaluaha, April 1910, Rock 7065, (fl.-i.fr.) : like f. *molokaiensis* but branchlets somewhat angled when young, thyrse strongly hirtellous. Trail on ridge east of Mapulehu Valley, alt. 2400 feet, December 29, 1932, St. John and Fosberg 12888, (b.-h.fl.-i.fr.-m.fr.) : like f. *molokaiensis* but leaves mostly subcordate, yellow hirtellous, thyrse hirtellous. Trail on ridge east of Mapulehu Valley, alt. 2200 feet, December 29, 1932, St. John and Fosberg 12901, (b.-i.fr.-m.fr.) : like f. *molokaiensis* but thyrse strongly hirtellous. Trail on ridge east of Mapulehu Valley, alt. 2300 feet, December 29, 1932, St. John and Fosberg 12898; (s.) : like f. *molokaiensis* but branchlets somewhat angled, leaves thin.

G. terminalis var. **ovata** f. **punaula** × **G. terminalis** var. **cordata** f. **molokaiensis.**

Trail on ridge east of Mapulehu Valley, alt. 2,000 feet, December 29, 1932, St. John and Fosberg 12909, (b.-i.fr.-m.fr.) : like f. *punaula* but leaves subcoriaceous, cordate to subcordate, somewhat acuminate.

G. Hillebrandii var. **nodosa** f. **eunodosa** × **G. terminalis** var. **ovata** f. **heterophylla.**

Pukoo, May 1910, Abbé Faurie 349, (p.fl.-i.fr.) : like f. *heterophylla* but most of the leaves are the same size, leaves pilose beneath, along midrib, nodes very prominent, branchlets only very weakly angled.

G. terminalis var. **ovata** f. **santalifolia** × **G. Hillebrandii** var. **nodosa.**

Puu o Kaeha, Kawela, alt. 3700 feet, December 23, 1932, St. John and others 12522, (i.fr.) : like f. *santalifolia* but with leaves more venulose beneath and hirtellous along midrib, thyrses terminal, on short lateral branchlets, and axillary. Puu o Kaeha, Kawela, alt. 3,550 feet, December 23, 1932, St. John and others 12527, (i.fr.) : like var. *nodosa* but thyrses terminal, leaves only slightly hirtellous. Ridge between Maunahui, Kaunakakai and Hanalilolilo, Kawela, alt. 3400 feet, December 20, 1932, St. John and others 12319, (i.fr.) : like f. *santalifolia* but a few thyrses axillary and leaves very slightly hirtellous along midrib. Puu o Kaeha, Kawela, alt. 3600 feet, December 23, 1932, St. John and others 12528, (i.fr.-m.fr.) : like var. *nodosa* but with broader, more elliptical leaves and most of the thyrses terminal, though very slender. Puu o Kaeha, Kawela, alt. 3700 feet, December 23, 1932, St. John and others 12518, (i.fr.-m.fr.) : like St. John and others 12528 but with no thyrses terminal except on short lateral branchlets. Puu o Kaeha, Kawela, alt. 3,650 feet, December 23, 1932, St. John and others 12531, (i.fr.-m.fr.) : like var. *nodosa* but leaves only slightly hirtellous beneath, thyrses axillary and terminal on short lateral branchlets.

G. terminalis var. **ovata** f. **maunahui** × **G. Hillebrandii** var. **nodosa.**

Ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, alt. 3500 feet, December 20, 1932, St. John and others 12304, (i.fr.) : like var. *nodosa* but with some thyrses on short lateral branchlets, leaves like those of f. *maunahui* but somewhat venulose and very sparsely hirtellous under side of blade. Along road to Maunahui, Kaunakakai, alt. 2400 feet, December 26, 1932, St. John and others 12636, (i.fr.) : like f. *maunahui* but with thyrses axillary or on short lateral branchlets, nodes rather prominent. Ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, alt. 3500 feet, December 20, 1932, St. John and others 12286, (i.fr.-m.fr.) : like var. *nodosa* but leaves only very slightly pilose on under side of blade, branchlets somewhat angled. Road to Maunahui, Kaunakakai, alt. 2,350 feet, December 26, 1932, St. John and others 12634, (i.fr.) : like f. *maunahui* but very slightly hirtellous on under side of blade of leaf, thyrses axillary or on very short lateral branchlets. Road to Maunahui, Kaunakakai, alt. 2,175 feet, December 26, 1932, St. John and others 12625, (i.fr.-m.fr.) : like f. *maunahui* but more hairy, especially on the under side of the leaves, leaves somewhat like those of var. *nodosa*.

