

**THE POLYNESIAN SPECIES
OF HEDYOTIS
(RUBIACEAE)**

**BY
F. RAYMOND FOSBERG**

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The Polynesian Species of *Hedyotis* (Rubiaceae)¹

By F. RAYMOND FOSBERG

FORMERLY MORRIS FELLOW IN BOTANY, UNIVERSITY OF PENNSYLVANIA

ABSTRACT

This paper undertakes a critical revision of the species of *Hedyotis* found in Polynesia. *Hedyotis*, as here construed, includes the genera *Kadua* and *Oldenlandia*, by many taxonomists regarded as distinct. In Polynesia it is represented by five subgenera, three of them here described as new. These comprise 24 species, six of them described as new, many of them including numerous subspecies, varieties, and forms. The Hawaiian representatives of the genus, in particular, are in an active state of evolution. The genus is widespread in Polynesia, with the greatest concentration of species in the Hawaiian islands.

INTRODUCTION

While I was engaged in revising the genus *Gouldia*, I found that the classification of the related Hawaiian genus *Kadua* was confused taxonomically. The characters supposedly separating *Kadua* from the widespread tropical and subtropical genus *Hedyotis* were by no means satisfactory. *Kadua* was merely a name applied to a rather diverse lot of *Hedyotis* species, the principal common feature of which is that they inhabit the Hawaiian islands. This belief was so strengthened by a subsequent study of the few extra-Hawaiian species of *Kadua*, that in 1937, I transferred several of them to *Hedyotis* (22).²

The present study was undertaken primarily to untangle the confused relationships of the Hawaiian species of the genus *Hedyotis*. To make the discussion of the so-called genus *Kadua* complete, the rest of the Polynesian species were included. To my knowledge, the name *Kadua* has never been applied to any species occurring outside the limits adopted in this paper, Polynesia in its most restricted sense. This includes all of the islands east of Fiji, which show no geological evidence of former continental land connections. The limits are Tonga, Samoa, and the Ellice Islands on the west, Hawaii on the north, and Easter Island on the east. The Tonga Archipelago is said to show continental structure, but having been completely submerged since the connection was severed, it may be treated as oceanic. No species of *Hedyotis* occurs in New Zealand on the south, and floristically and geologically it is not a part of Polynesia, being probably continental in origin.

¹ Presented to the Faculty of the University of Pennsylvania in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

² Numbers in parentheses refer to Bibliography, p. 99.

Several factors have increased the difficulty of this study and rendered the conclusions perhaps less final than might be desired. The region under consideration has been by no means fully explored botanically, and large areas where *Hedyotis* doubtless occurs, even in the Hawaiian islands, are not represented by specimens. Further field work, now that the problems are better understood, would clarify many points. Several of the types appear lost; if they are ever found, they may alter some of the interpretations here advanced. Several species probably now extinct, or almost so, are known only from poorly localized or poorly preserved early collections. Finally, the pernicious practice, followed in many of the largest herbaria, of mounting two or more collections on the same sheet, just because they happen to bear the same name or look somewhat alike, has at times reduced scientific interpretation to guesswork.

Mr. W. R. Philipson, of the British Museum, has obligingly examined the type of *Oldenlandia debilis* for me. My own collections are designated as being in Bernice P. Bishop Museum, where a full set will be deposited. Duplicates will be distributed to various other institutions, but these are not listed, as they have not been selected.

The following institutions kindly loaned specimens or permitted me to examine them, and the abbreviations in parentheses have been used in the citation of specimens to designate the institutions in which the specimens are housed: Botanisches Museum, Berlin-Dahlem (B); British Museum (Natural History) (BM); Cornell University (Cor); Otto Degener, private herbarium, Honolulu (D); Royal Botanic Garden, Edinburgh (E); Gray Herbarium (Gr); Bernice P. Bishop Museum (Ho); Royal Botanic Garden, Kew (K); New York Botanical Garden (NY); Museum National d'Histoire Naturelle, Paris (P); Academy of Natural Sciences of Philadelphia (Ph); University of California, Berkeley (UC); University of Pennsylvania (UP); United States National Arboretum (USNA); United States National Herbarium (US); Botanische Abteilung des Naturhistorisches Museums, Vienna (W); Yale University (Y).

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HISTORY³

The histories of the genera *Hedyotis* and *Oldenlandia* are so inextricably bound together that they will be treated so, with special note taken of the Polynesian species. That of *Kadua* is summarized separately.

Oldenlandia was first described and figured in 1703 by Plumier (44) and was taken up by Linnaeus in 1737 (33). *Hedyotis* was described by Dasso and published by Linnaeus in 1747 (34, also see 35, 36). Both were used, as separate genera, by Linnaeus in 1753 (37) and 1754 (38), establishing them on an equal basis in modern botanical nomenclature. Forster in 1786 (20) described two species of *Oldenlandia* from Tonga, the first mention of any Polynesian occurrence.

Schreber in 1789 (47) expressed doubts as to the distinctness of these two genera, but does not appear to have formally united them. Lamarck in 1791 (31) after some hesitation, definitely united them, selecting *Hedyotis* as the name to be used for the enlarged genus. Willdenow in 1797 (59) maintained them as separate genera. Cavanilles in 1801 (7) described a species of *Hedyotis* from Tonga. The next person to consider them definitely as one genus was J. E. Smith (49), who in 1811 used the name *Hedyotis* for the combined genus. He then, unfortunately, applied the name *Oldenlandia* to a wholly different genus, saying (49a) that this *Oldenlandia* was new. This procedure has caused most subsequent workers to overlook the fact that he had merged the original *Oldenlandia* with *Hedyotis*. (*Oldenlandia*, as used hereafter in the present paper, designates the original genus, not that of Smith.) He also described *H. coriacea* from the Hawaiian islands.

This treatment was followed by Sprengel in 1815 (50), by Blume in 1826 (3), and by Steudel in the first edition of his Nomenclator in 1821-1824 (51). Gaudichaud in 1826 (23) added another species of *Hedyotis* from Hawaii. Chamisso and Schlechtendal in 1829 (8) revived *Oldenlandia*, but since Smith had applied the name to another genus, renamed the original *Oldenlandia*, calling it *Gerontogea*. They also selected *H. auricularia* L. as the type species of *Hedyotis*, and segregated the genus *Kadua*. De Candolle in the Prodrômus, 1830 (6) followed Chamisso but restored the name *Oldenlandia* to its original sense, recognized a great number of species, and transferred several Polynesian species to *Oldenlandia*.

In 1834 Wight and Arnott (57) combined all the closely related genera

³ See also Merrill, E. D., and Metcalf, F. P., *Arn. Arb.*, Jour. 23: 226-227, 1942.

in this assemblage into a large genus *Hedyotis*, ascribing the idea to Brown in Wallich's List (53). He very satisfactorily subdivided it into sections, considering, however, only the Indian species. In 1838 Meisner (40) raised all of Wight and Arnott's sections to generic rank. This treatment is usually ascribed to Korthals who used it in 1851 (29). Endlicher, 1836-1841, in his *Genera Plantarum* (17), followed and somewhat elaborated upon the treatment of Wight and Arnott, adapting it to regions outside India. Steudel, in the second edition of his *Nomenclator*, 1840 (52), adopted Endlicher's views, and made the necessary combinations for all the known species, including those of *Kadua*, under *Hedyotis*.

Gray, 1860 (24), examined the question critically, and came to the conclusion that most of the genera that had been described by previous workers should be recognized, but admitted his inability to dispose of numerous intermediate species from tropical Asia and the islands. His treatment was backed up by very careful observation of the material available, but was hampered by lack of sufficient specimens of many species.

Bentham and Hooker (2) took an intermediate position, recognizing *Hedyotis* and *Oldenlandia* as distinct, but considering most of the related genera to be sections.

In 1891 three general treatments appeared, Kuntze (30), Baillon (1), and Schumann (48), all of which combined *Hedyotis* and most of its relatives with *Oldenlandia*, adopting the latter name, using 1737 as the starting point of modern nomenclature.

This position has been that of most recent workers who combine the two genera, in spite of the fact that the Vienna Code and the Cambridge Code make 1753 the starting point, which makes it necessary to follow Lamarck (31) in using *Hedyotis*. Perhaps the largest number of modern workers have followed Bentham and Hooker in separating the two genera.

Kadua was described by Chamisso and Schlechtendal in 1829 (8) with five species plus another doubtfully associated with it. No type was designated. De Candolle's treatment the following year (6) merely accepted Chamisso and Schlechtendal's elaboration, with the earlier *Hedyotis coriacea* Smith included as a synonym of *Kadua Menziesii*. Hooker and Arnott in 1832 (28) recognized seven species, excluding the fleshy fruited ones, known by them as *Petesia* and later known as *Gouldia*, and adding two new species of their own. They also recognized both previously described Hawaiian species of *Hedyotis* as belonging to *Kadua*, though they neglected to transfer *H. conostyla*, and for some unknown reason renamed *H. coriacea*, calling it *H. Smithii*.

Meyen, in 1835 (41) founded his genus *Wiegmannia* on plants which were practically identical with *Kadua cordata* Chamisso and Schlechtendal. This supposed genus was later further elaborated by Walpers (54).

In his *Genera Plantarum*, 1836-1841, Endlicher (17) recognized the essential identity of *Kadua* with *Hedyotis* and considered it a section under the latter. Steudel, 1840 (52), following this treatment, transferred all the species of *Kadua* to *Hedyotis*, renaming those whose names were preoccupied in *Hedyotis*. Walpers three years later (55) regarded *Kadua* as a section of *Hedyotis*, but admitted only four species. In a later volume of the same work, 1847 (55), he maintained the genus *Wiegmannia* for one of the other species.

Gray in 1860 (24) again separated *Kadua* as a genus, mainly on the basis of the extreme compression of the seeds, adding four new species, but excluding the two fleshy fruited species admitted by Chamisso and Schlechtendal. On these he founded the genus *Gouldia*. He reduced Meyen's *Wiegmannia* to *Kadua*, showing that it was based on faulty observation of a previously known species. Mann in 1867 (39) added another species and a variety, but otherwise adopted Gray's treatment. Wawra in 1874 (56) added two species and described a number of varieties of the old ones.

In 1888 Hillebrand (27) presented the first really comprehensive treatment of the group based on extensive field knowledge and numerous specimens. He recognized 15 species, five of them new, with numerous varieties.

Baillon, in 1891 (1), considered *Kadua* a section of *Oldenlandia*, while in the same year Schumann (48) and Kuntze (30) maintained it as distinct. Schumann selected *Kadua acuminata* as the type species of the genus. Kuntze in 1904 (45) divided *Kadua* into two sections, *Eukadua* and *Tetrakadua*, on the artificial basis of whether or not the capsule was winged. Heller in 1897 (25), in discussing the species in his own collections, raised one of Mann's varieties to specific rank. Léveillé in 1911 (32) described another species, as did Forbes in 1912 (19) and Degener in 1932 (12).

Extra-Hawaiian species were described, one in 1933 by Moore (42) and two by Brown in 1935 (4), all from southern Polynesia. The other extra-Hawaiian species, *K. romanzoffiensis*, had been considered since the time of Gray (24) to be a *Gouldia*, until 1927, when Christophersen (11) expressed doubts as to its relationship with *Gouldia*, and called his plants *Kadua*. In 1893 Drake (16) had mistaken this species for *Coprosma taitensis* Gray. Oliver, 1935 (43), misled by Drake's misinterpretation, redescribed it as *Coprosma oceanica*. In 1937 my studies of *Gouldia* (21) and of *Hedyotis* (22) led me to transfer this species and *K. rapensis* Brown to *Hedyotis*. Brown's *K. rurutensis* was found to be conspecific with *Hedyotis foetida* (Forster) Smith.

MORPHOLOGICAL CRITERIA

Discussion of morphological criteria used in differentiation of species and groups of lower rank may be limited to the subgenera *Polynesiotes* and *Kadua*.

Only one species of each of the subgenera, *Oldenlandia*, *Diplophragma*, and *Oceanica*, is found in Polynesia, and no geographical variations have been detected in these, though there is much fluctuation and ecological response, and possibly considerable heterozygosity in the genetic makeup of each.

As with other actively evolving groups of plants, identical types of variation in different species of this genus do not necessarily have the same taxonomic value. From an original heterozygous population, two isolated daughter populations may well have differentiated, a certain characteristic becoming fixed (or homozygous) in one, the other retaining the original heterozygosity and resulting variability for the same characteristic. This possibility enormously complicates the problems facing the taxonomist and also the classification resulting from his efforts. This classification is likely to be much more natural—a better expression of the actual structure and phylogenetic relationships within the genus—than a simpler and more artificial one. The acceptance of the doctrine of evolution has marked the doom of artificial classifications with their attendant simplicity, no matter how unfortunate this may seem to the practical user of plant names. The best that can be done for him is to make our species and genera as large and well differentiated as is consistent with a natural classification, and to regard the smaller subdivisions as subcategories under these two basic units.

The morphological characters and differences found useful in the segregation of what appear to be natural groups or populations in the subgenera *Polynesiotis* and *Kadua* are treated in order as follows:

HABIT

These plants are generally weak shrubs and suffrutescent herbs with habit a significant distinguishing feature only in the few forms that become scandent or arborescent, and in these its usefulness is strictly limited by the fact that the plants usually fruit before they have reached their full growth, and by the fact that habit seems to be much influenced by purely environmental factors.

STEMS

The stems offer several features that are useful in making keys, though they probably involve rather slight genetic changes. Splitting of the epidermis and decrease of corkiness takes place in a number of species, but only in *H. Degeneri* and one form of *H. Schlechtendahliana* is it sufficiently prominent and present on small enough stems to make it taxonomically useful. Here a noticeable exfoliation takes place or corky ridges form even on the small branches that are to be found on ordinary herbarium sheets. More or less hirtellous or tomentose pubescence is found on young internodes of certain forms in *Polynesiotis*, but never on the stems in *Kadua*, though the internodes rarely may be papillose. The internodes may have four longi-

tudinal ridges or costae, and may rarely (*H. molokaiensis*) be winged or (*H. littoralis*) quadrangular. These costae in *Kadua* are in pairs running from the sides of the stipules at one node to the sides of the branchlet or inflorescence above the next node below. In *Polynesiotes* they run singly from the bases of the petioles at one node to the middle of the stipules at the next lower, and from the middle of the bases of the stipules to the petioles below, the latter being usually stronger, producing what Hillebrand considered a compressed stem.

LEAVES .

All differences in the general shape, apex, base, texture, prominence of veins, and length of petiole are useful as diagnostic features in some forms and quite useless in others. Venation—usually of a rather common and uniform pinnately netted type, with the secondary veins variable in prominence, even on the same leaf—occasionally shows significant variations in the distance between the veins and in their prominence. Rarely, the fusion of the secondary veins with the midrib is of a rather gradual type, creating a somewhat plinerved appearance. Presence or absence of pubescence on the under side of the leaves seems to be usually a fairly constant character, though the amount is extremely variable. The type of hairs seems always the same, though their length, stiffness, and degree of curliness often vary with different groups. If the pubescence is very short, it is termed hirtellous; if stiff, hispidulous; if longer and straight, hirsute, if softer, pilose; or if curly and tangled, tomentose or woolly, the latter term implying a rather loose type. The upper side of the leaf is glabrous, except in *H. coriacea* and *H. fluviatilis*, where it may be lightly hirtellous or hispidulous. Hair on the petiole, though rare, seems to be rather constant where found. Cystoliths are usually present, but do not differ significantly in shape, and do not seem useful in classification of the genus.

STIPULES

These vary little in shape, being ovate to triangular, rarely acuminate or ovate-lanceolate, usually mucronate and carinate. The length of the mucro and the prominence of the carina are sometimes useful characters. In section *Wiegmannia* the stipules are adnate to the inside of a sheath formed by the connate expanded bases of the petioles. This sheath may be of different length in different groups. Rarely, the stipules are hairy, and when this is so the character seems constant.

INFLORESCENCE

The inflorescence of subgenus *Kadua* differs profoundly from that of subgenus *Polynesiotes*, and presents few features of use in classification. The only ones used are the length and degree of adnation of the peduncle, and the length and thickness of the pedicels. That of *Polynesiotes* is fundamentally a decussate thyrses, but its modifications are so highly diverse that

it is the most useful structure in the classification of the group. It may be a simple or a compound thyrse, the axes may be one to many internodes long, the ultimate cymes may be monochasial or dichasial, dichotomous or trichotomous, few-flowered or many-flowered. The bracts range from foliaceous to scalelike or subulate. The flowers may be single or in glomerules, the pedicels long or short. The whole inflorescence may be pyramidal, hemispherical, corymbiform, cylindrical, or elongate and interrupted. It may be stiff or weak, with branches divaricate to ascending, internodes short to elongate, with consequent open or dense habit, glabrous or pubescent. In section *Austrogouldia* the thyrse is so reduced that it may be described as a several times trichotomous cyme, or as a terminal and several axillary cymes. These characteristics seem to be rather constant, within certain limits of variation. The tendency, in section *Wiegmannia* toward monochasial elongation of the ultimate branchlets of the thyrse seems to fluctuate somewhat, but in certain forms is much more evident than in others. Only the greatest variations in size seem to be of any significance.

HYPANTHIUM

The hypanthium (inferior ovary), though somewhat variable, presents practically no differences of taxonomic value, except that it is occasionally pubescent. I have not ascertained whether this structure is a calyx tube fused with the ovary, or an enlarged receptacle in which the ovary is sunken. This point would probably be determined by a morphological study of many representatives of the family.

CALYX

The calyx is united only at the base, and the lobes may vary from foliaceous to dentiform. Differences in the calyx lobes seem to be more constant and more easily described than those in most other parts of the plant. Though perhaps of only minor genetic significance, they are useful as key differences where the other differences are difficult to describe. The lobes vary in shape from linear to orbicular, and in size from very small to as long as or longer than the corolla. They may remain the same size in fruit as in flower, or be accrescent to several or many times flowering size in fruit. They may be glabrous or hairy on the outside or (rarely) on the inside.

COROLLA

The corolla presents some very useful points of difference, but must be used with considerable caution. The arrangement of the lobes in the bud seems to be fundamental in distinguishing the sections. Large differences in tube length are sometimes significant, but small differences seem to be purely matters of fluctuation, as they occur even in the same inflorescence. Length of lobes seems much more constant as a rule. Differences in color seem to

follow specific and sectional lines quite consistently, but are rather useless in identifying dried specimens, as the corolla becomes black on drying, or purplish in certain white ones. In subgenus *Kadua*, whether or not the lobes become reflexed is a useful character. The texture, which would perhaps be significant in fresh specimens, is lost on drying. The corolla may be glabrous, hairy, or glaucous, and these differences seem to be practically constant, except in section *Protokadua*.

SEXUALITY OF FLOWERS

This is without doubt a matter of profound significance, and will have to be more completely investigated before a final treatment can be made of the genus as a whole. Here it has been largely ignored, because it is difficult to study in dried material unless large numbers of flowers are available for dissection. These have been available in but few of the groups treated here. It is a matter for extensive field study. Most of the species of *Polynesiotis* studied in this respect seem to be gynodioecious (pistillate and hermaphrodite flowers on separate plants).

STAMENS

The filaments in *Kadua* and *Polynesiotis* are completely or almost completely adnate to the corolla tube, making the anthers sessile in the tube. They may be inserted anywhere from halfway up the tube to just below the sinuses, and their position has some slight taxonomic value. They are never, in these two subgenera, exerted, though they may be visible in the mouth of the tube. The attachment is always dorsal, usually about one third the distance from the base. The shape varies from linear to narrowly oblong. The size seems to offer some reliable taxonomic differences, but will not be very useful until more is known about the sexuality of the flowers. The sterile anthers found in pistillate flowers seem to be from one half to two thirds the size of fertile ones. It is not always easy to determine whether anthers are sterile or are fertile ones which have shed their pollen.

STYLE

The style also presents some features that may be of use in the taxonomy of the group when the sexuality of the flowers and the floral biology is better understood. The apex is always more or less bifid, with the stigmatic portions on the ventral sides of the lobes. These may be linear or variously enlarged. Enlargement is most evident in section *Wiegmannia*. The lobes are coherent to different degrees in different species, and also in various stages of maturity of the same flower. The length varies with the sex of the flower and with maturity. The only character which has been extensively used in this treatment is that of pubescence. The presence or absence, density, length, and extent of pubescence on the style seem quite constant.

FRUIT

The fruit presents some very useful characters, but, as with the corolla, these must be used with extreme caution. It is difficult to determine the degree of maturity of the fruit in dried specimens unless dehiscence is complete. Even rather immature fruits will dehisce slightly on drying and pressing. Heavy sclerification or presence of mature seeds is the only reliable indication of maturity. The shape and size of the fruit, though differing markedly in different species, fluctuates considerably, due perhaps to the number of ovules fertilized, or a variation in the number of ovules actually present. The size and shape of the persistent calyx lobes, the size, shape, and prominence of the disk, and the number of cells (usually two), are all of some value. In section *Kadua* the fruit varies from terete to costate, quadrangular, or winged, the variation for each form being within definite limits. Otto Kuntze (45) used this character to separate sections of the genus *Kadua*, whereas I regard it as useful to separate forms within a species. The term cup-shaped as used here does not mean hollow, but indicates an external form that is very shortly cylindrical and hemispherical at the base. The dehiscence, in *Kadua* and *Polynesiotes*, is both loculicidal and septicidal, but the time and extent of each dehiscence varies with the species. The loculicidal dehiscence takes place first, across the disk and almost to the base of the septum, then in some species part way down outside the hypanthium. Later, the pyrenes tend to separate septically. This separation is delayed in many species until the mesocarp has weathered away, and in some may never be complete.

SEEDS

The seeds within a single capsule may vary so much that no two are alike, as their shape is due to compression. They are fundamentally peltate, but in most species higher than wide, consequently cuneoid (cuneate in at least the narrowest vertical section). They are always irregularly angular, due to compression, with the angles blunt, sharp, or more or less winged. In *H. centranthoides* they are extremely compressed and strongly winged. Descriptions of the shape of seeds apply to the average of many seeds. The color and type of surface, whether pitted, smooth, or papillose, seem to be constant within a species. The corners of the seeds in a few species are more or less prolonged to form horn-shaped appendages. These are regarded as important only if present on a large percentage of the seeds, as in other species occasional seeds may assume this appearance. The attachment, in mature seeds, is so loose that the seeds become free even before dehiscence of the fruit, and the hilum is practically invisible.

DELIMITATION OF CATEGORIES

The purposes of a study such as this are the construction of a taxonomy or classification of a group of plants that in some measure expresses the

evolutionary relationships of the populations concerned and, incidentally, the provision of names for the populations and means of identifying them. Identification is accomplished by means of keys and descriptions.

My concepts of the various categories used in classification are the result of an effort to detect and segregate all of the populations which exist as entities in nature, however small, so long as they exhibit differentiating characters that are reasonably constant, in combination with a desire to maintain the genus and species (the basic units of nomenclature) in as broad a sense as is consistent with the diversity involved. So long as the basic principle of a common origin for all the members is not violated, the rank a group may occupy is a matter for the judgment of the student of the group, at least in the present state of development of the science. The application of the categories of genus and species to groups which differ relatively slightly from others of the same rank results in an enormous multiplication of binomials, without a corresponding increase in understanding of the relationships concerned. This increase in the number of plant names tends to make it impossible for anyone, other than a specialist, to have a usable knowledge of any large group. This leads to general impatience with taxonomy as a science, and to indifference, in other branches of botany, toward careful identification of the plants that are being studied.

The type of classification adopted here seems to satisfy the needs of the person who wants a useful general knowledge of the group and the person to whom it is necessary to identify a plant to its exact "jordanon." It also seems to express, reasonably well, the evolutionary relationships within the genus.

Following is a brief discussion of the principles and criteria used in delimitation of the categories used in this treatment.

THE GENUS

Hedyotis is adopted in its broadest sense, because none of the criteria upon which segregates have been based, or upon which I have been tempted to base them, involve what seem to be very fundamental differences in structure. All are plainly members of this genus to anyone who knows the obvious characters upon which it is based. It is here construed to include those groups of Rubiaceae which have a dry, dehiscent, many-seeded, not strongly flattened fruit, fleshy fungoid placentae attached to near the middle of the septum, sclerified endocarp, seeds attached in a fundamentally peltate manner and not laterally winged or imbricate or evenly horizontally placed, with the corolla lobes strictly valvate and four in number, the calyx lobes equal, and the style branched or lobed, with stigmatic surfaces only on the ventral sides of the lobes. In addition, it includes certain species which differ in slight measure from this diagnosis, but which are obviously recent offshoots, still closely related to the genus.

SUBGENERA

These are the main evolutionary lines in the genus, old enough to be rather well set off from each other, though by no means all of the same age. Each preserves certain features throughout which indicate that it is monophyletic in origin. Many botanists would regard these groups as genera. Here they are regarded as incipient genera, not yet sufficiently differentiated. They differ in such features as type of inflorescence, position of anthers, dehiscence of fruit, length of style, and type of style branching.

SECTIONS

These are to the subgenera what the subgenera are to the genus. If a subgenus has broken up into two or more main lines of evolution, these are regarded as sections. They are not, in general, as well separated as subgenera, but each possesses enough features in common to indicate a community of ancestry for the species contained in it. The sections of the subgenus *Poly-nesiotis* differ in such characteristics as the arrangement of the corolla lobes in the bud, degree of development or reduction of the inflorescence, size of calyx lobes, and type of fruit. They are not very well separated, because the primitive form from which they all may have arisen is still in existence, and combines the characters of most of them, at the same time being rather variable.

SPECIES

Populations which differ rather constantly in a number of respects, including at least one or two which involve rather profound structural differences, are designated as separate species. All of the species here recognized, except those in section *Wiegmannia*, are well separated, not intergrading in the more fundamental characters. The differences used to separate them are pointed out in the discussion accompanying each. Those in *Wiegmannia* are not very satisfactory. The process of differentiation has not advanced sufficiently to produce many fundamental differences, though the diversity in the group is considerable when viewed as a whole. In order to show this, separation of the species has been made on the basis of an aggregation of less important differences where the groups so separated have seemed natural units. Further field study may reveal more satisfactory characters, or may cause a reduction in the number of species recognized in this section.

Within the species, three degrees of differentiation or fragmentation have been recognized. No formula can be given for the delineation of these categories, except that they represent degrees of differentiation rather than the presence or absence of intergrades. The placing of a population in a higher category simply means that a study of its differentiating characters and of the amount of formation of subgroups within it has convinced me that it is farther

on the way to becoming a separate species than are groups in the lower categories. These categories are enumerated with remarks on how my usage compares with that of other workers.

The term subspecies is not used in place of the term variety, as is done by many recent American workers. I do not feel that I can sacrifice a category from the series outlined in the international code of nomenclature, without lessening the flexibility of the system, and I feel that no good reason has ever been advanced for doing so. This category is intermediate between the species, as discussed above, and the classical concept of the variety.

There is no intended difference in my use of the varietal category from that of ordinary taxonomic (not horticultural) usage.

I think that it is logical to use the term "forma" for groups which differ from each other by very minor characters only, as well as for variants which do not seem to have a very definite geographic range. This is because I consider the latter condition a rather good indication of the former, even though the difference may appear more conspicuous in some forms which lack separate ranges. In my opinion, it is not necessary for a "form" to lack a separate geographic range, nor is it advisable to use the term to designate mere fluctuating responses to environmental differences, which fluctuations have no place in a phylogenetic system of taxonomy, except as characteristics of a population which may be mentioned in the description.

HYBRIDISM

Considerable hybridization may frequently occur in groups of plants in an active state of evolution. This is particularly evident in Hawaiian genera, such as *Metrosideros*, *Scaevola*, *Coprosma*, and especially *Gouldia*, which is closely related to *Hedyotis*. I was, therefore, surprised to find this process little evident in the Hawaiian species of *Hedyotis*, certain of which show tremendous evolutionary activity.

Evidence of hybridism was found between forms of *H. acuminata*, especially on the islands of Lanai and Oahu, and between forms of *H. Schlechtendahliana* on Oahu. Hybridism is apparent in plants which combine, in a manner which suggests segregation, the characters of two groups whose geographic ranges are contiguous or overlapping. The remarkable fact is not that this takes place, but that so little evidence of it has been found. I have only two suggestions that may help explain this. One is that plants of this genus are not at all common, thus reducing the chances of cross fertilization. *Gouldia*, which shows such a remarkable hybridism, is one of the most common plants in the wet Hawaiian forests. *Hedyotis* is only occasional, and seldom do two closely related species grow together. Judging from the number of sterile and undeveloped fruits in many species of *Hedyotis*, the pollination mechanism, what-

ever it is, is not very efficient. Therefore, frequent hybridization would scarcely be expected. The other suggestion is that when sufficient collecting has been done to give a true picture of the geographic ranges of the various forms of this genus in Hawaii, some of the polymorphism now noted in certain species may be found to be due to hybridism. I think that no adequate picture of the distribution of any Hawaiian species of *Hedyotis* could be obtained by plotting localities on a map from the specimens now available.

It may be said that no unquestionable cases of interspecific hybridization are known in this genus in the region under study. Two suspected hybrids, between *H. acuminata* and *H. fluviatilis*, and between *H. Schlechtendahlia* var. *Remyi* and *H. Mannii* var. *Munroi*, cannot be definitely established without further field work.

DISTRIBUTION

The genus *Hedyotis*, in the broad sense adopted, is pantropic and subtropic, occasionally temperate, with the subgenus *Euhedyotis* probably confined to the Old World tropics. *Diplophragma* is also an Old World subgenus, with one of its species, *H. foetida*, widespread from Micronesia to central and southern Polynesia, found chiefly on coral limestone. *Oldenlandia* is practically pantropic, and extends into temperate regions, at least in America. Certain species have a tendency to be weedy, and perhaps their present distribution is, with the help of man, more extensive than their natural range. There is no way of knowing whether the Samoan and Tongan occurrences of *H. biflora* are natural or the result of aboriginal introduction. The very small seeds could be readily transported accidentally.

Three subgenera are restricted to Polynesia. Of these, *Polynesiotis* is the largest and most widespread. Of its five sections, three, *Protokadua*, *Wiegmannia*, and *Gouldiopsis* are restricted to the Hawaiian islands, which seem to be the original center for the group and the region of its greatest development. Section *Austrogouldia* is found, so far as is known, only on Raiatea and Borabora of the Society Islands. The distribution of section *Bikkiocarpa* is amazing, one species in the Hawaiian islands, restricted to the island of Maui, the other only on the island of Rapa, over 3,000 miles to the south. I have no explanation for this.

Subgenus *Kadua* is restricted to the Hawaiian islands, where it is found on Hawaii, Maui, Oahu, Kauai, Molokai, and Lanai, and is by far the most common of all the groups. It seems most highly developed on the island of Oahu, but that is probably because this island is the best explored. Subgenus *Oceanica* is restricted to coral islands and islets in central and southeastern Polynesia.

Little can be said in a general way of the distribution of the genus in the Hawaiian islands. Almost every type of habitat, except the extremely high mountains, has one or more forms adapted to it. The islands of Hawaii and Maui seem to have rather few forms in proportion to their size, though this may not be significant. They are, however, younger islands, and more completely covered by recent lava flows. A more thorough search for these plants is needed, especially in small *kipukas* or pockets of vegetation between the flows.

PHYLOGENY AND RELATIONSHIPS

A detailed discussion of this topic must be postponed, pending a study of the various species of *Hedyotis* found in the western Pacific, and a more thorough investigation of the interrelationships of the extra-Polynesian subgenera. Further field work in Polynesia, especially in Hawaii, is also needed to clarify some of the relationships within the Polynesian subgenera. A few brief remarks on the relationships of the three Polynesian subgenera must suffice for the present.

Of these three subgenera, *Polynesiotis* appears to contain the most primitive species, the others being probably derived from it or its precursors. Section *Protokadua* is undoubtedly the most primitive member of this subgenus. *H. coriacea* possesses characters in common with all of the other sections, and also most closely resembles certain western Pacific species. It may have had its origin in something similar to subgenus *Diplophragma*.

Sections *Wiegmannia*, *Bikkiocarpa*, and *Gouldiopsis* may have each originated directly from *Protokadua*, each specializing in different ways and preserving certain of the characters of *Protokadua*. Of section *Austrogouldia* I prefer to say nothing until I have seen much more complete material than is available at present.

It is fairly evident that section *Gouldiopsis* must have given rise to the genus *Gouldia*, and probably through *H. Knudsenii*. The resemblance between the latter and *Gouldia terminalis* var. *elongata*, both from the island of Kauai, is striking, the only important difference being in the fleshy, indehiscent fruit and larger, more peltate seeds of the latter.

Subgenus *Kadua* most closely resembles section *Wiegmannia*, and may have had its origin in this section, though the break between them is rather abrupt, especially in the form of the inflorescence. Also *Kadua* preserves the character of supra-axillary branching which is found in section *Protokadua* and in certain species of subgenus *Diplophragma*.

Subgenus *Oceanica* is of rather obscure origin, though its inflorescence, large fruit, and general aspect suggest a kinship with *H. rapensis*, of section *Bikkiocarpa*. The inflorescence also suggests section *Austrogouldia*.

SYSTEMATIC AND DESCRIPTIVE TREATMENT

HEDYOTIS (SENSU LATA)

The synonymy in this treatment of *Hedyotis* contains only those names and references essential to an understanding of the species found in Polynesia and cites only the earliest publication of each name, starting with 1753. References prior to 1753, as well as subsequent references which are not the first publications of names, may be found in the historical survey, in the discussion of each entity, and in the appended list of literature consulted.

Hedyotis L., Gen. Pl., ed. 5, 44, 1754.

Oldenlandia L., Gen. Pl., ed. 5, 55, 1754.

Gerontogea Cham. and Schlecht., *Linnaea* 4: 154, 1829.

Kadua Cham. and Schlecht., *Linnaea* 4: 157, 1829.

Diplophragma Meisn., Pl. Vasc. Gen., 160, 1838.

Gouldia Gray, Am. Acad. Arts Sci., Proc. 4: 310, 1860 (in part, only as to *G. romanzoffiensis*).

Vegetatively very diverse; leaves opposite or verticillate, entire; stipules interpetiolar or somewhat sheathing, entire or dentate or pectinately lobed or cut; inflorescence axillary or terminal, flowers solitary, glomerate, capitate, cymose or thyrsoid; flowers usually 4-merous, ovary inferior or partly so, calyx lobes equal, sometimes alternating with secondary teeth, corolla salverform, campanulate, tubular, or almost rotate, thin to fleshy, lobes valvate; anthers introrse, opening by two slits, sessile or on short filaments, inserted in the corolla tube anywhere from sinuses to base; style cylindrical to filiform, bifid at apex, lobes sometimes coherent, or subcapitate and merely grooved at apex, lobes stigmatic only on ventral sides, sometimes enlarged and fleshy; ovary inferior or partly so, with 2(-3-4) cells, with fleshy fungoid placentae attached to the septum by a relatively small attachment, bearing few to numerous ovules scattered over surface; fruit with endocarp weakly to strongly sclerified, mesocarp thin or rarely thick, usually drying by maturity, dehiscence various, loculicidal almost to base, or only part way to base, or only across disk, if one of the two latter, usually followed by a separation of the pyrenes septicidally, or both loculicidally and septicidally across disk, or pyrenes separating septicidally only, or rarely indehiscent; seeds various, either subspherical and not angled, or peltate, rounded or crowded into irregular angular forms, or so crowded as to be higher than wide, or even compressed so much as to be winged at the angles.

Hedyotis auricularia L. was selected by Chamisso and Schlechtendal (8) as the type species of this genus.⁴ Therefore the subgenus *Euhedyotis* (Wight and Arn.) Fosberg, n. stat. (*Hedyotis* L. sect. *Euhedyotis* Wight and Arn., Prodr. Fl. Pen. Ind. Or. 1: 411, 1834) contains those species of southern Asia with axillary inflorescences and indehiscent or septicidal fruits and usually a depressed habit of spermacoccoid appearance. None of them enters the region under consideration, and no attention is paid to them in this study, except as is necessary in order to be certain of the typification of the genus.

⁴ Bremekamp (Rec. Trav. Bot. Neerl. 36: 438-439, 1939) has retypified the genus, designating *H. fruticosa* L. as type species and has placed *H. auricularia* L. in another genus. This does not seem justified, either taxonomically or nomenclatorially.

Five subgenera are represented in Polynesia—*Oldenlandia*, *Diplophragma*, *Polynesiotes*, *Oceanica*, and *Kadua*. They may be separated by the following key:

KEY TO SUBGENERA

1. Slender herbs, pedicels filiform, corolla thin, broadly tubular, capsule thinly cartilaginous **Oldenlandia**.
1. Woody, at least at base, pedicels not filiform, corolla salverform or rarely funnelform, capsule noticeably sclerified..... 2.
2. Corolla thin, funnelform, anthers noticeably exerted, stigma subcapitate, exerted, grooved only at apex, seeds not angular..... **Diplophragma** (p. 21).
2. Corolla fleshy, salverform, anthers included, style shorter than or subequal with tube, bifid (lobes may cohere), seeds angular..... 3.
3. Inflorescence supra-axillary, reduced to 1-5 flowers..... **Kadua** (p. 69).
3. Inflorescence terminal or terminal and axillary..... 4.
4. Width of corolla tube 1/3 the length, cyme 1-3 flowered, fruit fleshy, about 2 cm. across, crowned by minute calyx lobes..... **Oceanica** (p. 67).
4. Width of corolla tube much less than 1/3 the length, cyme usually many-flowered, fruit dry, or if fleshy, calyx lobes much over 1 mm. long **Polynesiotes** (p. 22).

SUBGENUS **OLDENLANDIA** ([PLUM.] L.) FOSBERG

Oldenlandia ([Plum.] L.) Fosberg, n. stat.

Oldenlandia (Plum.) L., Gen. Pl., ed. 5, 55, 1754 (as genus) (not of J. E. Sm. 1811 or Steud. 1821).

Gerontogea Cham. and Schlecht., *Linnaea* 4: 154, 1829.

Hedyotis sect. *Oldenlandia* Wight and Arn., Prodr. Fl. Pen. Ind. Or. 1: 413, 1834.

Oldenlandia sect. *Euoldenlandia* K. Schum., Engl. and Pr. Nat. Pflanzenf. ed. 1, 4(4): 26, 1891.

Slender herbs; corolla thin, often ephemeral, broadly tubular to slightly funnel-form or almost rotate; stamens often slightly exerted; style subequal with tube, thickened upward, bifid; capsule weakly sclerified, appearing thinly cartilaginous, dehiscing loculicidally almost to base, not at all septicidally.

Regarded by many taxonomists as a distinct genus, but separated with difficulty from *Anotis*, *Houstonia*, and other groups within *Hedyotis*. Its most striking character is its slender, usually herbaceous, often diffuse habit.

Only one species enters our range.

1. ***Hedyotis biflora*** (L.) Lam., Tabl. encycl. 1: 272, 1791 (not of Hornem., 1813; not of Rottbl. ex. Wight and Arn., 1834) (fig. 1).
Oldenlandia biflora L., Sp. Pl., 119, 1753.
Oldenlandia paniculata L., Sp. Pl., ed. 2, 119, 1762.
Oldenlandia debilis Forst., Prodr., 10, 1786.
Hedyotis paniculata Lam., Encycl. 3: 79, 1789.
Hedyotis multiflora Cav., Icones 6: 53, pl. 574, fig. 2, 1801.

Hedyotis debilis Roem. and Sch., Syst. Veg. 3: 200, 1818.

Gerontogea biflora Cham. and Schlecht., Linnaea 4: 154, 1829.

Oldenlandia multiflora DC., Prodr. 4: 427, 1830.

Erect or spreading, diffusely branched herb, glabrous or nearly so, up to 3-4 dm. tall, internodes quadrangular; leaves thin, up to 3 cm. long, 1.5 cm. wide, elliptic to ovate, base attenuate to a petiole at most 1 cm. long, apex acute or acuminate; stipules triangular, mucronate, adnate to petioles; panicle cymose, diffuse, sometimes reduced to a few flowers, branches slender, pedicels filiform, bracts, except lowest foliaceous ones, reduced to subulate or lanceolate scales; calyx lobes triangular, acute, 1-1.5 mm. long, not much accrescent in fruit; corolla broadly tubular, about 3 mm. long, lobes ovate, 1 mm. long, slightly spreading, tube sometimes swollen, the whole thin and very readily deciduous, so that in most specimens corollas are lacking, throat (in Samoan specimens at least) bearded with dense tufts of straight white hair; anthers 0.5 mm. long, almost as wide, attached in tube, subsessile; style about as long as tube, thickened upward, deeply bifid, glabrous; fruit subglobose, slightly compressed, about 2.5-3 mm. high; seeds numerous, small, black.



FIGURE 1.—*Hedyotis biflora*: a, fruit; b, bud; c, flower.

Tropical Asia to Mauritius, Malaysia, Micronesia, Melanesia, Fiji, and in Polynesia to Samoa and Tonga.

Samoa. Tutuila: between Faganeanea and Vuuli, *Setchell 320* (US); Faganeanea, alt. 15 ft., *Garber 969* (NY). Manua: without locality, *U. S. Expl. Exped.* (NY). Ofu: along northwest shore, *Yuncker 9555* (Ho); Tua, along beach at a few feet elevation, *Garber 1019* (NY). Tau: trail to Faleasao pig yard, *Garber 698* (US); south of Siufaga village, *Yuncker 9119* (Ho) (fig. 1). Savaii: Saleaula, *Vaupel 88* (US). Upolu: Apia, *Reinecke 564* (US). Without locality: *Garber 1084* (NY); *U. S. Expl. Exped.* (NY).

Tonga. Tongatabu: without locality, *Forster* (BM) (type of *O. debilis* Forst., examined and photographed for me by W. R. Philipson).

I have not seen specimens of *H. biflora* from Tonga, but it is recorded from there by Hemsley, by Drake (as *O. paniculata*), by Forster from Tongatabu (as *O. debilis*), and by Cavanilles from "Amicorum insula Babao" (Vavau?) (as *H. multiflora*), though De Candolle (6) says "circa Manillam in ins. Philippinas nec in Amicorum insulis ut incaute scripserunt Poirer et Roemer." At any rate, Cavanilles' illustration is certainly of this species.

Found in the lowlands on beaches, roadsides, cliffs and rocky places. It is difficult to know whether this plant is truly indigenous in these islands, but, as it was found by Forster, it has been there at least since pre-European times.

SUBGENUS **DIPLOPHRAGMA** (WIGHT AND ARN.) FOSBERG**Diplophragma** (Wight and Arn.) Fosberg, n. stat.*Hedyotis* sect. *Diplophragma* Wight and Arn., Prodr. Fl. Pen. Ind. Or. 1: 406, 1834.*Diplophragma* Meisn., Pl. Vasc. Gen., 160, 1838 (as genus).*Oidenlandia* sect. *Diplophragma* Wight and Arn., ex K. Schum. in Engl. and Pr., Nat. Pflanzenf. ed. 1, 4(4): 26, 1891.

Usually subshrubs; leaves usually coriaceous; stipules entire to pectinate; inflorescence terminal to axillary, cymose or thyrsoid, paniculate to subcapitate; corolla funnelform or tubular-funnelform, rather thin, deeply cut into narrowly oblong, ovate, or lanceolate lobes; anthers considerably exerted from sinuses; style conspicuously exceeding corolla tube, apex subcapitate or capitate, slightly grooved to bifid; capsule noticeably sclerified, loculicidal across disk, then the pyrenes separating septicidally.

This subgenus does not seem to have been typified previously, either as section or genus. It seems appropriate to select *H. fruticosa* L. as the type species, as it is a rather well-known species which satisfactorily exemplifies the characters of the group and has been included in it since the beginning.

Only one species is found in Polynesia, the widespread *H. foetida*. This seems to agree well enough with this subgenus, though the corolla is glabrous and the seeds are not angular.

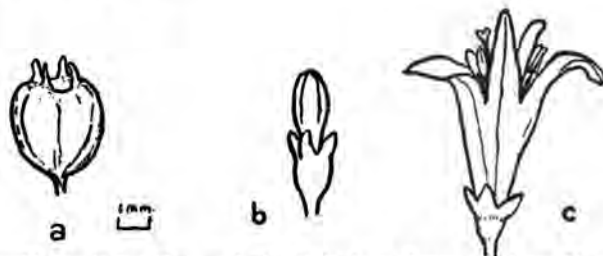


FIGURE 2.—*Hedyotis foetida*: a, fruit; b, bud; c, flower (a from Yuncker 9785; b, c from Yuncker 9553).

2. *Hedyotis foetida* (Forst.) J. E. Smith, Rees Cyclop. 17(2) (pages unnumbered) 1811; (not of Dalz. 1850) (fig. 2).

Oldenlandia foetida Forst., Prodr., 10, 1786.*Kadua rurutensis* F. Br., B. P. Bishop Mus., Bull. 130: 286, 1935.

Small shrub of variable habit, up to 2 m. tall, but in the Polynesian region usually more dwarfed, practically glabrous, internodes quadrangular, variable, but usually 0.5-2 cm. long; leaves coriaceous, usually 3-5 cm. long, 1.5 cm. wide, rarely much larger, lanceolate to elliptic, apex acute or nearly so, base attenuate to a short petiole less than 1 cm. long; stipules triangular, mucronate, adnate to petioles; panicle thyrsoid, variable in density and number of flowers, bracts except lowest reduced to subulate scales; calyx lobes about 1-1.5 mm. long, lanceolate to triangular, little accrescent in fruit; corolla firm, glabrous inside, funnelform, 4-5 mm. long, lobes oblong to lanceolate, 1-2 mm. long, tending to remain erect; stamens inserted in sinuses, anthers oblong or oblong-sagittate, 1-1.5 mm. long, exerted on filaments about 1 mm. long, dorsifixed;

style glabrous, filiform, 5-6 mm. long, stigma capitate or subcapitate, grooved across apex; capsule practically spherical, about 2-3 mm. across, loculicidal across disk, tardily septicial; seeds 0.3 mm. across, ellipsoid-spherical, not at all angled, surface shallowly foveolate-reticulate, dull brown.

Widespread in southern and western Polynesia, eastern Melanesia and Micronesia. Type locality, Tongatabu.

Austral Islands. Rurutu: Mato Tea, alt. 3 m., *St. John 16714* (Ho); hills northwest of Moerai, alt. 75 m., *St. John and Fosberg 16565* (Ho); Mato Arei, alt. 105 m., *Stokes 167* (Ho) (type of *K. rurutensis*).

Cook Islands. Rarotonga: *Wilder 808* (Ho, NY). Mangaia: *Graham 13* (Ho).

Tonga. Tongatabu: Hufagalupe, *Setchell and Parks 15461* (Gr, US); near Nukualofa, *Setchell and Parks 15252* (NY). Eua: plateau ridges, *Parks 16235* (Gr, US).

Samoa. Ofu: Ofu-Samoi, *Garber 1022* (NY); on broken lava near the shore, northwest Ofu, *Yuncker 9553* (Ho) (fig. 2, b, c).

Niue (Savage Island): without locality, *Moore 408* (US); near Hikutivake village, alt. 5 m., *Yuncker 9785* (Ho) (fig. 2, a); near Makefu village, alt. 20 m., *Yuncker 10125* (Ho).

Reported from Rarotonga by Cheeseman (9) and Wilder (58), from Palmerston Island by Drake (15) and Hemsley (26), from Vavau in the Tonga Islands by Burkill (5), from Tonga without locality by Hemsley (26), from Savage Island by Drake (15), Hemsley (26), and Burkill (5), from Samoa by Hemsley (26), and Burkill (5), and (Tau, Ofu) by Christopher-
sen (10).

Found at low altitudes, commonly on limestone cliffs.

Native names in Niue: *fakamaka*, *pupu*, *feutu*.

SUBGENUS POLYNESIOTIS FOSBERG

Polynesiotes Fosberg, n. subgen.

Kadua Cham. and Schlecht., *Linnaea* 4: 157, 1829 (in part).

Wiegmannia Meyen, *Reise um die Erde* 2: 139, 1835.

Frutices; inflorescentiae terminales; corolla hypocrateriformis carnosae vel subcarnosae; antherae sessiles in tubis inclusae; stylus bifidus; capsula loculicida, tarde septicida dehiscens; semina angulata.

Shrubs or suffrutescent herbs, leaves opposite, inflorescence terminal or rarely terminal and axillary, usually paniculate; corolla salverform, more or less fleshy; anthers sessile, included in the tube or throat, attached dorsally; style slender, shorter than or rarely subequal with corolla tube, stigmatic portion bifid, usually more or less enlarged, lobes often more or less coherent; flowers often gynodioecious; fruit a capsule crowned by persistent calyx lobes, loculicidal across disk or further, and down almost to base of septum, later usually separating septicidally; seeds angular.

This is a strictly Polynesian subgenus of 19 species, centering in the Hawaiian islands, with a secondary center in southern Polynesia. It is distinguished

from subgenus *Diplophragma* mainly by its fleshy, salverform corolla, included anthers, and short style; from subgenus *Oceanica* by its dry fruit and greater dehiscence; from subgenus *Kadua* by the terminal, usually well-developed inflorescence; and from the genus *Gouldia* by the dry, dehiscent fruit and smaller, more crowded seeds.

This subgenus has differentiated into five well-marked sections which may be separated by the following key:

KEY TO SECTIONS OF POLYNESIOTIS

1. Buds with corolla lobes noticeably inflexed, making apex of bud depressed, fruit almost as broad as long or broader, loculicidal dehiscence eventually noticeably surpassing disk.....2.
2. Calyx lobes foliaceous, longer than hypanthium in flower, conspicuous in fruit, corolla limb not quadrangular in bud, inflorescence usually quite glaucous **Wiegmannia** (p. 29).
2. Calyx lobes dentiform, remaining so in fruit, corolla limb in bud quadrangular, inflorescence not noticeably glaucous..... **Protokadua** (p. 23).
1. Buds with corolla lobes not noticeably inflexed, apex not depressed (see also *H. molokaiensis*), fruit with loculicidal dehiscence not or only slightly surpassing disk, or fruit much longer than wide.....2.
2. Corolla limb in bud strongly quadrangular, fruit not much longer than wide **Gouldiopsis** (p. 56).
2. Corolla limb in bud strongly quadrangular, fruit much longer than wide (in *Austrogouldia* ?)3.
3. Inflorescence a 3-flowered cyme or a dense corymbose thyrses..... **Bikkiocarpa** (p. 25).
3. Inflorescence a loose several times trichotomous cyme..... **Austrogouldia** (p. 28).

SECTION PROTOKADUA FOSBERG

Section *Protokadua* Fosberg, n. sect.

Frutex; folia coriacea reticulata, petiolis connatis; cyma corymbosa longi-pedunculata; corolla juvenis (in alabastris) quadrangularis, apice depresso; antherae curvatae; stylus dilatus, supra incrassatus bifidus; capsula lignosa brevis.

Shrub with coriaceous reticulate leaves, petiole bases connate below stipules, forming an infra-stipular sheath; stipules triangular, entire, adnate to sheath; inflorescence a long pedunculate, terminal, corymbose cyme, usually with two smaller ones half way up the peduncle; calyx lobes minute, triangular; corolla salverform, with limb in bud quadrangular, apex depressed, lobes inflexed, appendage remaining inflexed in anthesis; anthers curved; style shorter than tube, enlarged below into the conical disk, stigmatic portion enlarged, bifid, lobes flattened; capsule woody, little longer than wide.

The most primitive of the sections, combining the characters of the others, possibly having given rise to them all, composed of a single Hawaiian species.

3. *Hedyotis coriacea* J. E. Smith, Rees. Cyclop. 17(2), (pages unnumbered), 1811.

Kadua Menziesiana Cham. and Schlecht., Linnaea 4: 160, 1829.

Hedyotis conostyla Gaud., Bot. Freyc. Voy. Uran., 471, pl. 94, 1830.

Oldenlandia conostyla DC., Prodr. 4: 428, 1830.

Kadua Smithii Hook. and Arn., Bot. Beechey's Voy., 86, 1832.

Kadua Arnottii G. Don, Gen. Syst. Dichl. Pl. 3: 533, 1834.

Kadua conostyla Hook. ex. Endl., Wien Mus. Naturgesch., Ann. 1: 175, 1836.

Hedyotis Menziesiana Steud., Nom., ed. 2, 1: 728, 1840.

Hedyotis Smithii Walp., Repert. 2: 501, 1843.

Erect (?) shrub several dm. tall, vegetative internodes extremely variable in length, solid, terete or slightly costate, glabrous to hispidulous above; leaves elliptic or oblong, rarely ovate or lanceolate, quite variable in size, up to 8 cm. long, 3 cm. wide, usually less than 5 cm. long and 2 cm. wide, apex obtuse, base acute or rarely obtuse, coriaceous, prominently reticulate beneath, glabrous or somewhat hirtellous or hispidulous beneath, glabrous or rarely hispidulous on upper surface, especially likely to be hairy in upper part of plant, petiole 5-10 mm. or shorter, bases expanded and connate into an infra-stipular sheath; stipules triangular, acuminate, shortly and bluntly mucronate, up to 3 mm. long, carinate, interpetiolar, adnate to sheath; inflorescence hispidulous to glabrous, terminal, long-pedunculate, up to 20 cm. tall, usually 15 cm. or less, bearing a terminal corymbose cyme, and, usually, a pair of smaller lateral ones in the axils of a pair of foliose bracts halfway up the peduncle, lateral cymes more or less pedunculate, bracts at nodes of cymes minute and scale-like; hypanthium more or less turbinate, about 0.5 mm. long; calyx lobes triangular, mucronate, 0.5-0.7 mm. long; corolla salverform, glabrous to hirtellous, tube 5-10 mm. long, upper part of throat spreading, limb quadrangular in bud, apex depressed, lobes inflexed in bud, oblong with an inward pointing mucroniform appendage 0.5 mm. long, lobes soon becoming reflexed but mucro remaining inflexed; anthers oblong, about 1.3 mm. long, inserted in throat, strongly bent outward, because of spreading corolla throat appearing slightly exserted; style somewhat shorter than tube, enlarged below into the conical disk, basal third of style densely woolly-pilose, apical 1 mm. somewhat enlarged and bifid, lobes flat; fruit cup-shaped to turbinate, up to 5 mm. high, 4 mm. wide, disk conical, endocarp heavily sclerified, dehiscent loculicidally across disk, later further down, tardily dehiscent septically across disk, pyrenes finally separating septically; seeds dark brown, compressed, irregularly angular.

A rare, perhaps now extinct, Hawaiian species evidently inhabiting dry to moist places, though little is known of its habitats. Collected by most of the early explorers, but not found since Forbes' collection in 1911.

It was much abused nomenclatorially, having had eight names up to 1843, by which time it had been collected only three times. Mann (39) confused *H. centranthoides* with this species, as all his specimens labeled *Kadua Menziesiana* are *H. centranthoides*.

Two weakly distinguished forms may be separated.

4. ***Hedyotis coriacea* f. *coriacea*** Fosberg, new name.

Hedyotis coriacea J. E. Smith, Rees Cyclop. 17(2), 1811.

Kadua Menziesiana Cham. and Schlecht., Linnaea 4: 160, 1829.

Kadua Menziesiana β var. Hillebr., Fl. Haw. Is., 164, 1888.

Corolla lobes about 3-4 mm. long.

Hawaiian islands. Oahu: Nuuanu, *Hillebrand* (B); Nuuanu, *Hillebrand* 199 (K). Without locality: *Menzies* (K) (type); *Chamisso* (B) (type of *K. Menziesiana*); *U. S. Expl. Exped.* (US).

Waianae Mountains and Pearl River are additional localities according to Hillebrand (27).

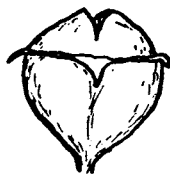


FIGURE 3.—*Hedyotis coriacea* var. *conostyla* (from sheet in Vienna).

5. *Hedyotis coriacea* f. *conostyla* (Gaud.) Fosberg, n. comb. (fig. 3).

Hedyotis conostyla Gaud., Bot. Freyc. Voy. Uran., 471, 1830.

Corolla lobes about 2 mm. long.

Hawaiian islands. Hawaii: on an island in flow of 1859 near Judd Road, *Forbes 249.H* (Ho); without locality, *U. S. Expl. Exped.* (US, Gr, NY), *Hillebrand* (K, Gr, Ho). Maui: without locality, *Bennett 9* (B) (this specimen has more lanceolate, acute leaves than most, and may represent a different variety, but the material has no flowers and is tentatively placed here on geographic grounds).

“Isles Sandwich”, 1824, *Gaudichaud* (P) (type).

This form has doubtless been greatly helped on its way to extinction by the volcanic activity on the island of Hawaii, and by the practice of grazing stock in the *kipuka*, or islands left in the flows.

SECTION **BIKKIOCARPA** FOSBERG

Section **Bikkiocarpa** Fosberg, n. sect.

Frutices vel suffrutices glabri; stipulae petiolibus adnatae triangulares; flores terminales vel terminales et axillares albi; hypanthium cylindrico-turbinatum; corolla hypocrateriformis, tubo gracile, lobis (in alabastris) valvatis non inflexis; antherae oblongae vel lineares in tubo inclusae; stylus glaber bifidus in tubo inclusus; capsula cylindrica lignosa partim loculicida tum septicida, valvis persistentibus; semina peltata angulata.

Glabrous shrubs or subshrubs; stipules triangular, adnate with petiole bases to form a short sheath; inflorescence terminal or both terminal and in upper axils; corolla white, salverform, tube slender, lobes valvate in bud, apex not at all depressed; anthers linear or oblong, included in tube; style glabrous, bifid, included in tube; capsule cylindrical, heavily sclerified, loculicidal across disk and almost to base of septum, then pyrenes separating septicidally, persisting after weathering away of mesocarp, surrounded by persistent vascular skeleton of mesocarp; seeds small, peltate, angular.