G. Hillebrandii var. **nodosa** f. **eunodosa** × **G. terminalis** var. **angustifolia.**

Trail on ridge east of Mapulehu Valley, alt. 3,000 feet, December 29, 1932, St. John and Fosberg 12865, (i.fr.-m.fr.) : like var. *nodosa* but with bases of leaves rounded, leaves only very sparsely pilose beneath, thyrses heavy, up to 7 cm long and 6 cm wide, fruiting thyrses with peduncles corky, terminal, on small lateral branchlets and axillary.

Trail on ridge east of Mapulehu Valley, alt. 2,050 feet, December 29, 1932, St. John and Fosberg 12908, (b.-i.fr.) : like St. John and Fosberg 12865 but leaves more strongly pilose, thyrse looser and more slender, mostly terminal. Trail on ridge east of Mapulehu Valley, alt. 2800 feet, December 29, 1932, St. John and Fosberg 12872, (b.-i.fr.-m.fr.) : like var. *nodosa* but some leaves rounded at base, branchlets distinctly angled, some thyrses in fruit before leaves at the same node have fallen.

G. terminalis var. **cordata** f. **molokaiensis** × **G. Hillebrandii** var. **nodosa.**

Puu o Kaeha, Kawela, alt. 3600 feet, December 23, 1932, St. John and others 12532, (i.fr.) : like var. *nodosa* but leaves cordate or subcordate, thyrses terminal or axillary on lateral branchlets. Puu o Kaeha, Kawela, alt. 3800 feet, December 23, 1932, St. John and others 12517, (i.fr.-m.fr.) : like var. *nodosa* but branchlets very fistulose, some internodes very long, leaves very small, only slightly hirtellous, base subcordate, subcoriaceous, thyrses terminal, axillary or on short lateral branchlets. Puu o Kaeha, Kawela, alt. 3900 feet, December 23, 1932, St. John and others 12514, (i.fr.) : like f. *molokaiensis* but leaves not so cordate, branchlets angled (except in fast growing shoots), some thyrses axillary. Puu o Kaeha, Kawela, alt. 3,750 feet, December 23, 1932, St. John and others 12515, (i.fr.-m.fr.) : like f. *molokaiensis* but branchlets angled, internodes short, some thyrses axillary. Ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, alt. 3,480 feet, December 20, 1932, St. John and others 12310, (i.f.-m.fr.) : branchlets as in var. *nodosa,* leaves as in f. *molokaiensis,* only very slightly hirtellous, thyrses axillary or on short lateral branchlets. Head of Waikolu Valley, Hanalilolilo, alt. 3,750 feet, December 21, 1932, St. John and others 12375, (i.fr.) : like var. *nodosa* but branchlets very fistulose, leaves cordate or subcordate. Head of Waikolu Valley, Hanalilolilo, alt. 3800 feet, December 21, 1932, St. John and others 12398, (i.fr.-m.fr.) : like var. *nodosa* but with leaves like f. *molokaiensis,* a few of the thyrses on short lateral branchlets.

G. terminalis var. **cordata** f. **molokaiensis** × **G. terminalis** var. **ovata** f. **maunahui** × **G. Hillebrandii** var. **nodosa.**

Ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, December 20, 1932, St. John and others 12313: branchlets as in f. *molokaiensis* but distinctly angled, not so fistulose, leaves as in f. *maunahui* but subcordate at base, thyrses terminal, axillary, or terminal and axillary on small lateral branchlets. Ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, alt. 3,350 feet, December 20, 1932, St. John and others 12321, (i.fr.) : like f. *maunahui,* but with leaves slightly cordate and a few thyrses axillary, also with many long slender branchlets.

MAUI

G. terminalis var. **cordata** f. **eucordata** × **G. terminalis** var. **ovata** f. **euovata.**

Maunahooma, Forbes and Cooke 26.M. (in part), (p.fl.-i.fr.) : like var. *ovata* with very slender branchlets, but with coriaceous, cordate or subcordate leaves.