Found on the island of Maui, Hawaiian islands, and on the island of Rapa, over 3,000 miles to the south. This distribution is very puzzling, and might be used as grounds for setting up separate sections for the two species, but morphologically the only important difference is in the inflorescence, which does not seem sufficient.

The section is perhaps most closely related to section *Austrogouldia*, though this affinity is not well established at present, and in some respects there is a similarity to subgenus *Oceanica*. The form of the corolla and the fleshy fruit of the latter are, however, very different.

The name was suggested by the striking superficial resemblance, except in size, of the fruits to those of the genus *Bikkia*. Two species only are included, of which *H. formosa* is the type. These may be separated as follows:

1. Leaves reticulate, inflorescence a terminal thyrse.....*H. formosa* (6).
 1. Leaves not reticulate, inflorescence reduced to triflorous axillary and terminal cymes.....*H. rapensis* (7).

6. *Hedyotis formosa* (Hillebr.) Fosberg, n. comb.

Kadua formosa Hillebrand, Fl. Haw. Is., 165, 1888.

Undershrub, up to 1 m. long, main stem (acc. Hillebr.) prostrate, herbaceous to somewhat woody, hollow, vegetative internodes usually 1-2.5 cm. long, somewhat quadrangular or at least with 4 costae, lateral buds somewhat supra-axillary, whole plant glabrous (or, acc. Hillebr. leaves with a sparse pubescence, though this is not evident on those of his specimens that I have seen); leaves up to 12 cm. long, 4.5 cm. wide, lanceolate to elliptic or oblong, apex acuminate, base acute or in upper leaves somewhat rounded, slightly contracted into a very short, thick petiole up to 4 mm. long, blade coriaceous, conspicuously reticulate beneath; stipules low-triangular, carinate and bluntly mucronate, adnate to inner edges of petioles, thus forming a low ringlike sheath, persistent until leaves are shed; inflorescence a dense corymbose thyrse subtended by two cordate bracts, on a long heavy peduncle, or more often the peduncle also with two smaller thyrses part way up in axils of cordate bracts, the whole terminal but becoming apparently lateral by development of one of the lateral buds at basal node of peduncle, branches of thyrse usually twice trichotomous, central flowers of ultimate triads sessile or with pedicels shorter than those of lateral flowers, bracts at nodes of thyrse and bases of pedicels reduced to triangular-subulate scales; hypanthium narrowly cylindrical-turbinate, about 2 mm. long, 0.8 mm. wide; calyx lobes blunt triangular, 0.7-1 mm. long; corolla salverform, white (drying black), tube 2-2.6 cm. long, 0.8-1 mm. wide below, gradually broadened above to 1.5-1.7 mm. at throat, lobes 6-6.5 mm. long, 2 mm. wide, oblong-lanceolate, patent to somewhat reflexed, 4 in number (occasionally 5 acc. Hillebr.); anthers oblong, 2 mm. long, 1 mm. wide, attached dorsally, inserted somewhat below mouth of tube; style glabrous, slightly shorter than tube, bifid, lobes flattened, papillose, up to 5 mm. long; capsule cylindrical, up to 12 mm. long, 3-3.5 mm. wide in middle, contracted at base and slightly at apex, crowned by the persistent non-acrescent calyx lobes, disk low conical, placentae attached longitudinally almost the length of septum, dehiscence loculicidal across disk and almost to base of septum, then septicidally, the two heavily sclerified pyrenes separating, then mesocarp weathering away except vascular skeleton which persists surrounding persistent pyrenes; seeds dull, dark brown or blackish, peltate, angular, about 0.3 mm. across.

Found only on west Maui.

Hawaiian islands. Maui: Waihee, *Hillebrand* (B); Waihee Valley, Sept. 1918, *Rock* (Ho), *Rock 16007* (Ho); Kanapali [Kaanapali] and Waihee, 1870, *Hillebrand* (K, B) (type); valley of Waihee, Aug. 1870, *Hillebrand* (W); Kaanapali, *Hillebrand and Lydgate* (Ho); Honokahau Drainage Basin, *Forbes 357.M.* (Ho); Waikapu Valley, *Forbes 139.M.* (Ho); Honokawai

Gulch in Kaanapali, *Hillebrand* (B, Ho); Lahaina, *Hillebrand* (B); without locality, *Hillebrand* (E, US); without data, *Rock* (Ho).

Found on very wet cliffs and in gulches.

7. *Hedyotis rapensis* (Brown) Fosberg, B. P. Bishop Mus., Occ. Papers 13(19): 250, 1937.

Kadua rapensis F. Brown, B. P. Bishop Mus., Bull. 130: 283, 1935.

Shrub up to 1 m. tall, glabrous, branchlets terete, internodes rather short; leaves narrowly lanceolate or oblanceolate to narrowly obovate, up to 12 cm. long, usually much smaller, apex acute to slightly acuminate, base acute, subcoriaceous, petiole up to 7 mm. long; stipules triangular, acute, adnate to upper surface of base of petiole, forming a short sheath; inflorescences reduced to triflorous cymes, shortly peduncled, both terminal and axillary, pedicels from very short to 2 cm. long; hypanthium narrowly turbinate, up to 4 mm. long; calyx teeth about 1 mm. long, triangular, acute; corolla salverform, fleshy, white (drying black), tube slender, about 13 mm. long, about 1 mm. thick near base dilated to 2 mm. at throat, lobes valvate, not inflexed in bud, apex not depressed, ovate- or oblong-lanceolate, patent; anthers linear, subsessile, inserted well below mouth of tube, attached dorsally; style glabrous, about two thirds as long as tube, bifid, lobes 2-5 mm. long, very slightly enlarged; fruit cylindrical, about 12 mm. long, contracted below, slightly so above, dehiscence loculicidal across disk, then septicidal, pyrenes separating but persistent in vascular skeleton of weathered mesocarp, heavily sclerified.

Found only on the island of Rapa, southern Polynesia.

Two varieties may be distinguished.

8. *Hedyotis rapensis* var. *typica* Fosberg, B. P. Bishop Mus., Occ. Papers 13(19): 250, 1937.

Branches not fleshy, leaves lanceolate or oblanceolate, acute, calyx lobes triangular, acute.

Rapa: Maitua, alt. 200 m., *Stokes 127* (Ho) (type); Maitua, cliffs of Tautautu, alt. 210 m., *Fosberg 11488* (Ho); southeast of Anarua Bay, alt. 6 m., *Stokes 411* (Ho); northeast of Hiri Bay, alt. 1.5 m., *Stokes 411a* (Ho); Hiri, alt. 2 m., *Fosberg 11631* (Ho); Karapo Rahi Islet, alt. 75 m., *St. John and Maireau 15598* (Ho); Maungaeae, alt. 270 m., *Stokes 358* (Ho); east side of peak between Ahurei Bay and Atanui Valley, alt. 110 m., *Fosberg 11370, 11371* (Ho); Area, alt. 20 m., *St. John and Maireau 15342* (Ho); Toutore, west of Mt. Vaitau, alt. 250 m., *St. John and Maireau 15415* (Ho).

9. *Hedyotis rapensis* var. *taverana* Fosberg, B. P. Bishop Mus., Occ. Papers 13(19): 250, 1937.

Differs from var. *typica* in the rather fleshy branchlets, obovate-cuneate, obtuse, venulose leaves, and oblong-ovate obtuse calyx lobes.

Rapa: Tavera Valley, alt. 200 m., *St. John and Fosberg 15726* (Ho) (type).

SECTION AUSTROGOULDIA FOSBERG

Section *Austrogouldia* Fosberg, n. sect.

Frutices glabri; folia coriacea; stipulae ovatae caducae; cymae trichotomae terminales pauciflorae; hypanthium cylindrico-turbinatum; calycis lobi dentiformes; corollae limbus (in alabastris) vix quadrangularis, apice non depressus ad anthesem patens; fructus 1 cm. longus, 5 mm. latus.

Glabrous shrubs; leaves coriaceous; stipules ovate, caducous, interpetiolar, sometimes slightly sheathing; cymes terminal, or terminal and in upper axils, several times trichotomous, few-flowered, only the lowest pair of bracts well developed, lateral pedicels of ultimate triads of flowers articulate and bracteolate halfway up; hypanthium turbinate or somewhat cylindrical; calyx teeth very short; corolla salverform, limb in bud slightly quadrangular, lobes in anthesis patent; anthers about 2 mm. long, attached in tube just below sinuses; style 4 mm. long, glabrous, bifid at apex; fruit (of the one species where it is known) 1 cm. long, 5 mm. wide.

Little known, affinities little understood. It is probably closest to section *Bikkiocarpa*, but until more material is available this is not certain. Two species known, both from the Society Islands. *Hedyotis raiateensis* is the type species. The following key will separate them:

1. Leaves ovate, acute, secondary veins near base of blade appearing plinerved, cymes terminal and in uppermost axils.....**H. Grantii** (11).
1. Leaves elliptic, acuminate, veins not appearing plinerved, cymes strictly terminal.....**H. raiateensis** (10).

10. *Hedyotis raiateensis* (Moore) Fosberg, n. comb.

Kadua raiateensis J. W. Moore, B. P. Bishop Mus., Bull. 102: 43, 1933.

Shrub 1.5 m. tall, glabrous throughout, branches quadrangular, not noticeably fistulose, only occasionally branching in upper axils, internodes 1-2 (-4) cm. long, leaf scars broader than high, connected by rather narrow stipule scars; leaves coriaceous, elliptic, blade about 6 cm. long, 2 cm. wide (on sucker shoots 9 cm. long, 4.5 cm. wide), apex acuminate, base acute to slightly attenuate, main secondary nerves 4-5 on a side, opposite to alternate, not appearing plinerved, petioles about 1 cm. long (up to 2 cm. on sucker shoot), margin somewhat revolute; stipules interpetiolar, ovate to triangular, 2-3 mm. long, not mucronate, somewhat carinate, adnate to petiole bases, soon drying and becoming papery, early caducous; cymes terminal, slender, about 3.5 cm. long, 2-3 times trichotomous, the branches often unequally developed, lowest pair of bracts similar to leaves but smaller, the others reduced to linear or ovate subulate scales, lateral pedicels of ultimate triads articulate about halfway up, with a pair of tiny scalelike bractlets; hypanthium cylindro-turbinate, 2 mm. long, slightly quadrangular; calyx lobes dentiform, less than 0.5 mm. long, spreading; corolla salverform, tube slender, somewhat enlarged above around anthers, 12-13 mm. long, lobes 2-3 mm. long, patent, apex with an inward pointing appendage less than 0.5 mm. long; anthers narrowly oblong, 2 mm. long, attached about 2 mm. below sinuses; style glabrous, filiform, 4 mm. long, bifid, lobes 0.7 mm. long; fruit (ex char.) narrowly turbinate, 1 cm. long, 5 mm. wide; seeds (ex char.) about 1.25 mm. long, 0.75 mm. wide, 0.5 mm. thick, black, minutely rugulose.

Known only from the island of Raiatea.

Society Islands. Raiatea: south ridge of mountain back of Vahuti, alt. 200 m., *Moore 671* (Ho) (type number).

11. *Hedyotis Grantii* Fosberg, n. sp. (pl. 1, A).

Frutis glaber ramulosus, ramulis teretibus fistulosis; folia coriacea ovata acuta plinervata; stipulae ovatae obtusae caducae; cymae terminales axillaresque, 3.5 cm. longae, trichotomae; calycis dentes sub 1 mm. longi; corolla hypocrateriformis, tubo 10-12 mm. longo, lobis 4 mm. longis; antherae 2 mm. longae; stylus glaber 4 mm. longus bifidus, lobis non incrassatis; fructus ignotus.

Glabrous shrub up to 13 dm. tall, branches fistulose, terete, producing slightly supra-axillary branchlets at upper nodes, internodes 2 cm. long, leaf scars conspicuous, roundish, stipule scars broad, interpetiolar, slightly narrower in the middle; leaves coriaceous, ovate, larger ones about 6 cm. wide and 10 cm. long, apex acute, base obtuse to sub-truncate and slightly attenuate into a broad petiole about 2 cm. long, main secondary veins 5-7 pairs, opposite to somewhat alternate, appearing somewhat plinerved near base of blade; stipules ovate, obtuse, not or scarcely mucronate, interpetiolar, adnate to inside of petioles and slightly connate above them, forming a short sheath, early caducous; cymes terminal and in uppermost axils, about 3.5 cm. long, 2-3 times trichotomous, the ultimate triads with lateral pedicels articulate halfway up, with tiny scale-like bractlets, bracts except lowest pair of terminal inflorescence greatly reduced and scale-like; hypanthium somewhat turbinate, 1-2 mm. long; calyx dentiform, teeth less than 1 mm. long, acute; corolla salverform, tube 10-12 mm. long, slightly enlarged at throat, lobes 4 mm. long, narrowly oblong, with minute inflexed appendage at apex, limb in bud slightly 4-sided, outside edge of sutures slightly separated, leaving a groove, tips slightly separated outside, apex of bud not depressed, corolla evidently fleshy-coriaceous when fresh; anthers about 2 mm. long, just below sinuses; style glabrous, about 4 mm. long, bifid at apex, lobes not enlarged; fruit unavailable.

Known only from the island of Borabora.

Society Islands. Borabora: Tevaitapu, Tarapaia, alt. 1,660 ft., *Grant 4957* (Ho) (type).

Differs from *H. raiateensis* in the terete branches, larger, ovate, plinerved leaves, cymes stouter, both terminal and axillary, corolla lobes longer, sutures in bud not completely closed externally. Named for Dr. M. L. Grant, authority on the flora of the Society Islands and collector of the type.

SECTION **WIEGMANNIA** (MEYEN) FOSBERG

Section **Wiegmannia** (Meyen) Fosberg, n. stat.

Wiegmannia Meyen, *Reise um die Erde* 2: 139, 1835 (as genus); Walpers, *Acad. Leop.-Carol. Nat. Cur., Nova Acta* 19, suppl. 1: 354, t. 9, 1843.

Kadua Cham. and Schlecht., *Linnaea* 4: 157, 1829 (in part).

Weak shrubs or herbs, rarely sub-arborescent; petiole bases usually united into a sheath outside and below stipules; inflorescence a terminal, decussate, usually thyrsoid, usually glaucous panicle; calyx lobes prominent, more or less foliaceous; corolla salverform, with tips of lobes inflexed in bud, usually strongly so, producing a depressed apex (except in *H. molokaiensis*), limb in bud not quadrangular; flowers usually glaucous, usually (or always?) gynodioecious, pistillate flowers with sterile, somewhat reduced anthers, longer styles than perfect flowers, style branches 2 (rarely 3 or 4) usually somewhat enlarged, often more or less coherent; fruit dehiscing loculicidally, at first only across disk and through the septum, later about half way down outside the cells, pyrenes separating septicidally very tardily, after mesocarp has weathered away.

Endemic to the Hawaiian islands; known from Hawaii, Maui, Oahu, Kauai, Molokai, and Lanai.

This section, though very well marked, shows an obvious relationship with section *Protokadua*, from which it was probably derived. The resemblance in certain respects to *H. Knudsenii* of section *Gouldiopsis* is probably the result of common origin rather than the development of one from the other.

All of the plants included in this section might conceivably be included in one very complex species, since the entities are by no means sharply set off from each other by morphological discontinuities. However, the main populations are so diverse that it seems best to recognize them as species, even though it is difficult to place certain forms and intermediate individuals. As treated here eleven species are recognized, with numerous varieties and forms in certain of them. The following key will separate the species:

1. Leaves, bracts and (usually) calyx lobes linear or narrowly lanceolate.
 2. Inflorescence corymbiform, with branches not particularly divaricate, internodes of inflorescence branches not conspicuously elongate.....**H. Cookiana** (41).
 2. Inflorescence not corymbiform, very open, with strongly divaricate branches and elongate internodes.....**H. angusta** (49).
1. Leaves and bracts, at least, broader, often cordate.
 2. Leaves, bracts, calyx lobes and ovary fleshy, leaves mainly sub-basal.....**H. littoralis** (60).
 2. Parts not fleshy, leaves usually mainly cauline.
 3. Two of the costae of the internodes strongly developed, often alate, leaves with strong secondary veins, weak areolation, mostly attenuate at base, inflorescence not strongly reduced, 5 cm. or more across.
 4. Inflorescence stiff, ultimate branchlets not elongating monochasially, at least not more than 2-3 internodes.....**H. thyrsoides** (57).
 4. Inflorescence weak, ultimate branchlets elongating monochasially and often pendent.
 5. Corolla in bud with apex not depressed, style glabrous, seeds with a horn-shaped appendage.....**H. molokaiensis** (56).
 5. Corolla in bud with apex depressed, style woolly-villous in lower half, seeds not appendaged.....**H. Mannii** (52).
 3. Not with above combination of characters.
 4. Depressed plants with outer corky layers of stem conspicuously exfoliating, leaves very small, 1-2.5 (rarely 4.5) cm. long, inflorescence reduced to 1-8 flowers.....**H. Degeneri** (64).
 4. Not with above combination of characters.
 5. Small erect shrubs, internodes with 2 prominent costae, leaves sessile, or very shortly pedicellate, all bracts much reduced except at the two basal nodes of thyrses, corolla funneliform, white, lobes at least half as long as tube, tips only slightly inflexed in bud.....**H. parvula** (61).
 5. Not as above.
 6. Straggling subherbaceous plants, leaves ovate to ovate-lanceolate, reflexed, minutely scattered pilose beneath, most axils bearing reduced leafy branchlets, inflorescence cylindrical, branches bearing only 3-8 flowers, corolla tube 4-6 mm. long.....**H. foliosa** (40).

6. Not with above combination of characters.
7. Leaves with strong, conspicuous areolation, especially on upper surface, firm chartaceous to coriaceous, or if thin, then strongly nerved.....*H. glaucifolia* (34).
7. Areolation inconspicuous above, or if rather noticeable, then blade membranous and not strongly nerved.
8. Leaves chartaceous or coriaceous, or if membranous, then inflorescence branches not monochasial.....*H. Schlechtendahliana* (12).
8. Leaves membranous, inflorescence branches monochasial.....*H. angusta* (49).

12. *Hedyotis Schlechtendahliana* Steud., Nom., ed. 2, 1: 728, 1840.

Kadua cordata Cham. and Schlecht., Linnaea 4: 160, 1829 (not *Hedyotis cordata* Steud., Nom., ed. 2, 727, 1840, or Zucc. Abh. Akad. Muench. N. 3: 177, 1846).

Wiegmannia glauca Meyen, Reise um die Erde 2: 139, 1835 [not *Hedyotis glauca* W. W. Smith, Kew Bull. (1911): 344, 1911].

Kadua Remyi Hillebr., Fl. Haw. Is., 162, 1888.

Weak shrubs or suffrutescent herbs, sparingly branched, branchlets usually terete or slightly 4-angled or 4-costate (rarely sharply 4-costate); leaves membranous to coriaceous, usually not strongly reticulate, sessile to shortly petiolate, petioles slightly united below stipules; stipules adnate to inside of petiole sheath, also very slightly connate, triangular, strongly mucronate; inflorescence usually decussate paniculate, more or less glaucous, conspicuously bracteate, bracts mostly cordate, sessile; hypanthium turbinate, calyx lobes more or less foliaceous, at least as long as hypanthium, usually longer, more or less accrescent in fruit; corolla yellowish to pale green, rarely whitish or purple tinged, salverform, lobes much shorter than tube, strongly inflexed in bud, making the bud depressed at apex, limb not quadrangular in bud; anthers included; style hairy in lower half; fruit turbinate to subspherical, usually 2-celled, rarely 3- or 4-celled, strongly sclerified.

Found on Maui, Oahu, Kauai, Molokai, and Lanai.

A very complex species, the subdivisions of which may be separated as follows:

1. Leaves membranous (subsp. *tenuifolia*).
2. Internodes terete, blades not at all reticulate above.....var. *tenuifolia* (28).
2. Internodes somewhat quadrangular, blades somewhat reticulate-areolate above.....var. *reticulata* (29).
1. Leaves chartaceous to coriaceous.
2. Lower leaves cordate at base, sessile, coriaceous (subsp. *Remyi*).
3. Leaves concave beneath.....var. *Remyi* (31).
3. Leaves plane.
4. Inflorescence compactvar. *plana* (32).
4. Inflorescence open, its branches elongate.....var. *Nuttallii* (33).
2. Lower leaves petioled, or if sessile, then narrowed to base.
3. Lower leaves not cordate at base, secondary nerves prominent (subsp. *Rockii*) (rarely var. *cordata* comes out here if the venation is unusually strong).
4. Leaves coriaceous, inflorescence very stiff, not sharply distinct from leafy part of plant.....var. *rigida* (25).

4. Leaves chartaceous, inflorescence sharply distinct from leafy part of plant.
 5. Young leaves glabrous.....var. **nitens** (24).
 5. Young leaves hirtellous beneath.....var. **opaca** (26).
3. Lower leaves often cordate, secondary nerves not or only moderately prominent (subsp. *cordata*).
 4. Calyx lobes (in flower) 6-10 mm. long (var. *glauca*).
 5. Leaves lanceolate to narrowly elliptic, calyx lobes and bracts rather stiff, not much reticulate.....f. **glauca** (21).
 5. Leaves ovate to cordate, or lower elliptic, calyx lobes and bracts not especially stiff, usually quite noticeably reticulate.....f. **kaalensis** (22).
 4. Calyx lobes about 5 mm. or less long.
 5. Calyx lobes (in flower) about 5 mm. long, ovate-lanceolate.....var. **cordata** (14).
 5. Calyx lobes 3-4 mm. long, ovate or elliptical (var. *secundiflora*).
 6. Leaves glabrous or practically so beneath.
 7. Inflorescence stiff, often compact.....f. **dichotoma** (18).
 7. Inflorescence open, often very broad, with a strong tendency to monochasial elongation of branchlets.....f. **glabrescens** (17).
 6. Leaves hirtellous beneath, at least on midrib.
 7. Inflorescence branchlets elongating monochasially.....f. **secundiflora** (16).
 7. Inflorescence branchlets not elongating monochasially.....f. **hirtella** (19).

13. *Hedyotis Schlechtendahlia* subsp. *cordata* (Cham. and Schlecht.) Fosberg, n. comb.

Kadua cordata Cham. and Schlecht., *Linnaea* 4: 160, 1829.

Leaves chartaceous to coriaceous, at least the lower leaves petioled, not strongly nerved or reticulate, upper parts ordinarily glaucous; inflorescence bracts conspicuous, even distally, except where monochasial elongation of branchlets has taken place, inflorescence usually pyramidal.

Found only on Oahu.

It is difficult to know just what treatment should be given the various forms of this subspecies. Much intergradation is evident in most of the characters, and often the most conspicuous differences are the least constant. A series of forms, based largely on the size and shape of the calyx lobes, seem to show a geographic correlation, so they are recognized and named. It is rather doubtful that these represent more than slight genetic differences.

14. *Hedyotis Schlechtendahlia* var. *cordata* (Cham. and Schlecht.) Fosberg, n. comb.

Kadua cordata Cham. and Schlecht., *Linnaea* 4: 160, 1829.

Shrubs up to 3 m. tall, rather weak or arching, upper internodes usually slightly 4-costate; leaves thin to firm-chartaceous, narrowly oblong to elliptic or ovate, apex usually slightly acuminate, base acute to subcordate, upper pair cordate, all petioled except upper pair, glabrous or slightly hirtellous along midrib beneath; inflorescence decussate paniculate, flowers glomerate, bracts broad, cordate, thin, bracts and calyx lobes usually reticulate, calyx lobes ovate-lanceolate, about 5-6 mm. long; flowers gynodioecious; corolla greenish yellow, glaucous, tube 11-13 mm. long, lobes with revolute margins, 5-7

mm. long; anthers attached just below sinuses, those of perfect flowers linear, 2 mm. long, those of pistillate flowers oblong, 1 mm. long; style in perfect flowers half the length of tube, lower two thirds woolly-villous, bifid portion only slightly enlarged, lobes coherent, in pistillate flowers style over half length of tube, lower half woolly villous, bifid portion distinctly enlarged, lobes free at apex; fruit hemispheric, broader than high, as much as 6 mm. wide and 3-4 mm. high.

Island of Oahu, both mountain ranges.

Oahu, Koolau Range: mountain east of the [Nuuanu] Pali, April 1861, *Hillebrand* (US) (lower plant on sheet only); Konahuanui, *Faurie 364* (Ho); Olympus ridge, *Hillebrand and Lydgate* (Ho) (mixed collection, most of it seems to belong here); Punaluu (Castle Trail), *Oliveira 27* (USNA).

Oahu, Waianae Mts.: Waianae Valley side of Kaala, *Degener 4142* (D); Puu Kawiwi-Puu Kaala ridge, Makaha-Waianaeikai, alt. 1,100 m., *Fosberg 10852* (Ho); same locality, alt. 1,000 m., *Fosberg 10849* (Ho); Makaha Valley, alt. 1,500 ft., *St. John 11618* (Ho); east side of Makua Valley, summit ridge, *Degener et al 11704* (D); Makaleha Valley, *Rock 17001* (Ho); Makaleha ridge, alt. 3,500 ft., June 1932, *Meebold* (Ho); east side of Kaaawa Gulch, north slope of Kaala, *Degener and Salucop 11680* (D); north slope of Haleauau Valley, Kaala Trail, Waianaeuka, alt. 850 m., *Fosberg 13659, 13660* (Ho); Mount Kaala, 1897, *Guppy* (K); foot of Kaala, east side, Aug. 5, 1908, *Forbes and Rock* (Ho); southeast slope of Kaala, *Degener et al 11673* (D); Kaala, *Wawra 2236* (W); north ridge of Puu Kumakalii, Waianaeuka, alt. 775 m., *Fosberg 13633* (Ho); northeast slope of Puu Kumakalii, *Degener et al 11683* (D); below Puu Hapapa, alt. 700 m., *Christophersen 1291* (Ho); summit ridge, Puu Hapapa, *Degener et al 12321* (D, USNA); Puu Kanehoa, *Degener and Park 11671* (D); northeast ridge of Puu Kanehoa, *Degener et al 12749* (D); South Ekahanui, *Degener and Martinez 11675* (D) (approaches var. *secundiflora* in width of calyx lobes); north fork of valley east of Palikea, Honouliuli, alt. 1,800 ft., *St. John 10370* (Ho).

Found usually in patches of semi-dry forest.

Some of the specimens in the large collection *Degener 12321* seem to approach var. *glauca* f. *kaalensis*.

This variety is identified from the description alone, as the type specimen of *K. cordata* Cham. and Schlecht. cannot be found in the Berlin herbarium. Location of this specimen may, of course, show my identification to be wrong.

15. *Hedyotis Schlechtendahliana* var. *secundiflora* (Hillebr.) Fosberg, n. comb.

Kadua cordata var. *secundiflora* Hillebr., Fl. Haw. Is., 162, 1888.

Differs from var. *cordata* in the frequent tendency to monochasial elongation in the branchlets of the inflorescence, and in the shorter, more ovate or elliptic calyx lobes, 3-4 mm. long.

Four forms recognizable, found in the Waianae Mountains of Oahu.

16. *Hedyotis Schlechtendahlia* f. *secundiflora* Fosberg, n. name.*Kadua cordata* var. *secundiflora* Hillebr., Fl. Haw. Is., 162, 1888.

Leaves cordate or subcordate at base, hirtellous beneath, especially along midrib and main veins, petioles only weakly united below stipules; inflorescence very open, once trichotomously branched, then each branch once or twice dichotomously cymose, each ultimate branchlet elongating monochasially, with an ovate bract opposite each flower; calyx lobes broadly ovate, acute, 3-4 mm. long; corolla tube 14 mm. long, lobes 4-5 mm.; anthers linear, 2 mm. long; style 7 mm. long, not especially enlarged at apex, villous in lower two thirds, bifid but lobes cohering most of way up; fruit turbinate.

Oahu, Waianae Mts.: Makaleha, *Lydgate* (B) (type); without locality, *Hillebrand* (Gr) (one twig on this sheet has leaves of a different shape, acute at base, hirtellous beneath, which probably does not belong here, but is too young to determine).

Hawaiian islands, without locality: *Hillebrand* (K, E) (latter sheet upper plant only), 1862, *Hillebrand* (US).

17. *Hedyotis Schlechtendahlia* f. *glabrescens* Fosberg, n. f.

Folia glabra; cymae latae glabrae.

Leaves glabrous or almost so; inflorescence open, often very broad, with a strong tendency to monochasial elongation of branchlets, glabrous or almost so; corolla tube 11 mm. long, lobes 4 mm.; anthers of perfect flowers linear, 2 mm. long; style 6 mm. long, not or slightly enlarged at apex, lower half strongly villous.

Found on the north slope of the Waianae Mountains, Oahu, in gulches and on exposed crests.

Oahu, Waianae Mts.: Pahole (Kukuiula) Gulch, near head of right branch, Mokuleia, alt. 550 m., *Fosberg 13062* (Ho); east side of Kaumokunui Gulch, *Degener et al 11679* (D) (type); east side of Kaaawa Gulch (north slope of Kaala), *Degener and Salucop 11680* (D); Mokuleia, slopes of Kaala, *Forbes 1789.O.* (Ho); ridge above second gulch east of Puu Kaupakuhale, Puu Kaala, Mokuleia, alt. 625 to 900 m., *Fosberg and St. John 8906, 8915, 8932* (Ho); Puu Kaala, Waianaeuka, alt. 900 m., *Fosberg 10379* (Ho).

Differs from f. *secundiflora* chiefly in the glabrous or practically glabrous under side of the leaves.

18. *Hedyotis Schlechtendahlia* f. *dichotoma* Fosberg, n. f. (fig. 4).

Folia glabra parva cordata; thyrsus rigidus compactus.

Small shrub, leaves small, glabrous, usually more or less cordate; inflorescence tending to be stiff, often compact, branches in axils of leaves subtending inflorescence often developing, giving a dichotomous appearance.

Found in the south half of the Waianae Mountains, Oahu.

Oahu, Waianae Mountains: Palikea, *Degener et al 11686* (D); Mauna Kapu, head of Nanakuli Valley, alt. 825 m., *Fosberg 13797* (Ho) (type); Palehua, *Skottsberg 287* (Ho); between Puu Manawahua and Palikea, *Degener et al 11669* (D); middle Palawai ridge, *Degener 11676* (D); Puu Hapapa, Honouliuli, alt. 2,600 ft., *St. John 10425* (Ho); northeast ridge of

Puu Kanehoa, *Degener et al* 12733 (D) (fig. 4 d, e); main divide, Puu Kanehoa, Honouliuli, alt. 2,650 ft., *St. John* 14007 (Ho); summit ridge, northwest of Puu Kanehoa, *Degener et al* 12731 (D) (fig. 4 a, b, c). The last two collections and *St. John* 10425 are somewhat doubtfully referred here.

Grows on cliffs and in small patches of rather dry forest.

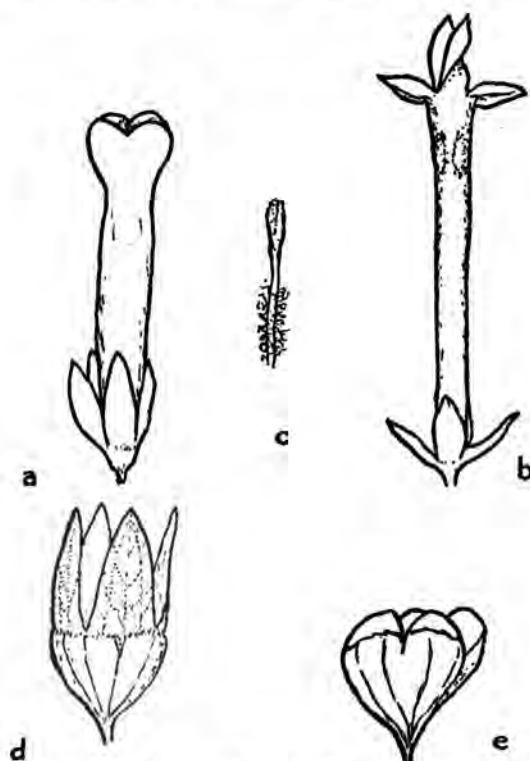


FIGURE 4.—*Hedyotis Schlechtendahlia* f. *dichotoma*: a, bud; b, perfect flower; c, style; d, mature fruit; e, post-mature fruit (a, b, c from Degener 12731; d, e from Degener 12733).

19. *Hedyotis Schlechtendahlia* f. *hirtella* Fosberg, n. f.

Folia subtus hirtella; thyrsi ramuli non elongati, floribus glomeratis.

Differs from f. *secundiflora* in the smaller inflorescence with flowers glomerate and branchlets not elongating monochasially; and from f. *dichotoma* in the larger inflorescence and the presence of hair on the under side of leaves, particularly along the midribs.

Found in the south portion of the Waianae Mountains.

Oahu. Waianae Mts.: northeast ridge of Puu Kanehoa, *Degener et al* 12749a (D); east slope of Puu Kaua, *Degener et al* 11687 (D); ridge above Kupehau, Honouliuli, *Fosberg* 10972 (Ho); near summit of Palikea, Honouliuli, *Fosberg* 10952 (Ho) (type).

20. **Hedyotis Schlechtendahlia** var. **glauca** (Meyen) Fosberg, n. comb.
Wiegmannia glauca Meyen, Reise um die Erde 2: 139, 1835.

Glabrous shrubs; inflorescence bracts (except lowest), and calyx lobes lanceolate, calyx lobes 6-10 mm. long.

Two forms, one in each of the Oahu mountain ranges.

21. **Hedyotis Schlechtendahlia** f. **glauca**, Fosberg, n. name (fig. 5).

Wiegmannia glauca Meyen, Reise um die Erde 2: 139, 1835.

Leaves lanceolate to narrowly elliptic, petioles quite noticeably united below stipules; calyx lobes and bracts tending to be rather stiff; perfect flowers with linear anthers 2 mm. long, attached 2.5 mm. below sinuses; style not reaching anthers, not or somewhat enlarged above, lower third pilose, lobes coherent; pistillate flowers with rudimentary anthers 1.3 mm. long, lanceolate; style equalling corolla tube, enlarged and deeply bifid above, lobes sometimes slightly exserted; fruit depressed globose to cup-shaped, up to 3.5 mm. high, 6 mm. wide; seeds irregularly cuneoid, angular, brown, reticulate.

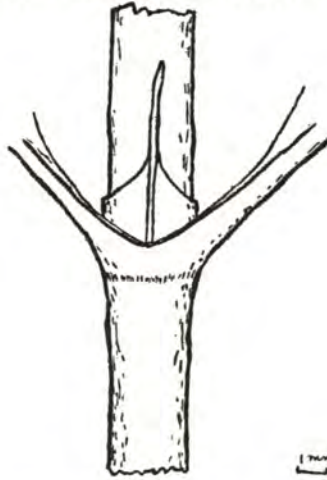


FIGURE 5.—*Hedyotis Schlechtendahlia* f. *glauca*: node (from Fosberg 9692).

Found in very wet forests of the Koolau Range.

Oahu. Koolau Range: Upper Palolo Valley, *Topping 3181* (D); east ridge of Manoa Valley, *Degener et al 11678* (D); Manoa Cliff Trail, Manoa Valley, alt. 430 m., *Fosberg 9692* (Ho) (fig. 5); lower slopes of Konahuanui, above Manoa, *Heller 2181* (US, NY, Gr, K, E, Ph, Ho); northwest slopes of Tantalus, *Degener and Shear 11711* (D); Pauoa Flats, *Degener 1554* (D, NY); mountain east of the Pali, April 1861, *Hillebrand* (US) (upper plant on sheet only); Pauoa-Konahuanui Trail, *Garber 496, 497* (Ho); Moanalua Valley, April 6, 1909, *Forbes* (Ho); Halawa Ridge, alt. 460 m., *Fosberg 13841* (Ho); middle Halawa Ridge, *Degener et al 11682* (D); North Halawa Valley, *Degener et al 11692, 11693* (D); Kalauao-Waimalu Ridge, alt. 540 m., *Fosberg 9461, St. John 13112* (Ho); high ridge above Kahana, *Skottsberg*

1841 (Ho); Waikane-Schofield Trail, *Degener et al 11668* (D). Without locality: *Hillebrand* (B); *Beechey* (K); *Mann and Brigham 210* (Gr, Ho); *Hillebrand 196* (Gr, K); *Hillebrand 195* (K) (in part).

Sandwich Islands, without locality: *U. S. Expl. Exped.* (Gr.).

Of the above collections, *Degener 1554* and *11692* from Halawa have very open inflorescences with the branchlets elongate monochasially. This might be recognized as a distinct form, but there is no certainty that it is not due to purely individual variation, as some inflorescences on *Fosberg 9692* from Manoa show a similar tendency, while others are perfectly normal.

22. *Hedyotis Schlechtendahlia* f. *kaalensis* Fosberg, n. f.

Folia ovata vel cordata venulosa; bracteae et calycis lobi tenues reticulati.

Differs in having the leaves ovate or cordate, or the lower elliptic, petioles not conspicuously sheathing below stipules, veins more prominent; bracts and calyx lobes thinner, inclined to be reticulate.

Vicinity of Puu Kaala in wet forests.

Oahu, Waianae Mts.: Puu Kaala, east slope, Waianaeuka, alt. 1,100 m., *Fosberg 9084* (Ho) (type); south side of Kaala, alt. 2,900 ft., Feb. 11, 1928, *Bergman* (Ho); Puu Kaala, alt. 3,000 ft., Jan. 8, 1933, *H. Davis* (Ho); same locality and date, alt. 2,000-2,100 ft., *M. Lum* (Ho); alt. 3,400-3,600 ft., *Krauss* (Ho); alt. 3,800-4,000 ft., *Suehiro* (Ho); Mt. Kaala, *Degener 11712* (D); near summit of Kaala, *Degener et al 12187* (D); north of Makua Valley, summit ridge, *Degener et al 11702* (D); Makaha Valley, Feb. 12-19, 1909, *Forbes* (Ho); east ridge of Puu Kalena, Waianaeuka, alt. 900 m., *Fosberg 13009* (Ho).

23. *Hedyotis Schlechtendahlia* Steud. subsp. *Rockii* Fosberg, n. subsp.

Folia valde nervata; panicula ampla.

Leaves coriaceous to chartaceous, base usually attenuate to a petiole or at least strongly narrowed, prominently nerved; panicle very large and open.

Varieties in the Koolau Range of Oahu, and on Kauai.

Leaves much like those of *H. Mannii*, but panicle much larger and more rigid, bracts more prominent, fruits larger.

24. *Hedyotis Schlechtendahlia* var. *nitens* (Wawra) Fosberg, n. comb.

Kadua cordata var. *nitens* Wawra, *Flora* 57: 262, 1874.

Planta glabra papillosa; folia chartacea magna ovata vel elliptica acuminata plinervata; panicula pyramidalis decussata composita maxime 20 cm. longa et 25 cm. lata; bracteae foliaceae cordatae vel ovatae; fructus 4 mm. longus et 5 mm. latus.

Plant glabrous, minutely papillose in dry specimens due to cell inclusions, stem terete, hollow, internodes often 10 cm. or more long; leaves chartaceous, ovate to elliptic, up to 15 cm. long and 6 cm. wide, rarely larger, acuminate at apex, acute to obtuse at base, but somewhat attenuate to a short winged petiole or sessile, plinerved at base; stipules low triangular, strongly carinate, mucro 3-4 mm. long, compressed; panicle open, pyramidal, decussate, compound thyrsoid, up to 20 cm. long, 25 cm. wide, main axis 3 internodes long, ultimate branchlets somewhat elongating monochasially, branches often becoming rather

firm with age, bracts prominent, cordate to ovate, foliaceous, except on monochasial branchlets, corolla tube 10-14 mm. long, lobes ovate, slightly acuminate, 3-5 mm. long; anthers oblong, sterile 1 mm. long, fertile 1.5 mm. long; style shorter than tube, lower half woolly-villous, lobes of stigma much enlarged, obovate to spatulate; fruit cup-shaped to broadly turbinate, about 4 mm. high, 5 mm. wide; seeds irregularly angular, more or less cuneoid, sometimes with one corner somewhat prolonged into a horn-shaped appendage, surface brown, reticulate-pitted.

Found in the wet forests of the Koolau Range, Oahu.

Oahu, Koolau Range: Koolauloa Mts. between Punaluu and Kaipapau [Kaipapau], May 3-8, 1909, *Forbes and Cooke* (Ho); Punaluu, June 11, 1916, *Swezey* (Ho); Punaluu Mts., *Rock 8835* (Ho); same loc., May 23, 1908, *Rock* (Ho); Castle Trail, Punaluu, alt. 2,000 ft., *Hosaka et al 2398* (Ho); Waiolani Ridge, Dec. 10, 1908, *Forbes* (Ho); Konahuanui, *Forbes 1303* (Ho); Waiolani, west side Nuuanu, Honolulu, June 28, 1908, *Forbes* (Ho); without locality, *Wawra 1790* (W) (type).

"Oahu, montagnes", *Remy 353* (Gr); Hawaiian islands, without locality, *Hillebrand* (US), 198 (K).

One sheet of the Forbes and Cooke collection, a sheet from Oahu, without locality, *U. S. Expl. Exped.* (US), and a collection from the Pig-god Trail, Punaluu, *Degener et al 11664* (D) have the leaf shape and petioles approaching var. *glauca*, and may possibly represent hybrids, though var. *glauca* is not known from nearer to Punaluu than Kahana Valley, several miles away.

25. *Hedyotis Schlechtendahlia* var. *rigida* Fosberg, n. var.

Folia dura venulosa breve petiolata; thyrsus rigidus non valde distinctus; bractea amplae.

Leaves stiff, strongly venulose, abruptly contracted or subcordate at base, not attenuate, very short-petioled; inflorescence not sharply distinct from leafy portion of plant, very rigid, bracts broad and prominent.

Wet forests of the Koolau Range, Oahu.

Oahu, Koolau Range: Palolo, *Rock O* (Ho) (type); Konahuanui-Olympus trail, *Garber 250* (Ho).

26. *Hedyotis Schlechtendahlia* var. *opaca* (Wawra) Fosberg, n. comb.

Kadua cordata var. *opaca* Wawra, *Flora 57*: 262, 1874.

Kadua cordata var. *pruinosa* Wawra, *Flora 57*: 262, 1874.

Kadua cordata var. *laxa* Hillebr., *Fl. Haw. Is.*, 161, 1888.

Slender erect shrub; upper pair of leaves sometimes cordate, leaves slightly reticulate, chartaceous or thick chartaceous, hirtellous beneath, at least when young, not so conspicuously plinerved; panicle very large, as much as 35 cm. wide and long, branches usually divaricate at right angles to rachis (lower pair often appearing ascending in pressed specimen), branches with no tendency to elongate monochasially; calyx lobes ovate-lanceolate, 3-5 (rarely 7-8) mm. long, rather thin, accrescent in fruit.

Mountains of Kauai.

Kauai: Waimea, *Knudsen* (B) (type of var. *laxa*); road to Kalalau from Kokee Camp, alt. 3,700 ft., *Wilder 447* (Ho); Waimea Drainage Basin, west

side, *Forbes 848.K.* (Ho); Kohaluamanu [Kaholuamanu], Oct. 1911, *Rock* (Ho); Halemanu, *Rock 143* (Ho); ridge west of Hanapepe River, *Heller 2615* (US); Puu Ka Ele Stream (Kilauea), *Forbes 556.K.* (Ho) (this specimen has very narrow calyx lobes and large leaves, perhaps representing a distinct form, though the material is insufficient to be certain); on ridge opposite Gay and Robinson's Hanapepe Valley House, *Heller 2608* (NY, US) (this collection has a more contracted panicle than usual, in this character approaching var. *Rockii*); Haupu Range, *Rock 2454* (Ho) (an anomalous specimen probably representing a different form, but the specimen lacking leaves except the uppermost pair, which are sessile, panicle contracted, calyx lobes lanceolate). Without locality, *Wawra 2041* (W) (type, 3 sheets), *2202* (W) (type of *Kadua cordata* var. *pruinosa*, 2 sheets, obviously from different plants, one with calyx lobes 7-8 mm. long).

This variety seems to weaken the distinction between *H. Schlechtendahlia* and *H. glaucifolia*, as the leaves are sometimes rather reticulate. There may be some hybridization between them. Further collecting on Kauai may very well show that several of the collections mentioned above represent established local forms or varieties, but material at hand is insufficient to segregate them definitely.

27. *Hedyotis Schlechtendahlia* subsp. *tenuifolia* Fosberg, n. subsp.

Folia membranacea non valde nervata infra petiolata; bractea late cordata; corollae tubus gracilis, lobis valde appendiculatis.

Leaves membranous, petioled except upper reduced ones, lower oblong, ovate, or ovate-lanceolate, sometimes reticulate, not prominently nerved or venulose; bracts broadly cordate; corolla tube slender, lobes short, strongly appendaged; seeds dark brown, irregularly angular, more or less cuneoid.

Two varieties, found on Maui and Molokai, possibly one or both better associated with *H. foliosa*, at least representing an intermediate between the two species.

28. *Hedyotis Schlechtendahlia* var. *tenuifolia* Fosberg, n. var.

Kadua Remyi Hillebr., Fl. Haw. Is., 162, 1888 (in part).

Caulis teres; folia ovata vel ovati-lanceolata 5-8 cm. longa, breve petiolata non reticulata; calycis lobi ovata acuminata 2-4 mm. longa; fructus turbinatus vel subglobosus, 3-4 mm. longus latusque.

Glabrous, internodes terete; leaves ovate to ovate-lanceolate, 5-8 cm. long, obtuse to cordate at base, petioles very short, apex not acuminate, not reticulate; stipular mucro 2-4 mm. long; inflorescence variable, pyramidal, compact to very open, branches often rather elongate and thyrsoid, repeatedly branched, main axis 3-5 internodes long, bracts at all nodes except the most distal cordate, broader than long, most distal ones ovate; calyx lobes ovate, acuminate, 2-4 mm. long; corolla tube 6-15 mm. long, lobes 1.5-2 mm. long; anthers oblong, 1-1.7 mm. long, inserted just below sinuses; style shorter than tube, long-woolly in lower half; fruit turbinate to subglobose, 3-4 mm. across and high.

Known only from the island of Maui.

Maui, west: central ridge of Olowalu Valley, *Forbes 2347.M.* (Ho) (type); Maunahooma, *Forbes and Cooke* (Ho); east: Makawao, *Hillebrand and Lydgate* (B, Ho).

Distinguished from *H. foliosa* most readily by the broadly cordate bracts of the inflorescence. Distinguished from *H. Schlechtendahlia* subsp. *Remyi* by the much thinner leaves. The specimens cited above have previously been referred to *Kadua Remyi*.

29. *Hedyotis Schlechtendahlia* var. *reticulata* Fosberg, n. var.

Caulis quadrangularis glabra; folia oblonga acuminata subtus sparse hirtella supra reticulata; thyrsus hemisphericus; calycis lobi ovati 3 mm. longi.

Internodes quadrangular, glabrous; leaves oblong, 8-10 cm. long, not cordate at base except upper reduced ones, acuminate at apex, veins sparsely hirtellous beneath, petiole bases more strongly hirtellous; stipules glabrous, mucro 3-4 mm. long; inflorescence glabrous, more or less hemispherical, 3 internodes long, each branch at lower two nodes a 3- or 5-flowered cyme, bracts at nodes of main axis broadly cordate, those at more distal nodes reduced, lanceolate or linear; calyx lobes ovate, about 3 mm. long; corollas not available; fruit subglobose, 3-4 mm. across.

Known only from type locality.

Molokai: Pelekunu Trail, *Forbes 234.Mo.* (Ho) (type).

30. *Hedyotis Schlechtendahlia* subsp. *Remyi* Fosberg, n. name.

Kadua Remyi Hillebr., Fl. Haw. Is., 162, 1888.

Internodes terete, corky or striate; leaves coriaceous, sessile, venulose beneath, calyx lobes less than 5 mm. long, ovary often 3-4 celled.

Three varieties, one each on Lanai, Oahu, and Molokai.

Kadua Remyi has been heretofore maintained unquestioned as a distinct species, but careful comparison shows that only the sessile leaves and low stature separate it from some of the forms of *H. Schlechtendahlia*.

31. *Hedyotis Schlechtendahlia* var. *Remyi* (Hillebr.) Fosberg, n. comb.

Kadua Remyi Hillebr., Fl. Haw. Is., 162, 1888 (in part).

Weak shrubs, often more or less reclining or supported on surrounding vegetation, internodes somewhat striate; leaves broadly ovate-cordate, apex acute, sessile, 3-4 cm. long, 2-3 cm. wide, usually concave beneath, strong pilosulous to absolutely glabrous beneath; stipules connate and adnate to leaf bases, strongly carinate, mucro laterally compressed, about 2 mm. long; inflorescence open pyramidal to cylindrical, or reduced, if reduced often numerous on small branches from upper axils, bracts at nodes of main axis and main branches cordate, more distal ones reduced to ovate or lanceolate scales; calyx lobes ovate or ovate-lanceolate, 3-4 mm. long; corolla large, cream color, with occasionally a purplish tinge, odor half sweet, unpleasant, tube 10-15 mm. long, or shorter, lobes 5-7 mm. long, or shorter, tube tending to be swollen in the middle; anthers oblong, 2 mm. long, attached about 2.5 mm. below sinus; style about half the length of tube or more, lower third densely long-woolly, stigmatic portion much enlarged, 2-4-fid; fruit subglobose, 5-7 mm. across, 4 mm. high, usually 3-4-celled; seeds irregularly angular, more or less cuneoid, brown, conspicuously black-granulate-papillose.

Common in the wetter portions of Lanai, particularly in low wind-swept vegetation.

Lanai: Kaiholena, *Rock 8116* (Gr) (in part); ridge above Kaiholena, *Munro F* (Ho); Kaiholena ridge, *Munro 9* (Ho); same locality, June 24, 1915, *Munro* (Ho); ridge east of Kaiholena, Oct. 11, 1913, *Munro* (Ho); same locality, *Munro 158* (Ho); mountains near Koele, *Forbes 33.L* (Ho); Mahana ridge, *Rock 8116* (Ho, W) (in part); ridge below Puu Aalii, between Maunalei drainage and Hauola drainage, alt. 750 m., *Fosberg 12463* (Ho); Puu Aalii [Aalii], *Ordenez (Degener's) 12856* (D); head of Hulopoe Gulch, alt. 700 m., *Fosberg 12503* (Ho); pali by Waiopaa, *Munro 270 1/2* (Ho); cliff, west face Lanaihale, Dec. 23, 1913, *Munro* (Ho); upper part of mountain, *Hitchcock 14660* (US); without locality, *Hitchcock 15602* (US), *Remy 352* (Gr), *Forbes 315.L* (Ho), 1870, *Hillebrand* (US, K, E, B) (type).

A specimen from Upper Maunalei, Hookio, *Munro 436* (Ho) seems to be a hybrid between this variety and *H. Mannii* var. *Munroi*, because of its large, thin, oblong, few-nerved leaves and weak inflorescence.

32. *Hedyotis Schlechtendahlia* var. *plana* Fosberg, n. var.

Folia plana; thyrus corymbosus.

Differs from var. *Remyi* in the sturdier, more woody habit, corky ridges on the internodes, flat leaves, and corymbiform inflorescence. The inflorescence of one piece of the Vienna sheet is more open than usual.

Known only from the type collection from Molokai.

Molokai. Maunahui, *Rock 6132* (Ho) (type), (W).

Rock had indicated this plant in the herbarium by a manuscript name as a new species, but, so far as I know, it was never published.

33. *Hedyotis Schlechtendahlia* var. *Nuttallii* Fosberg, n. var. (pl. 1, B).

Internodia suberosa; *folia plana*; *ramuli cymae elongati*.

Plant glabrous, densely leafy, internodes with corky ridges; leaves ovate-cordate, plane, stiff-coriaceous, strongly nerved; inflorescence open, compound thyrsoid, with main and secondary axes only 1-2 internodes long, bracts cordate, coriaceous, branches somewhat or conspicuously monochasially elongate.

Oahu; not found since Nuttall's collections.

Oahu. "Ouau", on rocks, *Nuttall* (K) (type); "Wahoo" *Nuttall* (Ph).

Much like var. *plana* but with more open and compound inflorescences.

34. *Hedyotis glaucifolia* (Gray) Fosberg, n. comb.

Kadua glaucifolia Gray, Am. Acad. Arts Sci., Proc. 4: 318, 1860.

Kadua waimeae Wawra, Flora 57: 264, 1874.

Shrubs, branchlets terete or somewhat 2- or 4-costate when young; leaves strongly reticulate, especially on upper surface, at least when dry, petiole bases somewhat united outside of base of stipules; stipules strongly mucronate, adnate to petiole bases; inflorescence usually very glaucous, thyrsoid-paniculate, pyramidal to corymbiform, bracteate;

calyx lobes foliaceous; corolla salverform, lobes less than half as long as tube, tips strongly inflexed in bud; flowers gynodioecious; anthers included; style shorter than corolla tube; fruit turbinate to cup-shaped, up to 5 mm. long and wide, dehiscent loculicidally across disk and almost to base of septum, later outside half way down hypanthium, pyrenes tardily separating septicidally.

Known only from Kauai, Hawaiian islands, where it is separable into three somewhat intergrading varieties, in one of which are distinguishable two forms.

This species shows a strong relationship to *H. Schlechtendahliana*, some plants being rather intermediate. Most of the points of difference are rather intangible. The reticulate leaves are the most striking character separating this species, and this breaks down in the case of the Molokai *H. Schlechtendahliana* var. *reticulata*, which is, in other respects, not so closely related. The peculiar stiffness of the inflorescence, tendency to innovation from one leaf axil, tendency of leaves to be reflexed, and the reduction of the inflorescence bracts distally may also be used to separate *H. glaucifolia*. In the reduction of the bracts, and the tendency toward lanceolate leaves, var. *glaucifolia* approaches *H. Cookiana*, which fact led Heller (25) to confuse var. *glaucifolia* with *Kadua Cookiana* var. *elatior*. Following is a key to the subdivisions of *H. glaucifolia*:

1. Middle and lower leaves ovate to lanceolate, not cordate, not reflexed, petioled, plant glabrous (var. *glaucifolia*).
2. Inflorescence flat topped, rather compact, ultimate internodes and pedicels about 3-7 mm. long.....f. *glaucifolia* (36).
2. Inflorescence rounded on top, open, ultimate internodes and pedicels about 10-20 mm. long.....f. *Nealae* (37).
1. Middle and lower leaves ovate-cordate, or lower ovate, often reflexed, pubescent or glabrous.
2. Leaves weakly nerved, strongly reticulate, inflorescence and leaves usually quite glaucous.....var. *waimeae* (38).
2. Leaves strongly nerved, weakly reticulate, inflorescence and leaves slightly glaucous.....var. *Helleri* (39).

35. *Hedyotis glaucifolia* var. *glaucifolia* Fosberg, n. name.

Kadua glaucifolia Gray, Am. Acad. Arts Sci., Proc. 4: 318, 1860.

Small glabrous shrub, branchlets somewhat 4-costate when young, soon becoming terete, costae beneath middle of stipules most prominent; leaves lanceolate to ovate, only the uppermost cordate at base, shortly petioled except uppermost; thyse tending to be flat topped, rarely rounded, main axis at most 3 internodes, branches strongly ascending, branching dichasial or at length monochasial, bracts at main nodes foliaceous, strongly reduced distally to tiny lanceolate or linear bractlets; calyx lobes lanceolate to subulate; fruit cup shaped.

Two forms are distinguishable.

36. *Hedyotis glaucifolia* f. *glaucifolia* Fosberg, n. name.

Kadua glaucifolia Gray, Am. Acad. Arts Sci., Proc. 4: 318, 1860.

Inflorescence flat-topped, ultimate internodes and pedicels usually about 3-7 mm. long, rarely more; calyx lobes lanceolate to subulate, 1.5-2 (rarely 3) mm. long, some-

what accrescent in fruit; corolla tube 10-11 mm. long, lobes 2-3 mm. long; sterile anthers oblong, 1 mm. long, attached 1.5 mm. below sinuses; style (of pistillate flowers from type specimen) four fifths the length of corolla tube, strongly villous for three fourths the distance from base, apex enlarged and bifid; fertile anthers 1.5 mm. long, oblong; style (of perfect flowers, *Mann and Brigham 568*) three fifths the length of tube, not enlarged at apex, slightly bifid; fruit 3-5 mm. long and wide, disk from almost flat to somewhat umbonate.

Found on the main mountain mass of Kauai.

Kauai: "Mts. Kauai", *U. S. Expl. Exped.* (US, Gr) (type); Waimea, 2,000-3,000 ft., *Mann and Brigham 568* (Gr, Y, Ho, K); Halemanu, *Knudsen* (B); Waimea Drainage Basin, west side, *Forbes 802.K.* (Ho); Hanapepe Valley, *Forbes 307.K.* (Ho); Hanapepe and Wahiawa watershed, *Heller 2442* (US, K, Ph, E); along Hanapepe River, near the falls, *Heller 2442* (NY, Gr, Ho); without locality, *Wawra 2079* (W).

The type and the Mann and Brigham specimens are more densely leafy and with stiffer leaves than the others. The size of the inflorescence varies greatly.

37. *Hedyotis glaucifolia* f. *Nealae* Fosberg, n. f.

Thyrus durus amplus non compactus, pedicellis 10-20 mm. longis; bracteoli subulati; calycis lobi duri.

Differing in the larger, much stiffer inflorescence, about 13 cm. across, round topped, with branches less ascending, ultimate internodes and pedicels mostly 10-20 mm. long, ultimate bractlets filiform-subulate; calyx lobes stiff.

Kauai: Halemanu, alt. 3,600 ft., *Neal* (Ho) (type).

This form seems to approach var. *waimeae*.

Named for Marie Neal, botanist at Bishop Museum.

38. *Hedyotis glaucifolia* var. *waimeae* (Wawra) Fosberg, n. comb.