G. terminalis var. **cordata** f. **eucordata** × **G. terminalis** var. **cordata** f. **acuminata.**

Haiku-Uka Trail, Haleakala, Makawao District, alt. 950 meters, August 18, 1933, Fosberg 9876, (p.fl.-i.fr.) ; Haiku-uka Boundary Trail, near Kailiili, alt. 3,000 feet, November 11, 1933, Hofmann 16, (i.fr.) ; Ukulele, July 1919, Forbes 934.M., (b.-i.fr.) : leaves rather narrow, acute or slightly acuminate, thyrses rather loose.

G. Hillebrandii var. **typica** × **G. terminalis** var. **ovata** f. **membranacea.**

Along pipe line trail, Olinda, June 14, 1927, Degener 2348, (i.fr.) : like f. *membranacea* but leaves sparsely pilose beneath, thyrses reduced, on short lateral branchlets. Along pipe line trail, Olinda, June 16, 1927, Degener 2344, (p.fl.-i.fr.) : like *G. Hillebrandii* but with elliptical, membranous leaves, internodes 1-3.5 cm long.

G. Hillebrandii var. **typica** × **G. terminalis** var. **crassicaulis.**

"Maui", Hillebrand and Lydgate, (m.fr.) : like *G. Hillebrandii* but entirely glabrous and with thick, somewhat fleshy, fistulose branchlets.

G. Hillebrandii var. **typica** × **G. terminalis** var. **cordata.**

Haiku-Uka Trail, Haleakala, Makawao District, alt. 950 meters, August 18, 1933, Fosberg 9872, (b.-p.fl.-i.fr.) : like *G. Hillebrandii* but with leaves cordate, some thyrses terminal or on small lateral branchlets, mostly axillary. Ukulele, July 27, 1919, Forbes 964.M., (p.fl.-m.fr.) : like var. *cordata* but branchlets, under side of midribs, thyrses, and corolla tubes sparsely hirtellous. Puu Kukui, between Haelau and Nakalalua, alt. 1,000 meters, August 24, 1933, Fosberg 10049, (b.-p.fl.-i.fr.) : similar to Forbes 964.M. but more minutely hirtellous and with some thyrses axillary.

G. terminalis var. **cordata** f. **acuminata** × **G. Hillebrandii** var. **typica.**

Haiku-Uka Trail, Haleakala, Makawao District, August 18, 1933, alt. 950 meters, Fosberg 9840, (i.fr.) : like *G. Hillebrandii* but leaves sometimes subcordate at base, acuminate, petioles rather long, thyrses large terminal.

G. Hillebrandii var. **typica** × **G. terminalis** var. **ovata** f. **makawaoensis.**

Haiku-Uka Trail, Haleakala, Makawao District, alt. 950 meters, August 18, 1933, Fosberg 9887, (i.fr.) : in general like f. *makawaoensis,* but leaves sparsely hirtellous beneath, noticeably venulose and larger than in f. *makawaoensis.* Kipahulu, above the plantation, November 13, 1919, Forbes 1628.M., (b.-fl.-i.fr.-m.fr.) : like f. *makawaoensis* but leaves sparsely hirtellous beneath, calyx lobes ciliolate, lower two thirds of corolla tube hirtellous, thyrses terminal, axillary, and on short lateral branchlets. Ridge right side of Kipahulu, November 20, 1919, Forbes 1694.M., (b.-p.fl.-i.fr.) : similar to Forbes 1628.M. but more of the thyrses axillary.

G. Hillebrandii var. **typica** × **G. terminalis** var. **ovata** f. **euovata.**

"West Maui", Hillebrand (in part), (b.-p.fl.-i.fr.) : like f. *euovata* but with shorter internodes, acuminate apex to leaves, thyrse terminal, but some axillary and some on short lateral branchlets, under sides of midribs and especially the thyrse and corolla tubes hirtellous. "Mailukuthal" (probably Wailuku Valley), Wawra 1849, (b.-p.fl.) : like f. *euovata* but with some thyrses axillary, leaves resembling *G. Hillebrandii,* sparsely pilose beneath, especially along the midrib and veins.