Kadua waimeae Wawra, *Flora 57*: 264, 1874.

Scandent or sub-arborescent shrub with drooping branches, most parts strongly glaucous, branchlets terete or faintly 4-costate, strongly hirtellous to glabrous, usually hirtellous at least at nodes; leaves ovate-cordate or the lower ovate, subcoriaceous, more or less reflexed, about 4-7 cm. long, 2-4 cm. wide, apex slightly acuminate, sessile or very shortly petioled; inflorescence highly variable, pyramidal to (rarely) almost flat-topped, central axis 3-5 internodes long, often somewhat curved, branching mainly dichasial, but ends of branchlets often somewhat monochasial, glabrous to strongly brown-hirtellous, often very glaucous, bracts leaflike at main nodes, reduced distally to lanceolate bractlets, main branches stiffly divaricate or slightly ascending; calyx lobes 2-3 mm. long, oblong to elliptic or rarely lanceolate, slightly acuminate, glaucous, accrescent in fruit; corolla tube 10-15 mm. long, lobes 3-5 mm. long, ovate to linear-oblong; anthers (fertile) oblong, 2 mm. long, attached 1.5 mm. below sinuses; style (perfect flowers) 6 mm. long, bifid, lobes strongly flattened, enlarged, connivent, lower two thirds to three fourths strongly woolly-villous; anthers (sterile) 1 mm. long; style (pistillate flowers) about three fourths the length of tube, the flattened, bifid portion much longer than in perfect flowers; fruit hemispherical to slightly turbinate, 4-5 mm. wide, 3-4 mm. high, calyx lobes in fruit lanceolate, rather stiff.

Found on the main mountain mass of Kauai.

Kauai: Kaholuamanu, *Forbes* 349.K., 385.K. (Ho), *Rock* 1942, 5787, 5795, 5798 (Ho); 1911, *Rock* (Ho, W); same locality, alt. 3,600 ft., *Hitchcock* 15596, 15347 (US); Waimea, *Faurie* 365 (Ho); Waimea Drainage Basin, west side, *Forbes* 805.K. (Ho); Waimea, below Kokee Stream and Kilohana, *Skottsberg* 932 (Ho); Waiakoali, Aug. 22, 1930, *Neal* (Ho); Halemanu, *Rock* 1884, 1886 (Ho), *Knudsen* (B); Kokee, *Degener* 11651 (D); Kalalau Trail, above Kokee, alt. 1,150 m., *Fosberg* 12718 (Ho); head of Kumuwela [Kumuweia] Ridge, *Fosberg* 12668 (Ho); "Kauai, Mts.", *U. S. Expl. Exped.* (US); without locality, Oct. 1916, *Rock* (Ho); *Wawra* 2087 (W) (type).

Some plants of var. *waimeae* show, in leaf shape or lack of pubescence, a close approach to variety *glaucifolia* and are difficult to separate from it. Some leaves on the type sheet are much like those of the latter variety in outline, but are strongly brown-hirtellous.

This variety shows some resemblance in habit, reticulate leaves, and form of inflorescence to *H. Knudsenii*. The reticulate leaves, stiff inflorescence and brown pubescence suggest a relationship with *H. coriacea*. Most of the morphological features are either rather general for the section, or occur here and there throughout the section. All of this suggests that this variety may in some measure approximate the ancestral stock from which the other members of the section have differentiated. This is, however, by no means to be considered an established conclusion.

39. *Hedyotis glaucifolia* var. *Helleri* Fosberg, n. var.

Folia valde nervata, subsessilis; paniculus amplus decussato-pyramidalis, bracteis foliaceis.

Like var. *waimeae* but leaves thinner, strongly nerved, less strongly reticulate, almost sessile; panicle large, decussate-pyramidal, up to 30 cm. long and wide, only slightly glaucous, bracts foliaceous even distally, though the ultimate ones are lanceolate and about 7 mm. long.

Known only from the mountain mass of Kauai.

Kauai: on ridge opposite Gay and Robinson's Hanapepe Valley House, *Heller* 2615 (NY); Kokee Stream, *Degener* 11653 (D); Kaholuamanu, *Rock* 93, 1936 (Ho) (the *Rock* specimens are only inflorescences and may possibly be closer to var. *waimeae* or to *H. Schlechtendahliana* var. *opaca*).

40. *Hedyotis foliosa* (Hillebr.) Fosberg, n. comb. (pl. 2, A).

Kadua foliosa Hillebr., Fl. Haw. Is., 164, 1888 (excl. β var.).

Small, straggling, slender shrubs, internodes terete, striate, variable in length, up to at least 6 cm.; leaves ovate to lanceolate, small, 1-3 (or 4.5) cm. long, base acute to rounded, apex acute, thin chartaceous (membranous acc. Hillebr.), sparsely pilose-puberulent beneath, mostly reflexed, shortly petioled, bearing dwarfed leafy branchlets in almost all axils, petiole bases united below stipules; stipules low, connate, forming a shallow sheath, hirtellous, somewhat carinate, shortly mucronate; inflorescence decussate-cylindric or somewhat larger or smaller above, up to 15 cm. long, 8 cm. wide, usually much smaller,

the 2-4 internodes of the main axis rather elongate, small branchlets sometimes bearing reduced inflorescences, bracts cordate, reduced distally to linear or oblong bractlets, inflorescence hirtellous at nodes; hypanthium 1 mm. long, turbinate, calyx lobes 2-3 mm. long, acuminate, sinuses hirtellous; corolla slender, glaucous, salverform, tube 6-12 mm. long, lobes linear, 4 mm. long, strongly inflexed in bud, carinate outside, tube tending to be quadrangular; anthers sessile, broadly oblong, attached somewhat below mouth of tube, about 1 mm. long, style about half length of tube (in Kula specimen, flowers lacking in others; Hillebrand says style subequal with tube, so flowers probably gynodioecious) scarcely bifid, lower half, except right at base, densely long-woolly; fruit cup-shaped, 3 mm. high and wide, disk convex, dehiscing loculicidally across disk; older fruits not available; seeds angular, peltate, strongly pitted, almost black, 0.5 mm. across.

Found in the Hawaiian islands on east Maui, on the slopes of Haleakala, according to Hillebrand, at altitudes of about 4,000 ft.

Maui, east: "Kula, Isthmus of Maui", *Lydgate* (B); upper Kula, *Hillebrand and Lydgate* (Ho); Haleakala, Aug. 1870, *Hillebrand* (Ho, B) (type) (Bishop Mus. specimen without date); Haleakala south, Aug. 1870, *Hillebrand* (US); southern slopes of Haleakala, 1864, *Hillebrand* (Gr, K); without locality, *Hillebrand* (B, K, E).

Not found since Hillebrand's time, possibly extinct.

Closest to *H. Schlechtendahlia* var. *membranacea*.

41. *Hedyotis Cookiana* (Cham. and Schlecht.) Steud., Nom., ed. 2, 1: 727, 1840.

Kadua Cookiana Cham. and Schlecht., *Linnaea* 4: 158, 1829.

Kadua Cookiana var. *elatior* Mann, Am. Acad. Arts Sci., Proc. 7: 172, 1867.

Kadua elatior (Mann) Heller, Minn. Bot. Studies 1, Bull. 9: 899, 1897 (excl. Heller's specimens).

Kadua herbacea Lévl., Fedde, Repert. 10: 153, 1911.

Small, usually glabrous shrubs or suffrutescent herbs; internodes angled to almost terete; leaves linear or linear-lanceolate, shortly petioled, margins slightly revolute; stipules linear with a somewhat broadened triangular base, petioles strongly sheathing outside and beneath stipules; inflorescence with central axis terminating after first, second, or third node, branches elongating monochasially, rarely these terminating at first node and producing 2 monochasial branches, rarely 3 such cymes borne together, or smaller ones at upper nodes, bracts at nodes of main axis paired, ovate-lanceolate to linear, those of the monochasial branches single, oppositiflorous, linear, inconspicuous; flowers subsessile to shortly pediceled, hypanthium very small and inconspicuous, calyx lobes linear to ovate, somewhat elongating in fruit; corolla salverform, tube somewhat larger above, lobes less than half as long as tube, strongly inflexed in bud; flowers evidently gynodioecious; anthers sessile, linear or linear-oblong, attached near top of tube, 1-2 mm. long; style shorter than tube, bifid above, lobes sometimes enlarged, lower half or two thirds hairy; fruit obovoid, variable in size, up to 5 mm. wide and long, mostly 2-celled, disk from almost flat to conic or rostrate; seeds angular, more or less cuneoid, attached at small end, usually slightly higher than wide, dull dark brown, surface minutely pitted.

Specimens available from the Hawaiian islands, Kauai, Oahu, Molokai, Maui, and Hawaii, reported from Lanai by Hillebrand. Four varieties, with three forms of one of them.

This species seems to be comparatively specialized, possibly derived from *H. glaucifolia*. Heller's (25) confusion of *H. glaucifolia* with *Kadua Cookiana* var. *elatior* led him to raise the latter variety to specific rank. What he considered *K. Cookiana* was really var. *elatior*.

The subdivisions may be separated by the following key:

1. Calyx lobes ovate.....var. **herbacea** (43).
1. Calyx lobes linear to lanceolate.
 2. Stems prominently striate, inflorescence strongly hirtellous....var. **Cookiana** (42).
 2. Stems not prominently striate.
 3. Venation on under side of leaves obscure.....var. **ensiformis** (44).
 3. Venation on under side of leaves prominent (var. *elatior*).
 4. Corolla tube 8 mm. long, fruit 3 mm. long.....f. **oahuensis** (47).
 4. Corolla tube 10-15 mm. long, fruit usually over 4 mm.
 5. Corolla tube about 11 mm. long, not enlarged above....f. **Brighamii** (48).
 5. Corolla tube usually 12-15 mm. long, somewhat enlarged above.....f. **elatior** (46).

42. *Hedyotis Cookiana* var. *Cookiana* Fosberg, n. name (pl. 2, B).

Kadua Cookiana Cham. and Schlecht., *Linnaea* 4: 158, 1829.

Freely branched, stems strongly striate, sparsely leafy; leaves chartaceous, linear, up to 5 cm. long, usually smaller, venation obscure; stipular mucro filiform-subulate, 5 mm. long; inflorescence usually rather reduced, branches sometimes elongate monochasially, lower bracts, inflorescence, hypanthium, calyx, corolla, and fruit all strongly hirtellous; calyx lobes linear, up to 5 mm. long, not accrescent in fruit; corolla tube 8 mm. long, lobes about 2 mm. long; fruit cup-shaped, slightly compressed, 3.5 mm. long, 4 mm. wide, disk conic to rostrate, 2-3 mm. high.

Probably restricted to dry regions on the island of Hawaii.

Hawaii: "O-Wahi-Karakoa (ubi Navarchus in proelio cecedit)" *Chamisso* (B) (type).

"Sandwich Isles, *A. M.*" [*Archibald Menzies*] (K).

Too little known, possibly extinct. In habit this variety somewhat resembles certain species of *Schiedea*. If this variety were better known, it is conceivable that the other varieties might be regarded as forming a distinct species.

43. *Hedyotis Cookiana* var. *herbacea* (Lévl.) Fosberg, n. comb.

Kadua herbacea Lévl., Fedde, Repert. 10: 153, 1911.

Internodes only obscurely angled; leaves thin, narrowly lanceolate, secondary nerves distinct beneath, areolation obscure, petiole about 1 cm. long; branching of inflorescence mostly dichasial, peduncle elongate, lower pairs of bracts ovate-lanceolate; calyx lobes ovate, 1.5-2 mm. long, enlarging in fruit, slightly acuminate; corolla tube about 9 mm. long, enlarged toward top, lobes 3 mm. long, triangular, acute; anthers at mouth of tube; fruit 4 mm. wide, 3 mm. high.

Known only from the type collection.

Maui, east: "in lacunis Nahiku", *Faurie* 368 (Ho) (type).

44. *Hedyotis Cookiana* var. *ensiformis* Fosberg, n. var.

Internodia quadrangularia; folia subcoriacea linearia vel lineari-lanceolata, nervis obscuris; calycis lobi accrescentes; antherae 3 mm. sub fauce insertae.

Internodes quadrangular; leaves subcoriaceous, variable in width, linear to linear-lanceolate, paler beneath, veins, except midrib, indistinct, blade up to 20 cm. long, 1.5 cm. wide; branches of inflorescence once branched dichasially, then elongate monochasially, lower bracts lanceolate; calyx lobes firm, lanceolate, 2-8 mm. long, elongating in fruit; corolla tube about 10 mm. long, 1.5 mm. wide, somewhat or not at all enlarging upward, lobes ovate 3-4 mm. long; anthers attached 3 mm. below mouth of tube, 1.5 mm. long, oblong; style half as long as tube (in perfect flowers), lower two thirds copiously long-villous; fruit 5 mm. wide, 4-5 mm. long, sometimes smaller.

Found only on Molokai.

Molokai: Wailau Valley, *Forbes 530.Mo.* (Ho) (type); Pelekunu Valley, *Forbes 571.Mo.* (Ho); Kaluaaha Valley, *Forbes 366.Mo.* (Ho); Mapulehu Valley, *Degener and Nitta 11729* (D); west branch Mapulehu Valley, *Degener 11728* (D); Halawa, *Hillebrand* (B, US); without locality, *Hillebrand* (Ho, Gr, K, W, E).

Easily recognized by its thickish leaves with obscure venation.

45. *Hedyotis Cookiana* var. *elatior* (Mann) Fosberg, n. comb.

Kadua Cookiana var. *elatior* Mann, Am. Acad. Arts Sci., Proc. 7: 172, 1867.

Kadua elatior Heller, Minn. Bot. Studies 1, Bull. 9: 899, 1897 (excl. Heller's specimens).

Internodes subterete or slightly angled; leaves chartaceous to subcoriaceous, prominently areolate beneath; inflorescence as in var. *ensifolmis*.

Three scarcely distinguishable forms on Molokai, Oahu, and Kauai.

According to the International Rules, as amended in 1935, the epithet *elatior* must be applied in its original sense, no matter how it has been interpreted by any who make changes in its status, so *Kadua elatior* is a synonym of this variety, rather than of *H. glaucifolia* which was the plant to which Heller applied it.

46. *Hedyotis Cookiana* f. *elatior* Fosberg, n. name.

Kadua Cookiana var. *elatior* Mann, Am. Acad. Arts Sci., Proc. 7: 172, 1867.

Leaves linear to lanceolate; bracts mainly linear; calyx lobes firm, linear, 3-4 mm. long, not much elongate in fruit; corolla tube mostly 12-15 mm. long, occasionally shorter, somewhat enlarged above, lobes 3-5 mm. long; anthers (fertile) linear, 2 mm. long, attached 1.5-2 mm. below sinuses; style in perfect flowers 9 mm. long, slightly bifid, lower 7 mm. villous; fruit variable in size, up to 6 mm. long and 5 mm. wide, usually much smaller, usually longer than wide.

Found only on Kauai.

Kauai: Hanalei, *Mann and Brigham 569* (in part) (US, K, Y, Gr) (type); Wahiawa Mts., *Forbes 228.K.* (Ho), *Lydgate* (Ho); Olokele, *Lydgate 13* (Ho); Hanapepe Falls, *Faurie 373* (Ho); Hanapepe River, near the falls, *Heller 2440* (Ho, US, Gr, NY, E, Ph, K); Kaholuamanu, *Lydgate* (Ho); without locality, *Lydgate 149* (Ho); *Wawra 2010* (NY, W).

47. *Hedyotis Cookiana* f. *oahuensis* Fosberg, n. f.

Folia linearia; calycis lobi lineares 3 mm. longi paucis accrescentes; corollae tubus 8 mm. longus.

Leaves linear; lower bracts linear or lanceolate, calyx lobes linear, firm, 3 mm. long, not much elongate in fruit; corolla tube slender, about 8 mm. long, not or only slightly enlarged upward, lobes ovate, about 2 mm. long; anthers (sterile) linear-oblong, 1.7 mm. long, attached 1 mm. below sinuses; style about 6 mm. long, slightly bifid at apex, lower half sparsely villous except at extreme base; fruit 2.5 mm. wide, 3 mm. long.

Oahu: Upper Wahiawa, *Forbes 1622.O.* (Ho) (type); without locality, *U. S. Expl. Exped.* (Gr, US).

48. *Hedyotis Cookiana* f. *Brighamii* Fosberg, n. f.

Folia lanceolata, chartacea; thyrsus amplus; calycis lobi lineares 3-6 mm. longi non valde accrescentes; corollae tubus gracilis 11 mm. longus.

Leaves lanceolate, chartaceous; inflorescence ample, lower bracts lanceolate; calyx lobes linear, 3-6 mm. long, not strongly elongating in fruit; corolla tube slender, about 11 mm. long, not enlarged above, lobes 3 mm. long; anthers (sterile) attached 1.5 mm. below mouth of tube, linear-oblong, 1 mm. long; style 9 mm. long, lower portion sparsely villous; fruit (from *Mann and Brigham 186*) about 5 mm. long and 3 mm. wide.

Molokai: without locality, *Brigham 569* (in part) (Ho) (type).

Mann and Brigham (186 ?) without any data, resembles this plant and may belong here.

49. *Hedyotis angusta* Fosberg, n. sp.

Kadua cordata δ var. Hillebr., *Fl. Haw. Is.*, 162, 1888 (Oahu plants only).

Frutices, caulibus exalatis glabris; folia tenuia, sessilia vel petiolis alatis; thyrsus valde amplus latus, ramis divaricatis vel subdivaricatis.

Glabrous shrubs, few branched, branches terete, neither costate nor alate; leaves thin, with few rather prominent nerves, sessile to petiolate, petioles winged, strongly united below stipules; stipules strongly keeled, mucronate; inflorescence broad and open, slender, main axis 1-3 internodes long, branches divaricate or slightly ascending, cymose, once or twice, rarely three times dichotomous, ultimate divisions elongating monochasially, bearing flowers with bractlets opposite them; corolla glaucous, probably yellowish green when living, drying dark, lobes short in proportion to tube; calyx lobes 3 mm. long; fruit turbinate to hemispherical.

Two rare varieties, known only from Oahu in the Hawaiian islands.

This is a thin-leaved species with a very open inflorescence, exactly intermediate between *H. Schlechtendahlia* and *H. Mannii*. The texture of leaves and form of inflorescence are much like *H. Mannii*. The form of the bracts, bractlets, and calyx lobes of var. *umbrosa*, also their prominent reticulate venation, suggests a close relationship with *H. Schlechtendahlia*.

KEY TO VARIETIES

- Leaves narrowly lanceolate, ultimate bractlets linear, calyx lobes lanceolate.....
var. *angusta* (50).
 Leaves elliptic, bractlets and calyx lobes ovate.....var. *umbrosa* (51).

50. *Hedyotis angusta* var. *angusta* Fosberg, n. var. (pl. 3, A).

Kadua cordata δ var. Hillebr., Fl. Haw. Is., 162, 1888 (Oahu plants only).

Folia anguste-lanceolata; thyrsus ramis divaricatis, bractis ovatis non cordatis, bracteolis linearibus; calyx lobis lanceolatis; semina minute foveolati-reticulati.

Branches elongate; leaves narrowly lanceolate, sessile or shortly petiolate; stipules with mucro sharp, 4 mm. long; inflorescence with main axis 3 internodes long, branches divaricate, bracts mostly ovate, acuminate, not cordate at base, bractlets linear; calyx lobes lanceolate, probably about 3 mm. long in flower; slightly accrescent; corolla not available; fruit turbinate to hemispherical, up to 2.5 mm. long, 3 mm. wide; seeds much compressed, angles very sharp, corners projecting, longest dimension 0.5-0.7 mm., surface dark brown, minutely foveolate-reticulate.

Oahu: Waianae, *Hillebrand* (B) (type); Wailupe, *Hillebrand* (Ho).

51. *Hedyotis angusta* var. *umbrosa* Fosberg, n. var.

Folia elliptica, valde petiolata; thyrsus laxis, bracteis cordatis, bracteolis ovatis, calyx accrescens lobis ovatis; fructus latus turbinatus disco leviter umbonato.

Sparsely branched shrub, up to 2 m. tall; leaves membranous, elliptic or narrowly so, with 4-5 secondary veins on each side, up to 15 cm. long and 5 cm. wide (usually smaller), apex acute or acuminate, base acute or attenuate, somewhat attenuate into a petiole 1-2.5 cm. long, upper pair sessile or subsessile, these often with branchlets in their axils; thyrses with main axis ordinarily 1-2 internodes long, plus a single terminal pedicellate flower, branches somewhat ascending, once or twice dichotomous, ultimate branchlets weak, with ovate to lanceolate bractlets opposite the flowers, these and the ovate to lanceolate calyx lobes membranous, reticulate veiny; corolla glaucous, probably yellowish green when fresh, tube 1 cm. long, 1-1.5 mm. thick, lobes 2-3 mm. long, inflexed in bud, pistillate with sterile anthers attached about 2.5 mm. below mouth, about 0.7 mm. long, style becoming at least equal to tube, deeply bifid (or trifid), lower half or third densely woolly, staminate with anthers 2 mm. long, attached 1.5 mm. below mouth, style 7 mm. long, woolly in lower half, lobes 1 mm. long, coherent, slightly thickened; fruit broadly turbinate, 2- (rarely 3-) celled, disk umbonate; seeds too young for characterization.

Oahu: Kaumokunui Gulch, in dense shade, alt. 1,000 ft., *Degener and Kepaa 12726* (D) (type); west branch of Kaaawa Gulch (north of Kaala), May 19, 1940, *Degener* (D, USNA).

In some characters suggesting *H. Schlechtendahliana*, in others, and especially in aspect, suggesting *H. Mannii*.

52. *Hedyotis Mannii* Fosberg, n. name.

Kadua laxiflora Mann, Am. Acad. Arts Sci., Proc. 7: 171, 1867 (not *Hedyotis laxiflora* Walp., Ann. Bot. Syst. 2: 772, 1851-1852, nor Merr., Phil. Jour. Sci. 17: 430, 1921).

Weak shrubs or suffrutescent herbs, stems usually hollow, strongly quadrangular or winged, the wings strongest on sides of internodes below stipules; leaves elliptic to lanceolate, attenuate at base, acuminate at apex, strongly but rather few nerved, not reticulate, uppermost pair reduced and cordate, petioles strongly united and sheathing below and outside stipules; stipules triangular, adnate to petioles; inflorescence a thyrsoid panicle, peduncle long, bearing a pair of cordate bracts half way up, cylindrical to corymbiform, usually quite lax, ultimate branchlets conspicuously elongate monochasially, usually many-flowered, bracts, excepting those at main nodes reduced and inconspicuous; calyx lobes small, as long as or longer than hypanthium, somewhat

accrescent in fruit; corolla salverform, lobes less than half length of tube, strongly inflexed in bud; flowers gynodioecious; anthers oblong or linear-oblong, sterile smaller than fertile, 1-1.5 mm. long, attached just below sinuses; style shorter than tube, lower half or two thirds villous-woolly, stigmatic portion enlarged, more or less bifid; fruit subspherical to cup-shaped or rarely turbinate, up to 3 mm. high and wide, dehiscing loculicidally across disk and almost to base of septum, later half way down outside, pyrenes tardily separating septicidally.

Three varieties are known, all from the Hawaiian islands, one each on Lanai, west Maui, and Hawaii. Material previously referred here from Molokai belongs to *H. molokaiensis* and *H. thyrsoides*, which are very closely related. Oahu specimens previously referred here belong either to *H. angusta* or to *H. Schlechtendahliana* subsp. *Rockii*, neither of which is really very close to this species. Besides the two Molokai species mentioned above, *H. Mannii* is related to the more widely distributed strand species, *H. littoralis*.

The varieties may be separated as follows:

1. Main branches of panicle thyrsoid with axes 2-4 internodes long....var. **Munroi** (54).
1. Main branches of panicle cymose, axes 1 or at most 2 internodes long.
 2. Small shrubs, inflorescence not scapose, calyx lobes 1.5-3.5 mm. long in flowervar. **laxiflora** (53).
 2. More or less herbaceous, inflorescence scapose, calyx lobes 4-5 mm. long in flowervar. **scaposa** (55).

53. Hedyotis Mannii var. **laxiflora** (Mann) Fosberg, n. comb.

Kadua laxiflora Mann, Am. Acad. Arts Sci., Proc. 7: 171, 1867.

Small glabrous shrubs, internodes strongly ridged or slightly winged; leaves thin, paler beneath, elliptic to elliptic-lanceolate, petiole short, blade 8-14 cm. long, up to 4.5 cm. wide, petiolar sheath 2-4 mm. high; stipular mucro up to 6 mm. long; panicle up to 16 cm. long (excl. of peduncle), main axis about 4 internodes long when well developed, bracts at main nodes cordate, main branches with axis rarely more than one internode long, once or at most twice branched dichotomously, monochasial ultimate branches as many as 9-flowered, usually less, rather lax; calyx lobes thin, ovate to ovate-lanceolate, 1.5-3.5 mm. long, glaucous; corolla salverform, tube not noticeably enlarged distally, 5-9 mm. long, lobes 1-2 mm. long, inflexed in bud, corolla glaucous; anthers about 1 mm. long; style almost as long as tube, lobes enlarged and flattened, lower half of style villous-woolly; fruit cup-shaped, up to 3 mm. wide, 2 mm. high, disk somewhat convex, poorly developed fruits turbinate; seeds dark brown, irregularly angular, somewhat cuneoid, higher than thick, usually wider than high, most angles rounded, surface minutely black-granulate.

Known from west Maui only.

Maui, west: Wailuku Valley, *Mann and Brigham 422* (Ho) (type); Waikapu Valley, *Forbes 142.M.* (Ho); Waikapu Valley, 1912, *Rock* (Ho, W); "Mts. W. Maui", *U. S. Expl. Exped.* (US).

54. Hedyotis Mannii var. **Munroi** Fosberg, n. var.

Folia elliptica membranacea; panicula composita maxime 24 cm. longa, ramis thyrsoides; fructus turbinate.

Differs from var. *laxiflora* in the somewhat more herbaceous habit; usually broader elliptic, membranous leaves, varying greatly in size; panicle stiffer, up to 24 cm. long, as many as 6-7 internodes in the main axis, main branches thyrsoid with axes up to 4 inter-

nodes long, twice branching dichotomously, then ultimate monochasial cymes as many as 8-flowered, usually 4-6-flowered, panicle less complex in depauperate specimens; calyx lobes mainly ovate or oblong-ovate; corolla tube 11-14 mm. long, lobes 3.5-4 mm. long; anthers (fertile) 1.5 mm. long, linear-oblong; basal portion of style less densely woolly-villous; fruit tending to be more turbinate, often 3 mm. high.

Found only on Lanai.

Lanai: Waiopaa [Waiapaa], *Munro 249* (Ho) (type); Waiopaa pali, Feb. 18, 1915, *Munro* (Ho); above Waiopaa, in rock face in stream bed, *Munro 241* (Ho); pali above Waiopaa, *Munro 431* (Ho); "Mts. E. end", *Forbes 240.L.* (Ho); Maunalei cliff, *Munro 10* (Ho); Maunalei Gulch, *Forbes 167.L.* (Ho); Maunalei Valley, *Munro 68* (Ho); without locality, *Munro* (Ho).

A specimen without locality, collected by *Hillebrand* (US) with rather narrow leaves and an old thyrse which is about 40 cm. long, would, judging by the complexity of the inflorescence, perhaps belong here.

55. *Hedyotis Mannii* var. *scaposa* Fosberg, n. var.

Folia lanceolata 8 cm. longa 1.5-2 cm. lata tenuis; thyrsum scaposus paucicompositus; calycis lobi ovati acuti 4-5 mm. longi; corollae tubus 6 mm. longus.

Subherbaceous, glabrous, basal internodes short, weakly quadrangular, leaves lanceolate, 8 cm. long, 1.5-2 cm. wide, thin; inflorescence scapose, floriferous portion 6 cm. long, of 3 internodes, branches forking once dichotomously, then somewhat elongate monochasially; calyx lobes ovate, acute, 4-5 mm. long; corolla small, tube 6 mm. long, not enlarged distally, lobes 2.5-3 mm. long; anthers 1 mm. long; style densely woolly-villous in lower half; fruit not available.

Little known; found only on Hawaii.

Hawaii: "Owyhee", *Menzies* (K) (type); Kilauea, *Hillebrand* (Ho) (leaves broader, inflorescence more diffuse, calyx smaller); Napau Crater, *Degener et al 11647* (D) (sterile, more elongate, but likely belongs here).

56. *Hedyotis molokaiensis* Fosberg, n. sp. (pl. 3, B).

Frutex glaber debilis; caulis alatus; folia lanceolata vel elliptica, acuminata membranacea paucinervata; panicula thyrsoidea gracilis; calycis lobi ovati acuminati 1.5 mm. longi tenuis; corolla hypocrateriformis, lobis (in alabastris) non inflexis, limbo (in alabastris) lanceolato; stylus glaber; semina appendiculata.

Weak glabrous shrub, internodes more or less 4-winged; leaves up to 18 cm. long, 6 cm. wide, usually smaller, lanceolate to elliptic, attenuate to a short petiole or sessile, apex acuminate, membranous, few nerved, paler beneath, petioles strongly sheathing below stipules; stipules triangular, membranous, mucro up to 5-6 mm. long; panicle thyrsoid, long-pedunculate, peduncle with a pair of cordate bracts half way up, main axis 4-5 internodes long, body of inflorescence about 15 cm. long, 8-10 cm. wide, rarely larger, often smaller, branches once or twice dichotomously branched, sometimes with axis prolonged to two internodes, ultimate branchlets very slender, monochasially elongate to as much as 10 flowers, weak and often drooping; hypanthium turbinate, 1 mm. long, many ovaries usually sterile; calyx lobes thin, ovate, acuminate, 1.5 mm. long; corolla (in the one specimen where they are available) salverform, tube 9-11 mm. long, only slightly enlarged distally, lobes 3 mm. long, linear, reflexed, in bud not at all inflexed, limb in bud lanceolate, acute, somewhat quadrangular, glaucous; anthers (fertile) linear-oblong, 1.5 mm. long, attached slightly below sinuses; style a little over half length of corolla tube, entirely glabrous,

slightly bifid and enlarged above; fruit up to 3 mm. wide and high, cup-shaped or (more often) turbinate; seeds dark brown, strongly pitted and black-granulate, about 0.3-0.5 mm. across, flattened and irregularly angled, angles mostly blunted, upper end of hilum edge drawn out into a horn-shaped projection, the other end sometimes slightly so.

Found on Molokai, usually in deep valleys.

Molokai: Kaluaaha Valley, *Forbes 363.Mo.* (Ho) (type); east branch of Kaluaaha valley, *Degener 11733* (D); Mapulehu Valley, *Forbes 309.Mo.* (Ho), *Degener and Nitta 11730* (D), *Degener 11723* (D); west branch of Mapulehu Valley, *Degener 11726* (D); Waikolu, 1874, *Hillebrand* (Gr); without locality, *Hillebrand and Lydgate* (Ho).

This species is like *H. Mannii* in almost every respect excepting the remarkable form of the corolla in bud, which is unlike any other member of section *Wiegmannia*. If it were not so obviously closely related in certain respects to other members it would have to be excluded from the section.

57. *Hedyotis thyrsoidea* Fosberg, n. sp.

Frutex glaber; caulis alatus; folia elliptica tenuia chartacea; thyrsus rigidus cylindricus bracteatus; ramis thyrsoideis; calycis lobi ovati duri accrescentes; corollae lobi (in alabastris) inflexi; stylus glaber.

Glabrous shrub 1 m. tall, erect, internodes 4-winged, strongest wings on sides below stipules; leaves elliptic, up to 22 cm. long, 7 mm. wide, usually much smaller, attenuate at base to a winged petiole up to 1 cm. long, apex acuminate, thin chartaceous, dark green, petiole bases strongly sheathing below stipules; stipules thin, more or less triangular, strongly carinate, mucro 3-5 mm. long; inflorescence thyrsoid, stiff, terminal, singly or in 3's, often with poorly developed axillary ones at one or two upper nodes, main axis 4-6 internodes long, each thyrses up to 15 cm. long and 8-10 cm. wide, more or less decussate-cylindrical, the three terminal ones giving the appearance of a broadly pyramidal panicle, bracts on main and secondary axes cordate, leaflike, distal ones strongly reduced, scale-like, stiff, branches thyrsoid, axes 3-4 internodes long, smaller branches repeatedly branching dichasially, monochasial branching in ultimate branchlets practically absent, never to more than 2-3 flowers; calyx lobes broadly ovate, acute to (usually) obtuse, stiff, somewhat accrescent in fruit; corolla tube dilated somewhat distally, lobes inflexed in bud (only a few damaged corollas available); style glabrous; fruit broadly cup-shaped, about 3 mm. wide and 2 mm. high, disk only slightly convex; seeds flattened, irregularly angled, upper end of longest edge somewhat drawn out and pointed, hilum at lower end of same edge, surface dark brown, pitted.

A little known plant from Molokai in the Hawaiian islands, perhaps closest to *H. molokaiensis* and *H. Mannii*, differing from the former in the form of the corolla, from *H. Mannii* in the glabrous style, and from both in the stiff, conspicuously bracteate panicle.

The two varieties may be separated as follows:

1. Leaves petioled, calyx lobes ovate.....var. *thyrsoidea* (58).
1. Leaves sessile, calyx lobes lanceolate.....var. *Hillebrandii* (59).

58. *Hedyotis thyrsoidea* var. *thyrsoidea* Fosberg, n. var.

Folia petiolata, calycis lobi ovati.

The typical form as described above.

Molokai: near Lalanui [Lalanui?], shaded ravine, *Degener 11722* (D) (type). Also a specimen in Kew with a note that it is a Hillebrand collection but with label missing.

59. *Hedyotis thyrsoidea* var. *Hillebrandii* Fosberg, n. var.

Folia sessilia valde nervata; thyrsus solitarius; calycis lobi lanceolati acuti; stylus infra vix hirtellus.

Differs from var. *thyrsoidea* in the thicker, more strongly nerved leaves, sessile and rather broad at base; inflorescence single (at least in material available), more densely flowered; calyx lobes lanceolate, acute; corolla tube 9 mm. long, lobes 2-3 mm. long; anthers linear-oblong, 1.5 mm. long, inserted about 2 mm. below sinuses; style very slightly hirtellous near base, 7 mm. long, upper 2 mm. bifid and somewhat enlarged.

Molokai: without locality, *Hillebrand* (B) (type).

60. *Hedyotis littoralis* (Hillebr.) Fosberg, n. comb.

Kadua littoralis Hillebr., Fl. Haw. Is., 166, 1888.

Herb, sometimes slightly lignified at base, basal leafy portion decumbent, up to 8 cm. long, rarely considerably more elongate, sometimes branched below, quadrangular, sometimes obscurely so, becoming scapose above, plant glabrous throughout except style and disk, lower internodes 3-5 mm. long, up to 2.5 cm. or more just below scape, these upper ones so strongly angled as to be subulate; leaves fleshy, variable, ovate or obovate to elliptical, lanceolate or oblanceolate, apex acute or acuminate, blunt at extreme apex, broadly sessile and slightly connate-perfoliate at base, up to 8.5 (-10) cm. long, 5.5 (-7) cm. wide, glossy above, light green, pale and dull beneath, veins impressed above; stipules broad, very obtuse, carinate, keel projecting as a fleshy, outward and upward pointing mucro 3-4 mm. long, together with the thickened middle parts of the leaf bases, forming a collar around the stem 4-5 mm. high, attached along lower edge, notched above to correspond with the groove along the midrib of the leaf, this groove becoming very pronounced in the basal fifth of leaf; scape up to 20 (-30), cm. tall, quadrangular, topped by a corymbose cyme, a pair of ovate-cordate or orbicular bracts with vestigial stipules one third to three fourths the way up the scape, these up to 2 cm. (rarely 4 cm.) long, sometimes bearing more or less vestigial or even well developed inflorescence branches in their axils, a second pair of bracts, much smaller, immediately beneath, or as much as 5 mm. below the cyme, under each branch of cyme except two lowest a lanceolate acuminate bractlet up to 8 mm. long, sometimes rudimentary ones subtending flowers, cyme sub-thyrsoid, with main axis prolonged for one or two internodes or very much reduced, making cyme subumbelloid, usually compact with branches tending to branch trichotomously, but in some cases mature inflorescences lax and with branches elongating monochasially; flowers sessile on cyme branches or very slightly pedicellate, hypanthium obscurely quadrangular, 4 mm. long, calyx lobes oblong-ovate, 6 mm. long and 4 mm. wide, acute, fleshy but becoming, with the ovary, tremendously more so with age; corolla white, fleshy, salverform, tube 8-10 mm. long, 2-3 mm. thick, lobes ovate, acuminate, 5 mm. long, 4 mm. wide, inflexed in bud; anthers 2 mm. long, oblong, shortly and bluntly mucronate above, inserted in the tube 5-7 mm. above base, attached dorsally just below middle; disk slightly raised, square with rounded corners, 2 mm. across, slightly pubescent around edges, surface minutely papillose; style 5 mm. long, at base densely pilose with white glistening hairs, upper 2-2.5 mm. enlarged, ovoid, 2 mm. wide at widest part, not bifid but slightly divided by grooves at top into 4 approximately equal parts, grooves running a little more than half way down enlarged portion, each part divided below by a groove running upward from base a little more than half way, giving base a lobed appearance, surface papillose; fruit hemispherical, 1 cm. high and wide, very fleshy, crowned by fleshy ovate calyx lobes 8 mm. high and 6 mm. wide, 4-celled, or sometimes 3- or rarely 2-celled, fleshy mesocarp drying with age to a thin skin around the rather weakly sclerified endocarp, dehiscence loculicidal across

disk, one slit for each pyrene, pyrenes tardily separating septically; seeds irregularly bluntly angular, from peltate to more or less broadly cuneoid, dark brown, black-papillose-granulate, loosely attached. (Description drawn up from fresh material (Fosberg 9675), and amplified with data from other collections).

Found on wet, rocky coasts, usually within reach of salt spray, on the five largest of the Hawaiian islands—Hawaii, Maui, Oahu, Kauai, Molokai. Only one collection (*Skottsberg 800*) comes from more than a short distance from the sea. The plant has become quite rare, except on the windward coast of east Molokai. I searched for it without avail at Hanalei, Kauai, in 1935. It has not been found on Oahu since Hillebrand's time.

Kauai: Hanalei, *Hillebrand* (B).

Oahu: without locality, *Hillebrand 194* (K).

Molokai: Waikolu, Nov. 1910, *Rock 7003* (Gr), 1870, *Hillebrand* (US, K, Gr, B) (type) (the type sheet, in Berlin, has two pieces of this species and two of *H. molokaiensis*); Wailau Valley, *Forbes 526.Mo.* (Ho), *Faurie 374* (Ho), *Degener 9430* (D, US, NY), *9431* (D, NY), *9432* (D, US), alt. 2-6 m., *Fosberg 9675, 13451* (Ho), Apr. 20, 1910, *Rock 7003* (Ho, W); Halawa, ridge south of valley, *Forbes 526.Mo.* (Ho).

Maui, east: Keanae beach, *Forbes 237.M.* (Ho); Haleakala, lower ditch trail, alt. 250 m., *Skottsberg 800* (Ho).

Hawaii: Halawa, *Faurie 375* (Ho).

An extreme form, possibly derived from something of the *H. Mannii* relationship, with pronounced halophytic characteristics, distinguished especially by the short, broad, white corolla, peculiar stigma, and predominantly 4-locular fruit. The corolla shows some resemblance to that of *H. parvula*.

61. *Hedyotis parvula* (Gray) Fosberg, n. comb.

Kadua parvula Gray, Am. Acad. Arts Sci., Proc. 4: 317, 1860.

Small glabrous shrubs with internodes 1-2 (-3) cm. long, more or less 4-angled or 4-costate with costae beneath middle of stipules more pronounced; leaves 1-3 (-3.5) cm. long, not reduced above, ovate or ovate-lanceolate or ovate-cordate, somewhat acuminate or acute, glabrous, coriaceous, sessile or very shortly petioled, petiole bases not or only very slightly united below stipules; stipules interpetiolar, triangular, strongly carinate, mucronate with a stout, laterally compressed, somewhat incurved mucro 1-2.5 mm. long; inflorescence corymbiform, 2-3 cm. across, sometimes several on contiguous branchlets give appearance of a larger one, bracts inconspicuous except lowest 1-2 pairs, which are cordate; hypanthium turbinate or somewhat cup-shaped, 1-1.5 mm. long, calyx lobes blunt, ovate, 1-4 mm. long, varying even on same plant, somewhat accrescent in fruit; corolla salverform, white, throat somewhat funnelform, tube 7-9 mm. long, lobes broadly ovate, acuminate, 5-6 mm. long, tips inflexed when young, becoming less so as bud nears anthesis; anthers linear or narrowly oblong, 1.8-2.2 mm. long, sessile, attached 2.5 mm. below throat; style about half length of tube (in specimens available), middle portion covered with long crinkly woolly hairs, basal and apical portions glabrous, apex enlarged, clavate and bifid into flat contiguous lobes; fruit subspherical, about 3 mm. high and 4 mm. wide, disk convex, dehiscent loculicidally across disk, later halfway down outside, pyrenes separating septically; seeds about 0.4 mm. across, bluntly angular, sub-peltate, dull brown, darkly granulate under high magnification.

In most respects resembling *H. Schlechtendahliana*, but corolla suggesting that of *H. littoralis*. Two forms, both found in the Waianae Mountains of Oahu, Hawaiian islands, may be separated as follows:

1. Leaves shortly petioled, ovate to ovate-lanceolate.....f. **parvula** (62).
 1. Leaves sessile, ovate to ovate-cordate.....f. **sessilis** (63).

62. *Hedyotis parvula* f. *parvula* Fosberg, n. name.

Kadua parvula Gray, Am. Acad. Arts Sci., Proc. 4: 317, 1860.

Leaves shortly petiolate, ovate to ovate-lanceolate, stipular mucro 2-2.5 mm. long, internodes rather strongly angled.

Oahu, Waianae Mountains: Makaha Valley, *Hillebrand* (Ho, B); without locality, *Hillebrand* (B, K, Gr), *U. S. Expl. Exped.* (Gr, US) (type).

63. *Hedyotis parvula* f. *sessilis* Fosberg, n. f.

Folia sessilia ovata vel ovato-cordata; internodia vix angulata.

Internodes weakly angled; leaves sessile, ovate to ovate-cordate; stipular mucro 1-2 mm. long; plant with strong tendency to branch near top, producing corymbiform clusters of inflorescences.

Oahu, Waianae Mountains: east slope of Puu Kaua, near top, *Degener et al 10768* (D, NY, Gr, Cor) (type); Kanehoa, side ridge, alt. 600 m., *Hume 115* (Ho); Puu Kanehoa, alt. 2,700 ft., *Hosaka 359* (Ho); middle ridge east of Puu Kanehoa, *Degener et al 12808* (D); Kaala, *Wawra 2216* (W).

This is the form illustrated by *Degener* (12). It seems to replace f. *parvula* in the south half of the Waianae Mountains. The Wawra locality need not be taken too literally, although it should stimulate search for this form in the Kaala region.

64. *Hedyotis Degeneri* Fosberg, n. sp.

Kadua foliosa β var.? *Hillebr.*, Fl. Haw. Is., 164, 1888.

Frutex prostratus ramosus; rami exfoliati, ramulis papilloso-puberulis; folia parva; cymae reductae 1-10 florum; bractee cordatae vel lanceolatae; calycis lobi lanceolati 5-8 mm. longi; corollae lobi (in alabastris) inflexi; antherae 2 mm. longae; stylus dense lanatus; fructus subglobosus, 3 mm. longus, 4-5 mm. latus.

Prostrate branching shrubs, branchlets quadrangular, densely papillose-puberulent, on older ones corky layers prominently and abundantly exfoliating; leaves small, 1-3 (-4) cm. long, shortly petioled, petiole bases somewhat united below stipules, most leaves bearing dwarfed, condensed leafy branchlets in their axils, these scaly with old stipules and leaf bases; stipules not connate, broad at base, apex prolonged, lanceolate; inflorescence a much reduced corymbose cyme, terminal, not more than 2 internodes long, 1-10 flowered, papillose-puberulent below, glabrous above, bracts cordate to lanceolate, prominent; hypanthium 1.5-2 mm. long, turbinate; calyx lobes broadly lanceolate, 5-8 mm. long, foliaceous; corolla glaucous, fully developed ones not available, lobes strongly inflexed in bud; anthers 2 mm. long, attached just below mouth of tube, pollen maturing before opening of corolla; style shorter than tube, strongly bifid, basal portion densely long-woolly; fruit subglobose, up to 3 mm. high, 4-5 mm. wide, dehiscing first loculicidally across disk and almost to base of septum, then about half way down on outside, later after mesocarp weathers away, pyrenes separate septicidally; seeds angular, almost black, pitted, fully mature ones not available.

Known only from north side of Puu Kaala, Oahu, where two well-separated varieties occur. Too little known. The varieties may be distinguished as follows:

1. Leaves ovate, subcoriaceous, reticulate.....var. *Degeneri* (65).
1. Leaves lanceolate, thinly chartaceous, not reticulate.....var. *coprosmifolia* (66).

65. *Hedyotis Degeneri* var. *Degeneri* Fosberg, n. var. (pl. 4, A).

Folia subcoriacea glabra reticulata ovata vel cordata; stipulae glabrae.

Leaves subcoriaceous, glabrous, reticulate, ovate or on fast-growing shoots, cordate; stipules glabrous; cymes of 1-6 flowers, almost hidden by leaves and bracts; calyx lobes reticulate.

Oahu, Waianae Mts.: *mauka* [mountainward] of Puuiki, rocky, rainy ridge, *Degener et al 11695* (D) (type); east side of Kaaawa Gulch, north slope of Kaala, *Degener and Salucop 11681* (D). One sheet of the type collection is from an obviously different plant, bigger, larger leafed, with a more conspicuous inflorescence, but with the pubescence of this variety. It is, perhaps, a hybrid with *H. Schlechtendahliana* f. *glabrescens*.

66. *Hedyotis Degeneri* var. *coprosmifolia* Fosberg, n. var.

Kadua foliosa β var. Hillebr., Fl. Haw. Is., 164, 1888.

Folia tenuiter chartacea, lanceolata, non reticulata; stipulae hirtellae.

Leaves thinly chartaceous, lanceolate, not reticulate, glabrous to sparsely hirtellous along under side of midrib; branchlets often more strongly hirtellous, smallest even woolly, stipules hirtellous to woolly; cymes ordinarily well exerted from leaves.

Oahu, Waianae Mountains: Mokuleia, slopes of Kaala, *Forbes 1774.O.* (Ho) (type); "Waianae auf Oahu", 1869, *Hillebrand* (B) (type of *K. foliosa* β var.); Kaumokunui Gulch, alt. 2,000 ft., *Degener and Kepaa 12727* (D).

Not at all close to *H. foliosa*, a species confined to Maui.

SECTION GOULDIOPSIS FOSBERG

Section *Gouldiopsis* Fosberg, n. sect.

Frutices vel suffrutices; stipulae triangulares petiolis adnatae; thyrsi terminales paniculati vel glomerati; calycis lobi dentiformes; corollae hypocrateriformes carnosae, limbo (in alabastris) valde quadrangularis; flores gynodioecii; antherae in tubis inclusae; stylus bifidus, lobis linearibus; capsula in longitudine latitudineque subaequalis, partim loculicida tum septicida, valvis persistentibus; semina valde compressa angulata vel alata.

Shrubs or suffrutescent herbs, stems terete, hollow; leaves very short-petioled or sessile; stipules triangular, heavily mucronate, not connate, but adnate to the inside of the petioles; inflorescence terminal, thyrsoid, paniculate to glomerate, bracts greatly reduced except at lower nodes; calyx lobes minute, dentiform, somewhat or not at all accrescent, not exceeding 5 mm., even in fruit; corolla salverform, 4-lobed, fleshy, buds strongly quadrangular, apex not depressed, lobes unappendaged or with a short or very long apical appendage; flowers gynodioecious, pistillate usually shorter, with small sterile anthers, style subequal with corolla tube, bifid, lobes subequal with united portion or shorter, linear, flattened; hermaphroditic flowers with larger, fertile anthers dehiscent at or before opening of bud, style about half length of tube, otherwise as in pistillate flowers; capsule 2-celled, slightly compressed, nearly as long as wide,

dehiscing loculicidally across disk and almost to base of septum, then septicidally, pyrenes persistent in vascular skeleton after weathering away of mesocarp; seeds strongly and irregularly compressed, angled to winged.

Found on Hawaii, Kauai, Oahu, Maui, Molokai, and Lanai.

The type species is *H. centranthoides*.

This section seems to have been derived from section *Protokadua*, which it strongly resembles, and to have given rise to the genus *Gouldia* through *H. Knudsenii*, which shows a strong resemblance to *G. terminalis* var. *elongata*.

The three species belonging to this section may be separated as follows:

1. Main axis of thyrses abortive after second or third node, thyrses more or less flat-topped.....*H. Foggiana* (82).
1. Main axis of thyrses not abortive, thyrses elongate.
 2. Leaves coriaceous, corolla lobes unappendaged or with a much reduced apical appendage.....*H. centranthoides* (68).
 2. Leaves chartaceous, corolla lobes with a very long apical appendage.....*H. Knudsenii* (67).

67. *Hedyotis Knudsenii* (Hillebr.) Fosberg, n. comb.

Kadua Knudsenii Hillebrand, Fl. Haw. Is., 162, 1888.

Elongate drooping shrub, up to 3 m. long, internodes glabrous, up to 13 cm. long, fistulose, with a sharp ridge running longitudinally from the branch at one axil to the middle of the base of the stipule above it, branches somewhat supra-axillary; leaves broadly ovate to ovate-cordate, rarely elliptic, up to 10 cm. long and 7 cm. wide, more or less acuminate, base acute to somewhat cordate, strongly reticulate veined, sparsely hirtellous beneath, especially on midrib and veins, chartaceous, petiole up to 7 mm. long, not winged, bases somewhat united below stipules; stipules interpetiolar, adnate to inner side of petiole base, not connate, triangular, sharply carinate, strongly mucronate, mucro 1-1.5 mm. long, stipules persistent as long as leaves; inflorescence a compound thyrsoid panicle, decussate, pyramidal, as much as 30 cm. long and wide (incl. peduncle), branches at first node of thyrses often reduced or abortive, or flowering later than the rest, terminal, with two vegetative branches usually originating from node at base of peduncle, whole thyrses or at least smaller branches and pedicels hirtellous, bracts at lower nodes cordate, sessile, foliaceous, gradually reduced above to minute subulate caducous scales at base of ultimate triads, uppermost branches of inflorescence not strictly opposite, stipules of smallest bracts separate, two for each bract, not grown together or interpetiolar; hypanthium narrowly urceolate-turbinate, 1-1.2 mm. long, slightly hirtellous; corolla salverform, glabrous, tube 6-7 mm. long, slightly dilated above, lobes patent to reflexed, 3-5 mm. long, margins strongly reflexed, limb in bud strongly quadrangular, blunt but not at all depressed at apex, appendages at apex very well developed, linear, directed inward in bud, in open flower sharply inflexed, 1.5 mm. long; anthers oblong, 1.5 mm. long, just below sinuses; style slightly shorter than corolla tube, lower third densely hirsute, upper third bifid, branches papillose, flattened, broader than lower portion; capsule subglobose, slightly compressed, up to 3 mm. high, 4 mm. wide, 3 mm. thick, crowned by persistent, not or only slightly accrescent calyx lobes, disk somewhat flattened or depressed, with a groove along septum, pyrenes firm, sclerified, dehiscing first loculicidally across disk and almost to base of septum, later the loculicidal split reaching almost half-way down hypanthium, separation of pyrenes septicidally taking place in extreme age if at all; seeds dull, dark brown, minutely rugulose-pitted, angular, irregularly cuneoid or subpeltate, usually slightly wider than high and higher than thick, up to 0.7 mm. wide, 0.5 mm. thick.

Known only from the island of Kauai.

Hawaiian islands. Kauai: Waimea Drainage Basin, west side, *Forbes 809.K.* (H); Halemanu, *Rock 2056* (Ho), 1888 (W), alt. 3,600 ft., April 30, 1929, *Neal* (Ho); Waimea, forest near Kokee Station, *Skottsberg 992* (Ho); Milolii Trail at Kokee end, *Degener and Ordenez 12643* (D); Kumuweia Ridge, *St. John and Fosberg 13834* (Ho); Kaholuamanu, *Rock 5779, 5860* (Ho), alt. 3,600 ft., *Hitchcock 15275* (US); without locality, Oct. 1916, *Rock* (Ho), *Knudsen* (B) (type).

Found in moist forests.

A rather puzzling species, not altogether certainly belonging with the other members of this section, but conforming to them in most of its characters. The united petiole bases and the dehiscence of the capsule are those of section *Wiegmannia*, and the corolla appendages are very long for section *Gouldiopsis*. It may perhaps be best interpreted as having differentiated from the other species of the section rather early, and as being rather closely allied to the primitive stock of section *Wiegmannia* and to section *Protokadua* itself, which also possesses all of these anomalous characters excepting the modified dehiscence. In section *Wiegmannia* this species most closely resembles *H. glaucifolia*, which should perhaps be considered the most primitive species of its section. The genus *Gouldia* also is most closely related to *H. Knudsenii*, and probably arose by modification of the fruit and flowers of this species.

68. *Hedyotis centranthoides* (Hook. and Arn.) Steud., Nom., ed. 2, 1: 727, 1840.

Kadua centranthoides Hook. and Arn., Bot. Beechey's Voy., 85, 1832.

Kadua glomerata Hook. and Arn., Bot. Beechey's Voy., 85, 1832.

Hedyotis Hookeriana Steud., Nom., ed. 2, 1: 727, 1840.

Hedyotis glomerata Walp., Repert. 2: 501, 1843 (not *H. glomerata* Ell. Sketch 1: 188, 1821).

Kadua glomerata var. *laevis* Wawra, Flora 57: 261, 1874.

Suffrutescent herbs or weak shrubs, up to 2 m. long, erect or sprawling, stems terete, fistulose, glabrous (except in inflorescence), sometimes somewhat glaucous, internodes variable in length, often up to 10 cm.; leaves heavy, stiff-coriaceous, often venulose beneath, oblong, ovate, or rarely lanceolate, base subcordate or cordate, apex usually acuminate, petiole short or leaves almost sessile; stipules heavy, triangular, often glandular-serrate on margin; inflorescence a rather stiff decussate thyrses, several internodes long, main branches ending in compact glomerate or loose cymes, the whole broadly or narrowly pyramidal, bracts at lower nodes of main axis like reduced leaves, broadly ovate or cordate, those further up or in cymes inconspicuous, scalelike; flowers gynodioecious; calyx lobes usually under 5 mm. long, inconspicuous; corolla salverform, length of tube variable, lobes valvate in bud, not depressed at apex, rarely a trace of an inward pointing appendage apparent, corolla of perfect flowers usually considerably longer than that of pistillate, but not constantly so; anthers linear or narrowly oblong, sessile, attached dorsally about a third the way from base, inserted about their own length or slightly more below sinuses, those in perfect flowers 2-2.5 mm. long, discharging pollen before opening of bud, those of pistillate flowers 1-1.5 (rarely 2) mm. long, sterile; style filiform, hirtellous or woolly-pilose below, usually up to within

a short distance of branching, rarely entirely glabrous, bifid, branches flattened, equaling united portion, style in perfect flowers much shorter than corolla tube, in pistillate flowers equalling tube or tips slightly exserted (rarely exceptions are found to these relationships); capsule woody, 2-celled, turbinate to cup-shaped, somewhat compressed perpendicularly to septum, calyx lobes persistent, somewhat or not accrescent, disk more or less truncate, with a distinct groove along septum, and a ridge or (rarely) a groove perpendicular to this, along which the first dehiscence takes place, dehiscence first loculicidal across disk and down septum, then, when mesocarp has weathered away the pyrenes separate septoidally, but remain enclosed in the persistent vascular skeleton of the mesocarp, capsules varying greatly in size and proportions, even on the same plant, 3-5 mm. high, 3.5-7 mm. wide, and 3-5 mm. thick, variation possibly correlated with number of ovules fertilized; seeds numerous, crowded more or less horizontally in the cells, light brown, highly compressed, conspicuously winged, loosened by the drying and shriveling of the fleshy placenta.

Found in the Hawaiian islands on Hawaii, Oahu, Maui, Molokai, and Lanai.

There seems to be a very large percentage of pistillate plants in this species, at least as indicated by the collections at hand. This may account for the large percentage of sterile ovaries observed. In the field one is often impressed by the large number of inflorescences observed in which none or only a few of the fruits have set any seeds. The others remain abortive and soon dry up. This condition is not so obvious in the herbarium because of the natural tendency of the collector to select material with plenty of well developed fruits. If there were a scarcity of hermaphrodite plants, a scarcity of pollen would result, causing a low percentage of pollination of pistillate flowers.

The species is widespread, but only very locally common, and is highly variable. The variations, upon careful study, are found to represent a number of fairly distinguishable forms. These, on the basis of length of corolla lobes, may be grouped fairly satisfactorily into two varieties, which vaguely correspond to Hooker and Arnott's two species, *K. centranthoides* and *K. glomerata*. The differences certainly do not justify maintaining them as species. A more pertinent question would be whether segregation, even into forms and varieties is worth while. The subdivisions may be separated as follows:

1. Flowers, fruits and pedicels glabrous.
 2. Leaves entirely glabrous beneath.
 3. Leaves mostly ovate, petiole under 5 mm. long.....f. *centranthoides* (70).
 3. Leaves oblong to elliptic, petiole over 5 mm. long.....f. *Yunckeri* (75).
 2. Sides of midrib hirtellous beneath.....f. *kamokuensis* (76).
1. Flowers, fruits and pedicels more or less hirtellous.
 2. Sides of midrib hirtellous beneath.
 3. Corolla lobes 5 mm. or more long.....f. *Meeboldii* (79).
 3. Corolla lobes 3-3.5 mm. long.....f. *hirta* (74).
 2. Sides of midrib glabrous beneath.
 3. Inflorescence diffuse, even in flower.
 4. Calyx lobes accrescent in fruit.....f. *accrescens* (81).
 4. Calyx lobes not accrescent.....f. *diffusa* (72.)
 3. Inflorescence glomerate, at least in flower.
 4. Leaves ovate, acute, under 6 cm. long.....f. *kohala* (71).