G. terminalis var. **ovata** f. **membranacea** × **G. Hillebrandii** var. **typica** f. **microphylla.**

Along pipe line trail, Olinda, June 24, 1927, Degener 9479, (b.-i.fr.) : internodes very short, mostly under 1 cm long, bases of old thyrses prominent at nodes, like f. *microphylla* but leaves membranous, broader, even subcordate at base, a few thyrses terminal, mostly axillary, (possibly a little *G. terminalis* var. *cordata* in its ancestry).

LANAI

G. St.-Johnii var. **Munroi** × **G. terminalis** var. **pseudodichotoma.**

Mahana, July 1910, Rock, (b.-fl.-i.fr.) : like var. *Munroi* but leaves not strongly revolute at margins, leaves near inflorescence reduced, inflorescences numerous on small lateral branchlets near the terminal node of the main branchlet, the end of a branchlet often showing the scar of an inflorescence and forking into two branchlets. "Lanai", Munro 11, (b.-fl.) : like the last but with internodes soon becoming terete, leaves strongly revolute. "Lanai", August 1913, Munro, (i.fr.) : like var. *Munroi* but glabrous, two lateral branches at base of thyrse well developed. "Lanai", July 8, 1870, Hillebrand, (p.fl.-i.fr.) : like var. *Munroi* but leaves entirely glabrous and thyrses extremely variable in size, terminal on small axillary branchlets, (type of *G. axillaris* Wawra var. β Hillebrand).

HAWAII

G. Hillebrandii var. **hawaiiensis** × **G. terminalis** var. **glabra** f. **euglabra.**

Between Glenwood and 29 Miles, July 24, 1926, Degener 9482, (p.fl.-m.fr.) : like var. *glabra* but with slightly shorter internodes, branchlets, under side of leaves, and inflorescence hirtellous, thyrse looser and larger than in var. *hawaiiensis,* but smaller than in var. *glabra.* Puu Oo Trail, above Olaa Flume, Hilo District, alt. 800 meters, December 10, 1933, Fosberg 10430, (i.fr.) : like var. *hawaiiensis* but with internodes longer (some much longer), leaves glabrous, branchlets and thyrse only slightly hirtellous, thyrses both terminal and axillary. Olaa Flume, June 2, 1915, Forbes 651.H., (fl.-i.fr.) : like var. *hawaiiensis* but internodes 3-5 cm long, under sides of leaves hirtellous only on midrib, thyrses both terminal and axillary. Hilo, 1862, Hillebrand, (in part, 4 left hand twigs on sheet), (b.-p.fl.) : like var. *glabra* but with short internodes and small thyrses. Olaa Forest Park Reserves, 22.5 miles from Hilo, 7.5 miles from the volcano, alt. 335 meters, April 23, 1935, Oliveira 4, (b.-p.fl.-m.fr.) : like var. *glabra* but with hirtellous branchlets and thyrse, much smaller thyrse, some internodes very short.

G. Hillebrandii var. **hawaiiensis** × **G. terminalis** var. **glabra** f. **parvithyrsa.**

Hills above Akaka Falls, Honomu, alt. 400 meters, December 5, 1933, Fosberg 10463, (i.fr.-m.fr.) : like var. *hawaiiensis* but leaves narrower, only slightly hirtellous on midribs, thyrse 4 cm across, looser than in var. *hawaiiensis,* some terminal, a few axillary, branchlets glabrous, thyrse slightly hirtellous.

G. Hillebrandii var. **hawaiiensis** × **G. terminalis** var. **pedunculata.**

Kohala (proper), June 1910, Rock 8356, (p.fl.) : like var. *pedunculata* but with some of the internodes short, upper ones slightly hirtellous, leaves shaped as in var. *hawaiiensis,* but more coriaceous and glabrous, thyrse smaller, peduncle not elongate. Kohala, Rock 8363, (p.fl.-m.fr.), (m.fr.), (b.-p.fl.-fr.), three plants represented: 1, like var. *pedunculata* but branchlets sharply angled, leaves slightly cuneate and slightly pilose along the sides of the midribs, thyrses without elongate peduncle, a few axillary; 2, like var. *pedunculata* but with the leaves hirtellous beneath along the sides of the midribs, and with the basal cm of the peduncle shortly hirtellous, thyrse large and much branched; 3, like var. *pedunculata* but with branchlets sharply angled and with the thyrse very compact and small, peduncle shortly hirtellous, and corky in fruit. Kehena Ditch Trail, near Kehena, Kohala Mountains, alt. 770 meters, September 2, 1933, Fosberg 10186, (p.fl.) : like var. *pedunculata* but leaves shaped as in var. *hawaiiensis* and not coriaceous, some internodes short, thyrses small but not as slender as in var. *hawaiiensis,* some terminal, some axillary.

G. Hillebrandii var. **hawaiiensis** × **G. terminalis** var. **antiqua** f. **kehena.**

Kohala, June 1910, Rock 8355, (p.fl.) : like f. *kehena* but petiole somewhat thicker, leaf shape like var. *hawaiiensis*. Kehena Ditch Trail, near Kehena, Kohala Mountains, alt. 770 meters, September 2, 1933, Fosberg 10193, (p.fl.-m.fr.) and 10190, (i.fr.) : branchlets and leaves as in var. *hawaiiensis,* but scarcely hirtellous, hairs very short, thyrse as in f. *kehena,* terminal. Kehena Ditch Trail, near Kehena, Kohala Mountains, alt. 770 meters, September 2, 1933, Fosberg 10813, (p.fl.) : like var. *hawaiiensis* but thyrse terminal and leaves elliptical (some slightly cuneate), pilose only along sides of midrib.

G. Hillebrandii var. **hawaiiensis** × **G. terminalis** var. **purpurea.**

Puakalehua Gulch, Hamakua, July 18, 1909, Rock 4551(151), (i.fr.) : like var. *purpurea* but with leaves oblanceolate-cuneate, and upper internodes and thyrse slightly hirtellous. Upper Hamakua Ditch Trail, head of Alakahi Fork of Waipio Valley, Kohala Mountains, alt. 1,075 meters, September 3, 1933, Fosberg 10226, (b.-fl.-i.fr.) : like var. *purpurea* but with leaves distinctly venulose, under side of midribs, branchlets and thyrses densely hirtellous. Upper Hamakua Ditch Trail, alt. 1,075 meters, September 3, 1935, Fosberg 10230, (b.-p.fl.-m.fr.-i.fr.) : like Fosberg 10226 but branchlets sharply angled, midribs, branchlets, and thyrses not so densely hirtellous. Trail from Waimea to Upper Hamakua Ditch Trail, alt. 1,075 meters, September 3, 1933, Fosberg 10241, (i.fr.) : like var. *hawaiiensis* but branchlets only slightly hirtellous, leaves coriaceous, cordate at base and only hirtellous on midribs. Upper Hamakua Ditch Trail, head of Alakahi Fork of Waipio Valley, alt. 1,075 meters, September 3, 1933, Fosberg 10221, (h.fl.-i.fr.) : like var. *purpurea* but with leaves venulose, hirtellous on midrib, branchlets and thyrse hirtellous, thyrses both axillary and terminal. Woods above Waimea, July 9, 1909, Rock 4706(151)-4723(151), (b.-p.fl.) : like var. *purpurea* but with thyrse very slightly hirtellous. Waimea, September 1911, Forbes 300.H., (fl.) : like var. *purpurea* but with very large leaves, longer internodes, upper internodes and thyrse hirtellous.

G. Hillebrandii var. **hawaiiensis** × **G. terminalis** var. **Forbesii.**

"Hawaii", U. S. Exploring Expedition, (i.fr.), (photo seen) : leaves like var. *Forbesii,* branchlets like var. *hawaiiensis,* thyrses both terminal and axillary. Gray's name *hirtella* suggests that it is conspicuously hirtellous, (type of *G. sandwicensis* var. *hirtella* Gray).