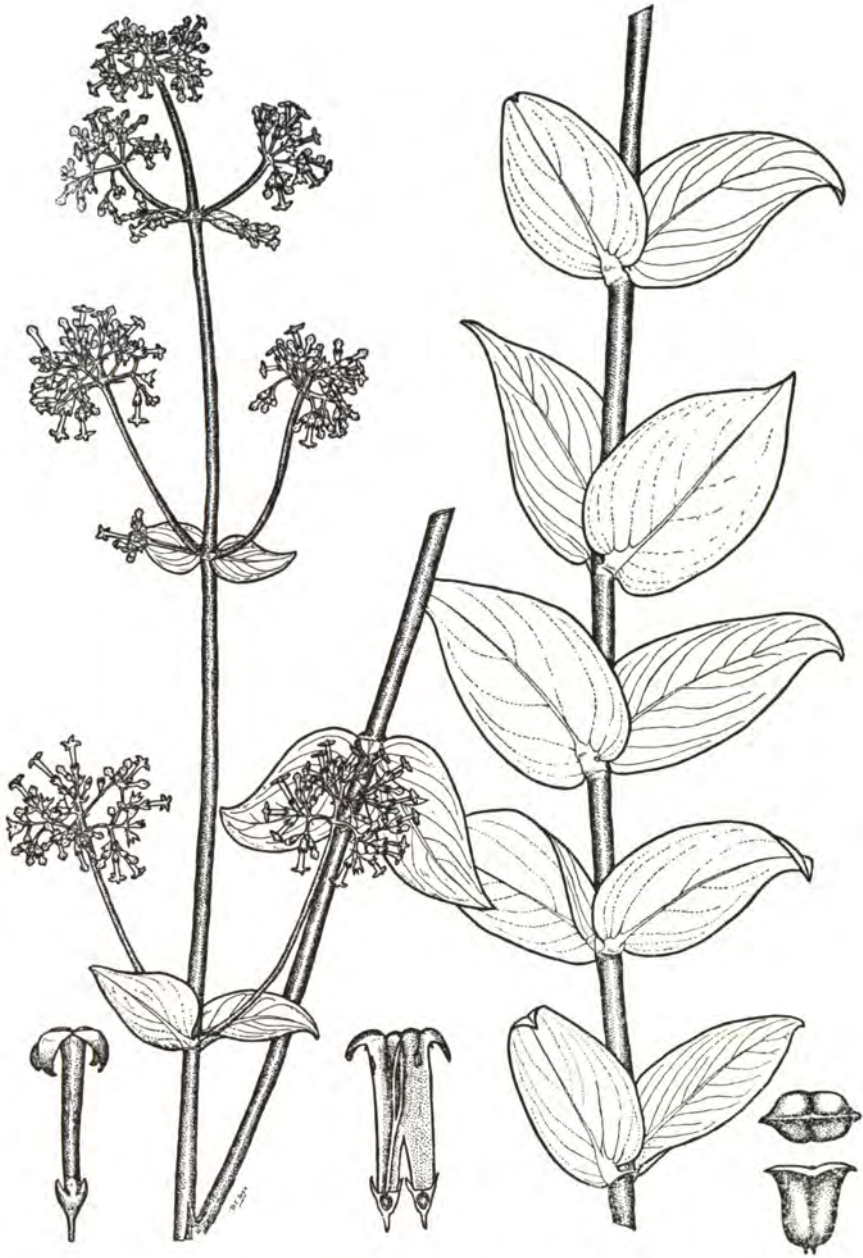


FIGURE 6.—*Hedyotis centranthoides* f. *centranthoides* (drawing loaned by Otto DeGENER).

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4. Leaves ovate or oblong, acuminate, over 6 cm. long.
 5. Corolla lobes 2.5-4 mm. long.....f. *vestita* (73).
 5. Corolla lobes 4-7.5 mm. long.
 6. Corolla tube densely hirtellous.....f. *glomerata* (78).
 6. Corolla tube lightly hirtellous.....f. *mauiensis* (80).

69. *Hedyotis centranthoides* var. *centranthoides* Fosberg, n. name.

Kadua centranthoides Hook. and Arn., Bot. Beechey's Voy., 85, 1832.

Hedyotis centranthoides Steud., Nom., ed. 2, 1: 727, 1840.

Leaves mostly ovate, sometimes oblong, mostly under 10 cm. long; corolla lobes 2.5-4 mm. long; corolla tube, calyx, and inflorescence glabrous or hirtellous, style glabrous or hirtellous, limb in bud broadly ovoid.

Found on Hawaii, Maui, Molokai, and Lanai, in seven forms.

70. *Hedyotis centranthoides* f. *centranthoides* Fosberg, n. name. (fig. 6).

Kadua centranthoides Hook. and Arn., Bot. Beechey's Voy., 85, 1832.

Hedyotis centranthoides Steud. Nom., ed. 2, 1: 727, 1840.

Leaves glabrous beneath, ovate or shortly oblong, base cordate, blade less than 10 cm. long (usually 5-8 cm.), petiole under 5 mm. long, much broader than long; cymes loosely glomerate to somewhat diffuse; corolla, calyx, hypanthium, and inflorescence glabrous or practically so.

Rather common on the island of Hawaii, mostly in the Kilauea region, often on rather recent lava.

Hawaii: Kilauea, *Hitchcock 14608* (US), *Degener 1597* (D), *Faurie 377* (Ho), *Rock 8766* (Ho), *Rock L, M* (Ho), Sept. 1908, *Forbes, Brigham, and Thompson* (Ho); Kilauea Observatory, *Skottsberg 556* (Ho); Kilauea, Keauhou Road from Cockett Trail to Thurston Tube, July 28, 1927, *Neal* (Ho); Kilauea, Hilo side of National Park, *V. O. Fosberg 58* (Ho); Kilauea, Byron Ledge, Aug. 13, 1929, *Neal* (Ho); Kilauea Iki, alt. 1,200 m., *Skottsberg 1901* (Ho); east of Kilauea Iki, *Degener 11655* (D); 29 Miles, *Degener 11648* (D); Puu Oo Trail, above Olaa Flume, Hilo Distr., alt. 660 m., *Fosberg 10449* (Ho); flow of 1855 near Haleouoki, *Forbes 696.H.* (Ho) (in part); rim of Napau Crater, Kilauea, alt. 800 m., *Fosberg 10101* (Ho); between Makaopuhi and Napau craters, Chain of Craters, Kilauea, alt. 840 m., *Fosberg 10108* (Ho), alt. 870 m., *Fosberg 10110* (Ho); west of Honokanenui, *Rock 8368* (Ho); without locality, *U. S. Expl. Exped.* (NY, Gr, US), *Kuntze 23088* (or 233 ?) (NY), *Capt. Haines* (K); "Ins. Owhyhee, ad montem ignivomen, June 1825", *Macrae* (KW) (type); "Volcano Owhyhee, Hort. Soc." (K) (this specimen also has a label "Oahu, Diell" but the plants all seem to be the Hawaii form).

71. *Hedyotis centranthoides* f. *kohala* Fosberg, n.f.

Folia parva ovata acuta maxime 6 cm. longa; thyrus diffusus hirtellus.

Differs from f. *centranthoides* in the small, ovate, acute leaves, under 6 cm. long, and in the somewhat diffuse, hirtellous inflorescence.

Found on the Hamakua coast, Hawaii.

Hawaii: Upper Hamakua Ditch Trail, Alakahi Fork of Waipio Valley, Kohala Mts., alt. 1,075 m., *Fosberg 10220* (Ho) (type); Kohala Mts., Waimea, *Forbes 511.H.* (Ho); Hilo, *Mann and Brigham 319* (Ho, Y) (as *K. Menziesiana*, 2 sheets, one with very diffuse inflorescence).

It is possible that the two Hawaii sheets cited under *f. vestita* should be included here, though the leaves are acuminate.

72. *Hedyotis centranthoides f. diffusa* Fosberg, n. f.

Thyrus valde diffusus hirtellus; corolla hirtella.

Differs from *f. centranthoides* in the conspicuously diffuse inflorescence, and hirtellous flowers and inflorescence.

Hawaii: mountains behind Pahala, Kau, *Forbes 411.H.* (Ho) (type); forest above Pahala, near transp. tunnel, Kau, *Skottsberg 581* (Ho); Kohala range, *Hillebrand 201* (K); Kilauea, *Rechinger 2065* (W); *Hillebrand* (US), *Hillebrand 203* (K) (approaching *f. kohala*).

73. *Hedyotis centranthoides f. vestita* Fosberg, n. f.

Folia 10 cm. longa variabilis, subtus glabra, petiolata; cymae glomeratae; thyrus floresque hirtelli.

Leaves variable, mostly about 10 cm. long, lanceolate to oblong, ovate, or even broadly elliptic, glabrous beneath, petiole over 5 mm. long (except in Hawaii specimens); cymes glomerate or loosely so, often becoming somewhat diffuse in fruit; corolla, calyx, hypanthium, and inflorescence more or less hirtellous or woolly-hirtellous, corolla lobes 3-4 mm. long.

Found on Molokai, Lanai, Maui, and Hawaii.

Molokai: east side of Waikolu Valley, *Degener 11715* (D) (type); Kalae, *Forbes 67.Mo.* (Ho).

Lanai: Haalelepaakai, *Munro E* (Ho), *Fosberg 12402* (Ho), April 6, 1915, *Munro* (Ho); Lanaihale, *Munro 228* (Ho), *Ordonez (Degener's) 12861* (D); Lanaihale, Palawai, *St. John and Hosaka 18872* (Ho); without locality, *Munro D* (Ho), *Hillebrand* (Gr).

Maui: east: Olinda trail, Waikamoi, *Rock 8536* (Ho); Kula pipeline, Waikamoi, *Forbes 1264.M.* (Ho); Waikamoi, *Forbes 2624.M.* (Ho); Oopuola Stream near ditch trail, *Degener 11710* (D); Keanae Valley, *Degener 11709* (D); "Gunnera Canyon" along Pipeline Trail, Olinda, *Degener 2361* (D); near Ukulele, above Olinda, *Forbes 206.M.* (Ho); Honomanu, May 1911, *Rock* (Ho); Kaopilopilo Gulch, south slope of Haleakala, *Forbes 1943.M.* (Ho); Kaupo Gap, Haleakala, *Degener 2357* (D); near base of cliffs south of Kuiki, along east side of Kaupo Gap, *Degener and Salucop 12519* (D). West: valley of Waihee, Aug. 1870, *Hillebrand* (US); Honokawai Gulch, *Rock 8156* (Ho); Hanakaoo, *Forbes 40.M.* (Ho); Maunahooma, *Forbes and Cook[e] 30.M.* (Ho); ridge north of Pohakea Gulch, *Degener 2358* (D); Lahaina, 1897, *Guppy* (K); "valleys, W. Maui", *Mann and Brigham* (Ho); southeast ridge of Iao Valley, *Degener et al 12517* (D). Puu Lio, *Ordonez (Degener's) 13027* (D, USNA).

Hawaii: flow of 1855 near Haleouolu [Haleoluolu?] *Forbes 696.H.* (Ho) (in part); Kealapuali, Kona, *Forbes 279.H.* (Ho).

Without locality: *Hillebrand and Lydgate* (Ho).

Several leaf forms are associated here which may eventually prove distinct. The type, from Molokai, and three collections from Maui (*Forbes 1943.M.*, *Degener 2357*, and *Hillebrand*) have very narrow leaves, less than 2 cm. wide. Certain collections from Lanai and Maui approach var. *laevis*, while the two collections cited from Hawaii are obviously close to f. *centranthoides* and f. *kohala*. I think, however, that further attempts at segregation must await the accumulation of much more material and extensive field observations.

74. *Hedyotis centranthoides* f. *hirta* Fosberg, n. f.

Costa subtus hirtella, alioqui ut f. *vestita*.

Differs from f. *vestita* in that the leaves are hirtellous beneath along sides of midrib.

Known from Lanai, Molokai, and perhaps Oahu.

Lanai: Haalelepaakai, *Munro 231* (Ho) (type), alt. 900 m., *Fosberg 12409* (Ho); Lanaihale, *Munro 414* (Ho); Lanaihale, Palawai, *St. John and Hosaka 18878* (Ho); without locality, *Mann and Brigham* (Ho), 319 (US).

Molokai: south of Kaulahuki, *Degener 11724* (D); head of Waihanu Stream, *Degener 11718* (D); near Lalanui [Lalanui?], *Degener 11721* (D); Kamoku, *Forbes 690.Mo.* (Ho), *Munro 569* (Ho); ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, alt. 3,600 ft., *St. John et al 12309a* (Ho); Halawa, *Lydgate* (Ho); Mapulehu, *Hillebrand* (B).

Oahu: Waianae Mts., *Hillebrand 197* (K) (may belong here, though midribs are only very slightly hirtellous).

75. *Hedyotis centranthoides* f. *Yunckeri* Fosberg, n. f.

Folia oblonga vel elliptica 8-10 cm. longa; petioli minime 5 mm. longi.

Differs from f. *centranthoides* in the oblong to elliptic leaves, mostly 8-10 cm. long, with petioles of lower ones 5 mm. or more long.

Molokai: ridge between Maunahui, Kaunakakai, and Hanalilolilo, Kawela, alt. 3,600 ft., *St. John, Baker, Coulter, Fosberg, and Yuncker 12309* (Ho) (type).

Named for Dr. T. G. Yuncker, of DePauw University, one of the collectors of the type.

76. *Hedyotis centranthoides* f. *kamokuensis* Fosberg, n. f.

Costa infra hirtella, alioqui ut f. *Yunckeri*.

Differs from f. *Yunckeri* in that the leaves are hirtellous.

Molokai: Kamoku Camp, *Rock 6124* (Ho, W) (type).

77. *Hedyotis centranthoides* var. *laevis* (Wawra) Fosberg, n. comb.

Kadua glomerata Hook. and Arn., Bot. Beechey's Voy., 85, 1832.

Kadua glomerata var. *laevis* Wawra, Flora 57: 261, 1874.

Leaves usually oblong, mostly 12-18 cm. long; corolla tube, calyx, hypanthium, and pedicels always hirtellous, corolla lobes 4-7.5 mm. long, limb in bud oblong or long ovate.

Four forms, two on Oahu, one on Maui, and one on Maui and Hawaii.

78. *Hedyotis centranthoides* f. *glomerata* (Hook. and Arn.) Fosberg, n. comb.

Kadua glomerata Hook. and Arn., Bot. Beechey's Voy., 85, 1832.

Leaves glabrous beneath, strongly acuminate, oblong; cymes glomerate, tending to remain so, even in fruit; calyx lobes 2-3 mm. long; corolla tube conspicuously hirtellous or woolly-hirtellous.

Both mountain ranges of Oahu.

Oahu, Koolau Range: Niu Ridge, *Topping 2846* (D); Wilhelmina Rise, *Degener and Park 11670* (D); Woodlawn Trail, *Garber 251* (Ho); Konahuanui-Olympus Trail, *Garber 240* (Ho); lower slopes of Konahuanui, above Manoa, *Heller 2907* (Ho, E, K, Ph, US, Gr); peak at head of Pauoa Flats, Pauoa, alt. 650 m., *Fosberg 8955* (Ho); Konahuanui, alt. 2,000 ft., Jan. 10, 1904, *W. A. Bryan* (Ho); Konahuanui, *Rock 1075* (Ho); Pauoa-Konahuanui Trail, *Garber 487, 489* (Ho); Nuuanu Pali, *Faurie 376* (Ho); Mts. behind Honolulu, *U. S. Expl. Exped.* (Gr); Kahuauli ridge, alt. 500-750 m., *Christophersen and Hume 1424* (Ho); main divide, Kipapa Gulch, alt. 2,800 ft., *Hosaka 719* (Ho); summit of Koolau Mts. above Kipapa Gulch, Waiahole, alt. 900 m., *Fosberg 8710* (Ho); Kipapa Gulch, alt. 1,700 ft., *Hosaka 1173* (Ho); Kipapa Gulch, Waipio, alt. 750 m., *Fosberg 9763* (Ho); Kahana Valley, *Harris C242230* (Ho); Waikane-Schofield Trail, Kahana, alt. 700 m., *Fosberg and Duker 8808, 8778* (Ho), alt. 675 m., *Fosberg 12250* (Ho); main divide, crest of Koolau Mts., at head of north branch of Kahana Valley, alt. 720 m., *Fosberg and Hosaka 13931* (Ho); high ridge above Kahana, *Skottsberg 1840* (Ho); Punaluu, *Rock 795* (Ho); Punaluu, trail to the small waterfall, alt. 2,000 ft., May 1932, *Meebold* (Ho); Punaluu Mts., Aug. 23, 1908, *Rock* (Ho); Pig-god Trail, Punaluu, *Degener et al 11665, 11697* (D); Koolauloa Mts., between Punaluu and Kaipapau, Nov. 14-21, 1908, *Forbes* (Ho); Kaluanui, alt. 2,400 ft., *E. H. Bryan, Jr. 848* (Ho); CCC Trail, Kawailoa, near summit, *Degener and Ordonez 12050* (D).

Oahu, Waianae Mountains: Kaala? *Wawra 2016b* (W) (type of *K. glomerata* var. *laevis*); east ridge of Puu Kaala, alt. 3,200 ft., *St. John 9920* (Ho); Mt. Kaala, alt. 3,000 ft., *Hosaka 236* (Ho); Makaleha Valley, *Skottsberg 390* (Ho); near Keeau [Keaau], Makua, alt. 1,700 ft., Feb. 22, 1928, *Bergman* (Ho); Puu Kawiwi-Puu Kaala ridge, Makaha-Waianae Kai, alt. 1,000 m., *Fosberg 10867* (Ho). Without locality: *U. S. Expl. Exped.* (US), *Gaudichaud* (Gr), *Beechey* (K) (type of *K. glomerata*), *Mann and Brigham* (Ho).

Hawaiian islands, without locality: *Hillebrand 197* (Gr), *Gaudichaud* (B) (in part).

On the type sheet of *K. glomerata* is also a poorly preserved fragment of one of the varieties of *H. Schlechtendahlia*.

Not uncommon in moist or wet forests, and on exposed ridges.

79. *Hedyotis centranthoides* f. *Meeboldii* Fosberg, n. f.

Costa infra hirtella, alioqui ut f. *glomerata*.

Differs from f. *glomerata* only in being hirtellous beneath on sides of leaf midribs.

Oahu, Waianae Mountains: Kaala, Makaleha ridge, alt. 3,500 ft., June 1932, *Meebold* (Ho) (type); Kaala region, June 18, 1932, *Meebold* (*Degener's*) 11696 (D) (same collection as type?); Mt. Kaala, alt. 2,000-4,000 ft., *Hitchcock* 13983 (US); without locality: *Hillebrand* 197 (K) (may belong here, though the corolla lobes are almost as short as in var. *centranthoides* f. *hirta*).

80. *Hedyotis centranthoides* f. *mauiensis* Fosberg, n. f.

Folia parva ovata; corolla vix hirtella.

Differs from f. *glomerata* in the smaller, more ovate leaves, and much more thinly hirtellous corollas.

Maui: Pipeline Trail, Olinda, *Degener* 2360 (D) (type).

81. *Hedyotis centranthoides* f. *accrescens* Fosberg, n. f.

Folia ovata; cymae diffusae; calycis lobi obtusi accrescentes; discus depressus.

Leaves ovate, up to 10 cm. long; cymes diffuse, divaricate-ascending; calyx lobes obtuse, accrescent, in fruit reaching 3-4 mm. long; corolla lobes 4-5 mm. long; disk in fruit rather depressed.

Found on east Maui and in the Kohala Mts., Hawaii.

Maui, east: Koolau Gap, Haleakala Crater, alt. 6,000 ft., *Rock* 8629 (Ho) (type); northwest side of Koolau Gap, alt. 5,750 ft., *Degener* and *Salucop* 12518 (D); Keanae Gap, Haleakala Crater, *Forbes* 997.M. (Ho); Pipeline Trail, Olinda, *Degener* 11705 (D).

Hawaii, Kohala Mts.; Holoakaia Gulch, Waimea, Hawaii, *Rock* 4198 (Ho).

This form seems related to var. *centranthoides* f. *diffusa*, and could almost equally well be placed in var. *centranthoides*.

82. *Hedyotis Foggiana* Fosberg, n. sp. (pl. 4, B; fig. 7).

Kadua glomerata var. *typica* Wawra, *Flora* 57: 260, 1874 (not *K. glomerata* Hook. and Arn., *Bot. Beechey's Voy.*, 85, 1832).

Suffrutex; folia obovata coriacea venulosa subtus glabra vel leviter hirtella; thyrus diffusus corymbiformis, axi abortivo, ramulis cymosis; flores gynodioecii; calycis lobi lineares vel oblongi; corollae hypocrateriformis, tubus maxime 9 mm. longus, lobis 3-4 mm. longis patentibus; antherae fertiles 2.2 mm. longae, steriles 1.3 mm. longae; stylus hirtellus bifidus; capsula subglobosa leviter compressa, 4 mm. lata, 3 mm. longa crassaque, loculicida tum septicida; semina rugulosa compressa angulata.

Sprawling suffrutescent herb or weak shrub, stems glabrous, often slightly glaucous, internodes often 10-15 cm. long, hollow when dry, terete; leaves obovate, sometimes oblong,

or even ovate, up to 15 cm. long, 5 cm. wide, usually about 10 cm. long, 4 cm. wide, apex strongly acuminate, base rounded to distinctly subcordate, blade coriaceous, glabrous to somewhat hirtellous beneath along sides of midrib, venulose, petiole up to 1 cm. long, 3 mm. wide, somewhat winged; stipules interpetiolar, triangular, mucronate, caducous well before leaves, adnate to petioles, not at all connate; inflorescence a broad diffuse corymbiform thyrse whose main axis becomes abortive after the second or rarely the third node, the one or two internodes which sometimes occur above this being much reduced, main branches of thyrse similarly abortive, usually after first node, smaller branches typically diffuse cymose, the whole hirtellous or rarely glabrous, lowest bracts of thyrse cordate-acuminate, quickly becoming reduced distally to tiny linear bractlets, pedicels slender; hypanthium narrowly urceolate to somewhat turbinate, about 1 mm. long; calyx lobes linear or narrowly oblong, acute to blunt, hirtellous or rarely glabrous; flowers gynodioecious; corolla salverform, tube up to 9 mm. long, usually much shorter, hirtellous or rarely glabrous, lobes up to 4 mm., usually 3 mm. long, patent, hermaphroditic flowers longer than pistillate; fertile anthers about 2.2 mm. long, sterile ones 1.3 mm.; style somewhat hirtellous below branches, bifid, much shorter than corolla tube in hermaphrodite flowers, subequal with it in pistillate; capsule subglobose, slightly compressed, strongly grooved vertically on sides, making the whole appear somewhat didymous, up to 4 mm. wide, 3 mm. thick and high, broadest about halfway up, calyx lobes widely separated, only slightly accrescent, disk slightly elevated in center, grooved along septum, a slight ridge perpendicular to this, dehiscence loculicidal across disk and almost to base of septum, later with weathering away of mesocarp, the thinly sclerified pyrenes separate septicidally, but remain enclosed in persistent vascular skeleton of mesocarp; seeds dark brown, minutely rugulose, irregularly broadly cuneoid compressed, lower angle sharp, slightly wing-margined, slightly less than 1 mm. long, 0.5 mm. wide, extremely variable in size and shape.

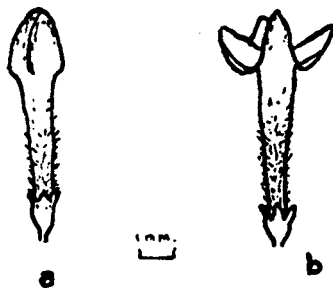


FIGURE 7.—*Hedytis Foggiana*: a, bud; b, flower (from Heller 2703).

Found only in the mountains of Kauai.

Kauai: plateau at head of Kalalau Valley, alt. 1,230 m., *Fosberg 12694* (Ho) (type); Kaholuamanu, Oct. 1911, *Rock* (Ho); same locality, *Forbes 395.K., 410.K.* (Ho); Kaholuamanu behind Waimea, *Forbes 895.K* (Ho); Waialae Valley, back of Kaholuamanu, *Rock 6022, 5789* (Ho) *5788* (W); bog at head of Wahiawa, *Heller 2703* (US) (fig. 7); Wahiawa Mts., *Forbes 226.K.* (Ho), *Lydgate* (Ho); without locality, *Rock 9005* (Ho); *Wawra 2016a* (W) (type of *K. glomerata* var. *typica* Wawra).

Found in wet forests and bogs.

This species is closest to *H. centranthoides* but differs in the peculiar structure of the inflorescence, the generally obovate leaves, less winged petiole, flowers a little over half as large, fruits subglobose, subdidymous, somewhat

smaller and much less heavily sclerified, seeds thicker, scarcely winged, dark brown.

Considerable variation is evident in the shape of leaves and hairiness of various parts, but with the material available these variations do not appear to be more than individual segregates of a heterozygous population. Future collecting and field observations may reveal that some of the variants are localized and should receive names.

Named for Dr. John M. Fogg, Jr., of the University of Pennsylvania, under whose direction this study has been conducted.

SUBGENUS **OCEANICA** (OLIVER) FOSBERG

Oceanica (Oliver) Fosberg, new subgenus.

Kadua Cham. and Schlecht. *Linnaea* 4: 157, 1829 (in part).

Gouldia Gray, *Am. Acad. Arts Sci., Proc.* 4: 310, 1860 (in part).

Coprosma, group of *C. oceanica* W. R. B. Oliver, *B. P. Bishop Mus. Bull.* 132: 142, 1935.

Frutex glaber; folia carnosa; cymae triflorae; corolla brevis carnosocoriacea hypocrateriformis; antherae sessiles in fauce inclusae; stylus in corollae tubo inclusus bifidus; fructus magnus carnosus apice dehiscens; semina nigra peltata angulata.

Small glabrous shrubs; leaves fleshy, obovate; stipules persistent, adnate to petioles; inflorescence usually a terminal 3-flowered cyme, occasionally reduced to 1 flower, occasionally single flowers in upper axils; flowers always hermaphroditic; corolla fleshy-coriaceous, salverform with short broad tube and short lobes; anthers sessile, included; style shorter than corolla tube, bifid; fruit very large, mesocarp greatly thickened into a soft, tough, fleshy aerogenous tissue, dehiscing loculicidally across disk, forming a terminal roundish hole almost as large as disk, this often somewhat enlarged by a slight septicial dehiscence; seeds black, peltate, angular.

Well differentiated from the other subgenera by the peculiar inflorescence and large fleshy fruit with dehiscence confined to the disk. Strictly Polynesian in distribution, and only one species known.

83. *Hedyotis romanzoffiensis* (Cham. and Schlecht.) Fosberg, *B. P. Bishop Mus., Occ. Papers* 13(19): 248, 1937.

Kadua romanzoffiensis Cham. and Schlecht., *Linnaea* 4: 162, 1829.

Petesia carnosa Hook. and Arn., *Bot. Beechey's Voy.*, 64, 1832.

Hedyotis romanzoffiana Steud., *Nom.*, ed. 2, 1: 843, 1840.

Gouldia romanzoffiensis Gray, *Am. Acad. Arts Sci., Proc.* 4: 310, 1860.

Coprosma oceanica W. R. B. Oliver, *B. P. Bishop Mus. Bull.* 132: 142, 1935.