G. terminalis var. **Forbesii** × **G. terminalis** var. **antiqua** × **G. terminalis** var. **glabra.**

Olaa Forest Park Reserves, 22.5 miles from Hilo, 7.5 miles from the volcano, alt. 735 meters, April 23, 1935, Oliveira 7, (b.-p.fl.-m.fr.) : like var. *antiqua* but branchlets and thyrse hairy, and leaves stiff as in var. *Forbesii,* thyrse rather large, though not as large as in var. *glabra,* shaped as in var. *glabra.*

G. Hillebrandii var. **hawaiiensis** × **G. terminalis** var. **Forbesii** × **G. terminalis** var. **glabra.**

Olaa Forest Park Reserves, 23 miles from Hilo, 7 miles from volcano, alt. 740 meters, April 20, 1935, Oliveira 8, (b.-fl.-i.fr.-m.fr.) : like var. *Forbesii* but leaves shaped like var. *glabra* and only slightly hairy beneath, a few thyrses axillary, mostly terminal. Near Olaa, May 1930, Degener 9452, (h.fl.-m.fr.) : not as hirtellous as either var. *hawaiiensis* or var. *Forbesii,* leaves shaped as in var. *Forbesii,* but hirtellous only on under side of midrib, thyrse as in var. *Forbesii* but both terminal and axillary, flowers glabrous. Between Glenwood and 29 miles, July 24, 1926, Degener 9483, (i.fr.) : like Degener 9452 but leaves more cuneate, branchlets more hirtellous, thyrses all terminal.

G. terminalis var. **glabra** × **G. terminalis** var. **Forbesii.**

Puu Oo Trail, above Olaa Flume, Hilo District, alt. 760 meters, December 10, 1933, Fosberg 10443, (b.-i.fr.-m.fr.) : like var. *glabra* but thyrse only 4 cm across and 4 cm long, hirtellous, peduncle corky, midrib of leaf hirtellous beneath, branchlets fistulose, woolly-hirtellous. Between Glenwood and 29 Miles, June 28, 1929, Degener 9455, (p.fl.-i.fr.-m.fr.) : like var. *glabra* but with smaller, stiffer leaves, not strongly cuneate at base, slightly hirtellous beneath on midrib, and very slightly hirtellous on thyrse, branches and peduncle; thyrse small, 2-4 cm long and wide. Olaa Forest Park Reserves, 22.5 miles from Hilo, 7.5 miles from the volcano, alt. 735 meters, April 23, 1935, Oliveira 6, (b.-h.fl.-i.fr.) : like var. *glabra* but with hirtellous branchlets and thyrse, small leaves, small thyrse, also slightly hirtellous base to corolla tube. Olaa Forest Park Reserves, 22.5 miles from Hilo, 7.5 miles from the volcano, alt. 735 meters, April 23, 1935, Oliveira 5, (b.-p.fl.-i.fr.-m.fr.) : like Oliveira 6 but flowers glabrous, leaves larger, quite hirtellous beneath. Hilo, April 1871, Hillebrand and Lydgate, (b.-p.fl.-h.fl.), at least two plants represented: twigs on left like var. *Forbesii* but leaves only hirtellous on midrib, twigs on right like var. *glabra* but thyrses small and somewhat hirtellous.

G. terminalis var. **konaensis** f. **eukonaensis** × **G. terminalis** var. **kapuaensis** f. **rigidifolia.**

Between Makaopuhi and Napau Craters, Chain of Craters, Kilauea, alt. 810 meters, August 29, 1933, Fosberg 10103, (i.fr.) : like var. *konaensis* but with internodes mostly 1.5-3 cm long, leaves with under side of midrib slightly hirtellous. Makaopuhi Crater, Hawaii National Park, alt. 880 meters, April 23, 1935, Oliveira 2, (b.-p.fl.-i.fr.-m.fr.) : like f. *rigidifolia* but leaves strongly hirtellous on midrib beneath. Edge of Napau Crater, June 25, 1930, Degener, Iwasaki, Brumaghim, and Bartram 9454, (m.fr.) : like var. *konaensis* but with internodes mostly about 2-3 cm long, branchlets distinctly angled.

G. terminalis var. **kapuaensis** f. **eukapuaensis** × **G. terminalis** var. **konaensis** f. **eukonaensis.**

Manuka, Kau, September 1929, Russ, (p.fl.-m.fr.) : like var. *kapuaensis* but with long internodes and fistulose branchlets.

G. terminalis var. **Hosakai** × **G. terminalis** var. **konaensis** f. **eukonaensis.**

Kau, Manuka, September 23, 1926, Skottsberg 1933, (p.fl.-i.fr.) : like var. *Hosakai* but branchlets and thyrse hirtellous.

G. terminalis var. **antiqua** × **G. terminalis** var. **konaensis** f. **eukonaensis.**

Judd Trail, east of Kealakekua, September 23, 1922, Skottsberg 641, (b.-p.fl.-i.fr.) : like var. *antiqua* but leaves larger, internodes longer and branchlets and thyrse hirtellous.

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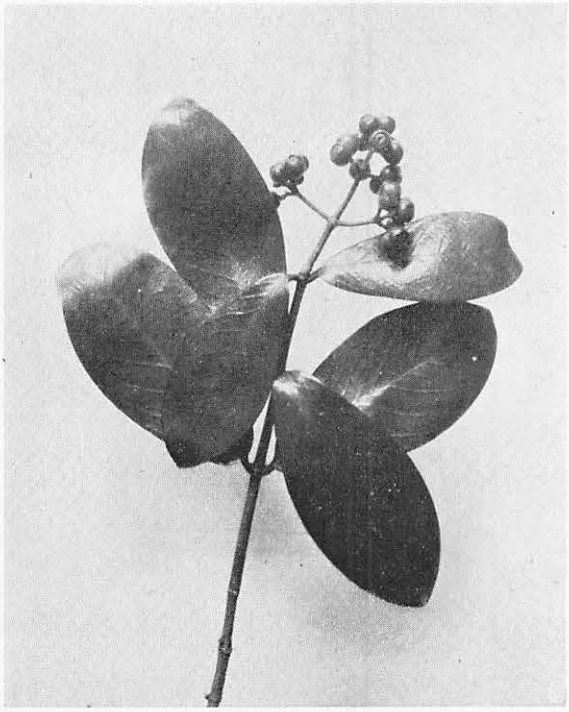
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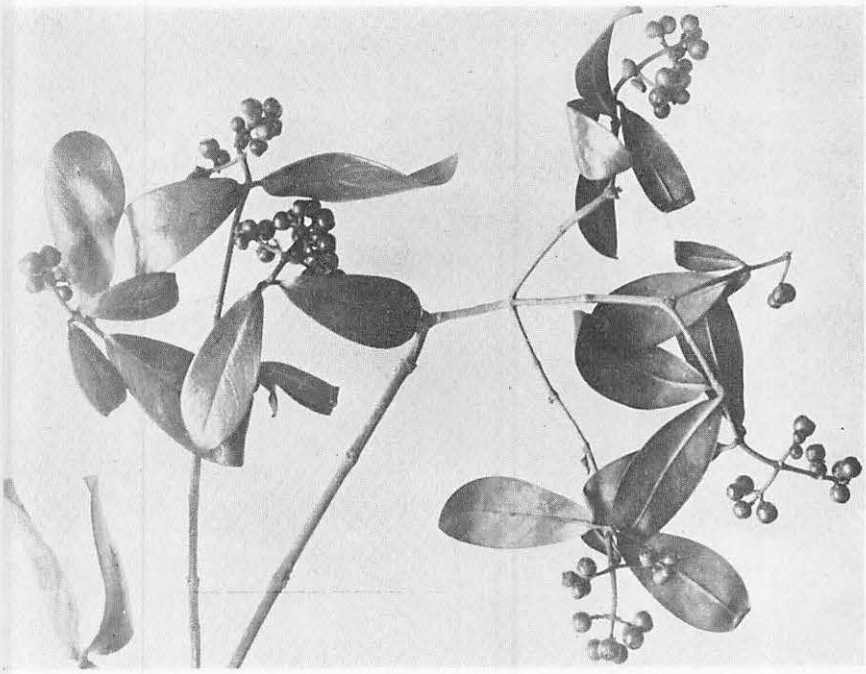
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GOULDIA TERMINALIS VAR. *TYPICA*: *A*, BASAL SHOOT; *B*, GENERAL VIEW. (BOTH APPROXIMATELY 1/2 NATURAL SIZE.)



GOULDIA TERMINALIS VAR. *CORIACEA*. (APPROXIMATELY 2/3 NATURAL SIZE.)



GOULDIA HILLEBRANDII VAR. *TYPICA*. (APPROXIMATELY 1/2 NATURAL SIZE.)