Erect, glabrous slightly woody herb or small shrub less than 1 m. tall, internodes rather short; leaves obovate with rounded apex and cuneate base, stiff, fleshy, rather glossy above, veins somewhat pellucid, shortly petioled; stipules broadly triangular, obtuse, mucronate, carinate, adnate with petioles into a short sheath, persistent, usually falling with the leaves; inflorescence ordinarily a 3-flowered cyme, with a leaf-like bract subtending each lateral flower, a pair of such bracts part way up on the pedicel of the terminal flower, represented on the lateral pedicels by a pair of tiny pyramidal bractlets less than

1 mm. long, which sometimes replace the bracts on the terminal ones, occasionally reduced to one terminal flower, occasionally solitary flowers in upper axils, pedicels 1-5 cm. long, usually short in flower and elongate in fruit, cymes in fruit often pendent, usually appearing to be in a fork of a branch, as two branches appear at base of cyme; buds with lower portion tubular, upper part abruptly larger, broadly ovoid, 4-sided, corolla lobes valvate with outer parts slightly separate, leaving a shallow cleft, inner parts truly valvate; flowers all hermaphroditic; hypanthium broadly turbinate, round to strongly flattened, 3 mm. long and wide; calyx lobes obtuse, less than 1 mm. long, 1 mm. broad; corolla pale green, fleshy-coriaceous, salverform but without a sharp angle between tube and throat, tube 5 mm. long, 2 mm. wide at base, 2.5 mm. wide at throat, lobes 4-5 mm. long, ovate, acute, 2.5 mm. wide at base, a slight prominence outside apex, appendage inside apex blunt, inflexed, 0.5 mm. long, corolla readily deciduous; anthers 1.5 mm. long, narrowly sagittate, sessile in throat; style 2.5 mm. long, stigma 1.5 mm. long, with 2 thickened narrowly ovate lobes appearing revolute around margins, erect, coherent, style deciduous with corolla; ovary 2-(3-) celled, placenta fleshy, attached to middle of septum; fruit about 2 cm. in diameter when well developed, spherical or subspherical with flattened apex, disk depressed and somewhat wrinkled and twisted, calyx only evident as a low, remotely denticulate ring, endocarp lightly sclerified, mesocarp soft and fleshy with thick white aerogenous tissue, epidermis white to deep purple, usually purplish on one side, cells 3-4 mm. across, fruit persistent on plant, gradually drying and becoming shriveled and obovoid, dehiscing when almost dry loculicidally across disk, then slightly septically, causing disk to open up into a small roundish hole; seeds angular, irregular, peltately attached, black, loose in ripe fruit.

Coral islands throughout southern and central Polynesia, north to Christmas Island, west to Danger, Niue (Savage), Tokelau (Union), and Ellice Islands. Type locality, Romanzoff (Tikei) Island.

Tuamotu Archipelago (*sensu lato*). Oeno Island, *St. John and Fosberg 15192, 15198, 15200* (Ho). Timoe, April 25, 1922, *Quayle X, XXX* (Ho) (one of these is type of *Coprosma oceanica*), north islet, *St. John and Fosberg 15206* (Ho). Mangareva Islands: Vaiatekeua, *Fosberg 11162* (Ho). Tuamotu Islands: South Marutea, northwest islet, *St. John 14436* (Ho), *St. John and Wight 14429* (Ho); Hao, Boring Bay, *St. John 14363* (Ho); Tepoto, *St. John 14351* (Ho); Anaa, *Brown 305* (Ho), Tukahora, *St. John 14249* (Ho); Fangatau, *Brown 313* (Ho); Apataki, *Quayle 1266* (Ho); Ahunui, *Quayle 562* (Ho); Maria, *Quayle XX* (Ho); Vanavana, *Quayle and Curtis 530* (Ho); Ahii, *Jones 963* (Ho); Kaukura, *Quayle 2169* (Ho); Makemo, *Quayle 2102* (Ho); Marutea, 1923, *Quayle XXXX* (Ho); Nengonengo, *Quayle and Curtis 580* (Ho); Tahanea, *Quayle 1992* (Ho); Takapoto, *Jones 1009* (Ho); Takuma, *Quayle 2077* (Ho); Tenararo, 1923, *Quayle XXXX* (Ho); Tenarunga, *Quayle and Curtis 500* (Ho); Toau, *Quayle 2012* (Ho); Vahanga, *Quayle and Curtis 498* (Ho); Tikei (Romanzoff Island), *Chamisso (B)* (type).

"Coral isles", *Beechey (K)* (type of *Petesia carnosa*).

"Coral islands" *U. S. Expl. Exped. (Gr)*.

Austral Islands. Raivavae: Motu Tehau, *St. John and Wight 16136* (Ho). Maria: middle islet, *Fosberg 12093, 12094* (Ho); northeast islet, *St. John 16950* (Ho).

Pukapuka (Danger) Islands; *E. H. Bryan, Jr., 13* (Ho); *Beaglehole 50* (Ho).

Tokelau (Union Islands): Swains Island, March 1891, *Lister* (K).

Pacific equatorial islands. Christmas Island: 4 miles west of Manulu Lagoon, *St. John and Fosberg 17491* (Ho); Motu Tabu, *Fosberg 13194* (Ho); Joes Hill, *Fosberg 13234* (Ho); coast north of Manulu Lagoon, *Fosberg 13284* (Ho); without locality, *Bergman 12* (Ho).

Ellice Islands: Tenoen, *Whitmee 20* (K) "found throughout the group." "Tokerau, Ellice Group, and Savage Island", *Powell 22* (K).

Collected by M. L. Grant on Tupai, in the Society Islands.

Mentioned by Brown (4) as also occurring on the coral atolls of Fiji, but I have seen no specimens from there.

Found only on coral sand and gravel, from 1 to 5 m. above sea level. This is a typical strand plant, in some islands quite abundant. In a previous discussion (22) I mentioned a shade form, collected on Maria (Austral Islands) and Pukapuka (Danger Islands) which has longer petioles and oblanceolate leaves.

Polynesian names are *koporoporo* (Hao and Anaa), *koporapora* (Tepoto), *ti riga* (Mangareva); "*tokitokiaveka* of Tokerau, Ellice Group and Savage Island" according to Powell (note on label).

Drake (16) confused this plant with *Coprosma taitensis*, which led Oliver (43) to redescribe it as a new species of *Coprosma*. Christophersen's reference (11, p. 76) to *Coprosma tahitensis* from Christmas Island is also traceable to Drake's error, the plant being *H. romanzoffiensis*. Gray (24) considered it to be a species of *Gouldia* on the basis of its fleshy fruit and peltate seeds, but in all other respects it is much nearer *Hedyotis*.

SUBGENUS **KADUA** (CHAM. AND SCHLECHT.) FOSBERG

Kadua (Cham. and Schlecht.) Fosberg, n. stat.

Kadua Cham. and Schlecht., *Linnaea* 4: 157, 1829 (in part).

Hedyotis sect. *Kadua* Endlicher, *Gen. Pl.* 550, 1841.

Kadua sect. *Eukadua* O. Ktze., *Post and Ktze., Lexicon*, 305, 1904 (in part).

Kadua sect. *Tetrakadua* O. Ktze., *Post and Ktze., Lexicon*, 305, 1904 (in part).

Shrubs; herbage foetid when bruised or broken, branches supra-axillary, first internode very short, first node with more or less persistent stipular collar; leaves opposite; stipules entire, ovate or triangular, forming a short, often obscure sheath, adnate with petioles; inflorescence reduced to a very short peduncle bearing at its apex 1-5 pedicellate flowers, lateral, supra-axillary by adnation of peduncle completely or in the lower part with stem, pedicels subtended by minute scale-like bractlets; hypanthium narrowly turbinate, usually quadrangular; calyx lobes usually as large as hypanthium, sinuses between them bearing 1 to several small saclike glands; corolla salverform, lobes valvate, inflexed in bud, apical appendage turned inward, apex in bud usually depressed; anthers sessile, included in the upper part of corolla tube, dehiscent at about the time of opening of flower; style

slender, included, deeply bifid, stigmatic surfaces cohering (in hermaphroditic flowers) until after discharge of pollen, then separating and the whole elongating somewhat; ovary 2-celled, placenta peltate, attached to septum slightly above middle, disk thick and fleshy, cells larger above, small at base; fruit a woody capsule crowned with persistent calyx lobes, dehiscing loculicidally across disk and gradually down the septum almost to base, in age the pyrenes separating septicidally, the two bifid valves held together by the vascular skeleton of the weathered off mesocarp; seeds fundamentally cuneoid, attached at base, much distorted by crowding, sharply angular, surface minutely reticulate, translucent reddish brown.

A subgenus of two extremely variable species, confined to the Hawaiian islands, distinguished from all others by the reduced supra-axillary inflorescence. The quadrangular character of the fruit on which Gray (24) based his *Kadua grandis* and on which Kuntze based his section *Tetrakadua* seems to mean very little. The hypanthium is usually quadrangular to start with, and rounds out to varying degrees in the fruit.

Several of the entities here recognized as forms of *H. acuminata* have previously been considered distinct species, but the evolution within this group does not seem to have progressed very far. When they are known from a sufficient number of collections to show their complete geographic ranges, the boundaries between them will probably become even more indistinct. I believe that at one time this species was a large, heterozygous population, widely distributed and common over a forested area doubtless much larger than that at present occupied. Subsequent changes in environmental conditions, particularly topography, served to break up this population into a great many small, isolated groups. These, then, differentiated somewhat into local races or forms, which have tended to diffuse out and hybridize with the surrounding forms. This makes a phylogenetic classification impossible, and any relationship is merely an indication of greater similarity in morphology and genetic makeup, not of descent. Therefore, the forms are given coordinate rank, and grouped only by islands.

The two species of this subgenus may be separated thus:

1. Corolla yellow to pale green or cream (rarely white ?), drying black, not of especially waxy texture, pedicels not angled, except near base of fruit.....**H. acuminata** (84).
1. Corolla white, waxy, drying purplish, pedicels angled, at least in dried specimens**H. fluviatilis** (124).

Corollas of these species are often absent, and when dry are not particularly distinctive, so the following key is presented to determine the subdivisions of both species:

1. Young internodes with 2 distinct ridges or costae running up each side from fusion of peduncle with stem at one node to base of stipule at node above.....2.
1. Internodes not costate or only faintly so.....16.
2. Whole plant glabrous.....3.
2. At least sides of midribs of leaves hairy beneath.....6.
3. Corolla tube 2 cm. or more long, flowers white....**H. fluviatilis** var. **kauaiensis** (129).

3. Corolla tube 1 cm. or less long, flowers green or yellowish.....4.
4. Corolla tube 9-10 mm. long, lobes considerably less.....5.
4. Corolla tube 6-8 mm. long, lobes equaling tube or slightly shorter, fruit globose-obovoid, 7-8 mm. long.....*H. acuminata* f. *halawana* (89).
5. Mucro on well-developed stipules 2.5-5 mm. long, pedicels usually 2.5-3 cm. long, corolla lobes 6-8 mm. long, fruit strongly turbinate.....*H. acuminata* f. *turbinata* (119).
5. Mucro 1-2 mm. long, pedicels up to 2 cm. long, corolla lobes about 4 mm. long, fruit usually not strongly turbinate.....*H. acuminata* f. *acuminata* (98).
6. Leaves distinctly obovate, corolla white (?).....*H. acuminata* f. *Forbesii* (116).
6. Leaves not obovate or only slightly so, usually ovate, elliptic or oblong, corolla yellow or green.....7.
7. Calyx lobes sparsely and minutely hirtellous or pilosulous outside, at least toward base8.
7. Calyx lobes glabrous outside.....9.
8. Pedicels 7-12 mm. long.....*H. acuminata* f. *pilicalyx* (101).
8. Pedicels 30-35 mm. long.....*H. acuminata* f. *grandis* (123).
9. Calyx lobes oval or orbicular.....10.
9. Calyx lobes ovate to lanceolate.....11.
10. Leaves strongly acuminate, strongly venulose beneath.....*H. acuminata* f. *ovalicalyx* (115).
10. Leaves usually weakly acuminate, weakly venulose.....*H. acuminata* f. *quadricosta* (103).
11. Leaves strongly venulose beneath.....*H. acuminata* f. *iaoensis* (114).
11. Leaves not strongly venulose.....12.
12. Fruit winged.....*H. acuminata* f. *duripes* (104).
12. Fruit not winged.....13.
13. Corolla lobes as long as or longer than tube, pedicels 2-5.5 cm. long.....*H. acuminata* f. *Skottsbergiana* (120).
13. Corolla lobes considerably less than length of tube.....14.
14. Calyx lobes infolded and appearing subulate at apex.....*H. acuminata* f. *ovalifolia* (113).
14. Calyx lobes flat, not appearing subulate.....15.
15. Leaves less than 2 cm. wide, calyx lobes in flower 4-6 mm. long, corolla lobes patent, fruit not quadrangular.....*H. acuminata* f. *hirticalyx* (118).
15. Leaves mostly 3 cm. or more wide, calyx lobes in flower 8 mm. long, corolla lobes reflexed, fruit quadrangular.....*H. acuminata* f. *obovata* (117).
16. Leaves glabrous beneath, even on sides of midrib.....17.
16. Leaves hairy beneath, at least on sides of midrib.....37.
17. Calyx lobes orbicular or broadly ovate.....18.
17. Calyx lobes lanceolate, oblong, or ovate, at least 1.5 times as long as wide.....19.
18. Peduncle 8-15 mm. long, top $\frac{1}{8}$ free from stem.....*H. acuminata* f. *liberipes* (85).
18. Peduncle up to 5 mm. long, almost entirely fused with stem.....*H. acuminata* f. *alicarpa* (100).
19. Corolla tube 2-2.5 cm. long, white, waxy, fruiting pedicels heavy, stiff, well over 3 cm. long.....20.
19. Corolla tube under 1.5 cm. long, usually yellow to green, fruiting pedicels 3 cm. long or less, usually slender.....21.
20. Calyx lobes ovate, in fruit accrescent to at least 1.5 cm. long, corolla lobes 1.3-1.5 cm. long.....*H. fluviatilis* f. *kamapuaana* (127).
20. Calyx lobes lanceolate, little accrescent, not usually over 15 mm. long in fruit, corolla lobes less than 1 cm. long.....*H. fluviatilis* var. *typica* (125).
21. Corolla white, waxy, tube 13 mm. long, lobes strongly recurved, pedicel sharply angled, over 1 mm. thick.....*H. fluviatilis* f. *breviflora* (128).

21. Corolla yellow to green, tube usually 12 mm. long or less, lobes patent or reflexed, pedicels usually less than 1 mm. thick, usually not strongly angled except very near apex..... 22.
22. Peduncle (at least when mature) 8-15 mm. long, top third usually free from stem *H. acuminata* f. *liberipes* (85)
22. Peduncles usually under 8 mm. long, fused with stem to near apex..... 23.
23. Leaf blades mainly under 8 cm. long..... 24.
23. Leaf blades mainly 10 cm. long or more..... 32.
24. Blades of older leaves mainly 4 cm. wide or more, broadly ovate or elliptic.....
..... *H. acuminata* f. *sphaerocarpa* (87)
24. Blades of older leaves mainly less than 3 cm. wide, lanceolate or narrowly elliptic 25.
25. Calyx lobes not over 3 mm. long..... 26.
25. Calyx lobes well over 3 mm. long..... 27.
26. Leaves mostly strongly acuminate..... *H. acuminata* f. *acuminata* (98).
26. Leaves acute or at most weakly acuminate..... *H. acuminata* f. *tuberculata* (111).
27. Leaves usually elliptic, calyx lobes oblong, ovate, or ovate-lanceolate..... 28.
27. Leaves lanceolate, oblanceolate, narrowly elliptical or narrowly oblong, calyx lobes lanceolate or linear..... 29.
28. Leaves strongly acuminate..... 30.
28. Leaves weakly acuminate..... *H. acuminata* f. *Storeyi*
29. Leaf blades oblanceolate, petiole 2 cm. or more long.....
..... *H. acuminata* f. *brevimucronata* (88).
29. Leaf blades lanceolate or narrowly oblong, petiole well under 2 cm. long..... 31.
30. Corolla tube glabrous..... *H. acuminata* f. *koolauensis* (93).
30. Corolla tube sparsely and minutely puberulent..... *H. acuminata* f. *Toppingii* (90).
31. Corolla lobes patent, fruit acute at base, turbinate, usually longer than wide, not contracted at apex below calyx lobes..... *H. acuminata* f. *Violetana* (99).
31. Corolla lobes soon somewhat reflexed, fruit usually rounded or obtuse at base, usually globose-obovoid, usually noticeably contracted at apex below calyx lobes *H. acuminata* f. *acuminata* (98).
32. Stipular mucro about 1 mm. long or less..... 33.
32. Stipular mucro 1.5 mm. long or more..... 35.
33. Leaves elliptic, over 3 cm. wide..... 34.
33. Leaves oblanceolate, about 2 cm. wide..... *H. acuminata* f. *brevimucronata* (88).
34. Internodes glaucous, peduncle completely adnate, calyx lobes slightly acuminate *H. acuminata* f. *pololuensis* (122).
34. Internodes green, peduncle free at apex, calyx lobes not acuminate.....
..... *H. acuminata* f. *Storeyi* (105).
35. Petioles of larger leaves mostly 3 cm. long or more, fruit quadrangular, but not strongly so..... *H. acuminata* f. *haupuensis* (86).
35. Petioles usually 1-2 cm. long, rarely over 2.5 cm., fruit usually strongly quadrangular 36.
36. Corolla tube minutely puberulent..... *H. acuminata* f. *Toppingii* (90).
36. Corolla tube glabrous..... *H. acuminata* f. *koolauensis* (93).
[and f. *cylindrica* (121).]
37. Leaves sessile or petioles mostly 4 (-7) mm. or less long, winged, at least 1.5 mm. broad (incl. wings), blade coriaceous..... 37.
37. Petiole well over 4 mm. long, or if not, then slender and not noticeably winged... 39.
38. Leaves subcordate at base, calyx lobes very slightly hirtellous outside, fruit cup-shaped, quadrangular..... *H. acuminata* f. *subaessilis* (112).
38. Leaves acute at base, calyx lobes glabrous, fruit usually turbinate.....
..... *H. acuminata* f. *Eamesii* (110).
39. Petioles hirtellous 40.
39. Petioles glabrous, except rarely at extreme base..... 43.

40. Pedicels, hypanthium, and calyx hirtellous..... *H. acuminata* f. *kaalae* (92).
 40. Pedicels, hypanthium, and calyx glabrous.....41.
 41. Corolla tube hirtellous..... *H. acuminata* f. *Sherffiana* (91).
 41. Corolla tube glabrous.....42.
 42. Leaves broadly elliptical, oval, or broadly oblong, 7-10 cm. long, venulose
 beneath43.
 42. Leaves lanceolate, narrowly oblong, or narrowly elliptical, usually less than
 6 cm. long, not strongly venulose..... *H. acuminata* f. *hirtella* (97).
 43. Fruit winged, style hairy well above base..... *H. acuminata* f. *allicarpa* (100).
 43. Fruit quadrangular, not winged, style hairy only at base.....
 *H. acuminata* f. *St.-Johnii* (109).
 44. Leaves lanceolate, elliptic-lanceolate, or oblong-lanceolate, calyx lobes lance-
 olate or linear-lanceolate..... *H. acuminata* f. *Grayana* (96).
 44. Leaves elliptic, ovate, or oblong, calyx lobes broadly ovate or orbicular to
 narrowly lanceolate45.
 45. Middle pedicel over 2 cm. long, several times the length of the lateral ones,
 at least when young..... *H. acuminata* f. *heteripes* (107).
 45. Middle pedicel not more than twice as long as lateral ones.....46.
 46. Calyx lobes ovate to sub-orbicular in flower, not abruptly dilated at base in
 fruit47.
 46. Calyx lobes lanceolate or ovate-lanceolate, abruptly dilated at base in fruit.....49.
 47. Leaves noticeably venulose beneath..... *H. acuminata* f. *wailauensis* (106).
 47. Leaves only slightly venulose beneath.....48.
 48. Leaves weakly acuminate at apex, mostly rounded at base.....
 *H. acuminata* f. *quadricosta* (103).
 48. Leaves usually strongly acuminate at apex, mostly acute or attenuate (rarely
 rounded or obtuse) at base.....49.
 49. Leaves strongly venulose, pedicels 2-4 cm. long, corolla lobes soon reflexed, as
 long or almost as long as tube..... *H. acuminata* f. *variabilis* (102).
 49. Leaves not strongly venulose, pedicels 1 cm. long, corolla lobes patent, much
 shorter than tube..... *H. acuminata* f. *lanaiensis* (108).
 50. Corolla tube very slightly hirtellous outside, style hairy above base, anthers
 2 mm. long..... *H. acuminata* f. *elliptica* (95).
 50. Corolla tube glabrous.....51.
 51. Fruit quadrangular, not winged, style hairy only at base, anthers 2.5 mm.
 long *H. acuminata* f. *Brownii* (94).
 51. Fruit winged, style hairy above base, anthers 2.5-3.5 mm. long.....
 *H. acuminata* f. *allicarpa* (100).

84. *Hedyotis acuminata* (Cham. and Schlecht.) Steud., Nom., ed. 2, 1: 726. 1840.

Kadua acuminata Cham. and Schlecht., Linnaea 4: 163, 1829.

Kadua grandis Gray, Am. Acad. Arts Sci., Proc. 4: 318, 1860.

Kadua petiolata Gray, Am. Acad. Arts Sci., Proc. 4: 318, 1860.

Kadua kaalae Wawra, Flora 57: 273, 1874.

Shrub or suffrutescent herb, sparingly branched except near apex, where branching is frequent, usually arching, internodes extremely variable in length on same plant, tending to be very short near apices of small branches; leaves more or less petioled, secondary veins varying greatly in prominence, even on same leaf, angle of divergence from midrib varying with width of leaf, blade lanceolate to ovate, oblong, elliptical, oval, or rarely obovate, apex usually acuminate, glabrous above, glabrous or hirtellous beneath, petiole glabrous or hirtellous; cymes 1-, 3-, or 5-flowered, pedicels 0.6-5 cm. long, lateral ones sometimes abortive; hypanthium narrowly turbinate, usually quadrangular; calyx lobes

linear to orbicular, erect to somewhat spreading, remaining erect or becoming patent in fruit, usually accrescent in fruit; corolla salverform, with tube sometimes slightly dilated at throat, this part sometimes reflexed with the lobes in age, exposing anthers, lobes flat or often revolute, patent to strongly reflexed, green or greenish yellow or cream-color (rarely white ?), thin fleshy, tips inflexed in bud, making apex of bud somewhat depressed, bearing at tip an inward directed mucro, which points downward inside the bud, corolla glabrous inside, glabrous or puberulent outside; anthers linear to oblong, 1.5-3 mm. long, attached dorsally about two thirds the way from apex, 2-3 mm. below sinuses, sometimes apparently sterile, but this may be due to pollen having been shed earlier; style shorter than corolla tube, even in age, pilose at base, or hirtellous or pilose up to branches, or rarely glabrous, style at time of shedding of pollen usually less than half length of tube, later elongating somewhat, branches sometimes slightly divergent, somewhat shorter than, equal to, or somewhat longer than united portion of style; fruit turbinate to cup shaped, rarely globose-obovoid, round to strongly quadrangular or even alate in cross section, disk thick, more or less fleshy, often prominent until ripe, then drying and dehiscing; seeds light reddish brown.

Found on the six largest Hawaiian islands—Hawaii, Maui, Oahu, Kauai, Molokai, Lanai—in many localized forms, usually found in moist or wet shaded places, such as gulch bottoms and small openings in woods. By far the commonest species of the genus in the Hawaiian islands.

Rock (46) gives *au* as the native name for this species, though the name *pilo*, usually applied to *Coprosma*, is found on the label of a Hillebrand specimen [187 (K)].

A number of collections seem to be hybrids between forms of this species, and one between this species and the next. They have been found, so far, on Oahu and Lanai, and are briefly characterized below, with a suggestion as to their parentage.

Oahu: foot of [Nuuanu] pali, Oct. 7, 1908, *Forbes* (Ho) is much like *f. acuminata* but with a few scattered hairs on the under side of the leaves, calyx lobes slightly broader, corolla tube up to 14 mm. long, lobes up to 10 mm. long, style hirtellous, fruit 6 mm. high, 7 mm. wide, only weakly costate and not contracted at apex; possibly *f. acuminata* × *f. koolauensis*. Lower slopes of Puu Konahuanui, above Nuuanu Pali road, Kailua, alt. 400 m., *Fosberg 10742* (Ho) is much like the above but with more hair on the leaves, shorter corolla tube, lanceolate calyx lobes, style hairy only part way up; probably same parentage as the last. Lower slopes of Puu Konahuanui, above Nuuanu Pali road, Kailua, alt. 430 m., *Fosberg 10740* (Ho) is like *f. acuminata* but with broader leaves with a few hairs beneath, much longer peduncles, free in upper portion, and corolla lobes 6 mm. long; possibly *f. acuminata* × *f. koolauensis*. Hauula Valley, *Degener 13016* (D, USNA) is like *f. alicarpa* but the leaves are attenuate at base, calyx lobes are narrower, and the style is hairy only at base; possibly *f. alicarpa* × *f. Brownii*. East side Nuuanu Pali, *Degener et al 11647* (D) is like *f. acuminata* but with larger leaves, corolla tube slightly longer, lobes slightly longer; possibly *f. acuminata* × *f. koolauensis*. Kalihi Valley, *Forbes 1253* (Ho) is like *f. halawana* but with internodes only faintly costate,

and with the corolla of *f. acuminata*; probably *f. halawana* × *f. acuminata*. North ridge Kipapa Gulch, alt. 900 ft., *Hosaka 566* (Ho) is like *f. Grayana* in every way, but is much larger in all parts; possibly *H. acuminata* *f. Grayana* × *H. fluviatilis* var. *typica*.

Lanai: without locality, *Munro 425* (Ho) is like *f. lanaiensis* but with leaves broader, less acuminate, secondary veins closer together, peduncle more free at apex; possibly *f. lanaiensis* × *f. St.-Johnii*. Head of Hulopoe Gulch, *Fosberg 12498a* (Ho) has vegetative characters of *f. lanaiensis* but much longer stipular mucro and the fruit shape of *f. St.-Johnii*; possibly *f. lanaiensis* × *f. St.-Johnii*. Without locality, *Remy 381* (?) (Gr) is like *f. lanaiensis* but with broader calyx lobes, longer, soon reflexed corolla lobes; possibly *f. lanaiensis* × *f. St.-Johnii*. Mountains near Koele, *Forbes 205.L.* (Ho) is like *f. subsessilis* except for longer petioles, acute leaf bases, and longer stipular mucro; possibly *f. lanaiensis* × *f. St.-Johnii*. Kaiholena-Hookio divide, Halulu, alt. 2,700 ft., *St. John and Eames 18726* (Ho) is like *f. subsessilis* but with corolla much longer and calyx entirely glabrous; possibly *f. subsessilis* × *f. St.-Johnii*. Plateau at head of Kapahaku [Kaphaku] Gulch, alt. 850 m., *Fosberg 12369* (Ho) is like *f. Eamesii* but with longer petioles, longer stipular mucro, somewhat thinner leaves and longer corolla lobes; possibly *f. Eamesii* × *f. St.-Johnii*. Without locality, *Forbes 312.L.* (Ho) is much the same as the last but with narrower leaves, longer pedicels, longer corolla tube but much shorter lobes; possibly *f. Eamesii* × *f. St.-Johnii*.

85. *Hedyotis acuminata* *f. liberipes* Fosberg, n. f.

Internodia non costata; folia glabra subcoriacea; pedunculus infra adnatus supra liber; calycis lobi ovati vel orbiculares maxime 1 cm. longi; corolla glabra vel minute puberula; stylus hirtellus; fructus alatus.

Internodes without ridges; leaf blades up to 16 cm. long and 6.5 cm. wide, usually less, elliptic or ovate-elliptic to (rarely) lanceolate, strongly acuminate, usually acute or attenuate at base, subcoriaceous, secondary veins prominent but not very close together, glabrous, petiole glabrous, 1.5-4.5 cm. long, usually quite long; stipules rounded, mucro about 2.5 mm. long; peduncle 8-17 mm. long, variable, the lower two thirds or more adnate to stem, upper part free and usually divergent, 3-5 flowered, 1 or more flowers often abortive, pedicels up to 18 mm. long; calyx lobes ovate to orbicular, acuminate, up to 1 cm. long, variable; corolla tube 9-12 mm. long, glabrous or minutely puberulent, lobes 8-11 mm. long, patent or reflexed; anthers 2.3-2.5 mm. long; style hirtellous; fruit turbinate, strongly quadrangular-alate, 7-8 mm. long and wide.

Widespread on the island of Kauai, quite variable.

Kauai: Kalalau Valley, *Forbes and Dole 63.K.* (Ho); Waimea Drainage basin, west side, *Forbes 1024.K.* (Ho); Olokele Valley, Sept. 1909, *Forbes* (Ho) *Forbes 454.K.* (Ho); Olokele Canyon, *Degener 11656* (D), *Skottsberg 1040* (Ho); Olokele Gulch, alt. 1,400 ft., *Hitchcock 15203, 15215* (US) (type); Maunapulo, Haena, alt. 400 ft., *St. John and Fosberg 13892* (Ho); Hanakapiae [Hanakapiai], Napali Coast, *St. John et al 10915* (Ho) (young internodes glaucous), *Degener and Ordonez 12644* (D).

St. John and Fosberg 13892 has the free portion of the peduncle variable in length. A Forbes specimen (without number, Sept. 1909) (Ho) collected at the same time and place as *Forbes 454.K* is identical with the latter, except that the peduncle is almost or completely adnate.

86. *Hedyotis acuminata* f. *haupensis* Fosberg, n. f.

Internodia non vel leviter costata; folia chartacea glabra elliptica vel anguste oblonga; calycis lobi anguste ovati vel oblongi maxime 10 mm. longi in fructu; stylus hirtellus; fructus vix quadrangularis.

Internodes not or slightly 4-costate; leaf blades up to 18 cm. long and 8 cm. wide, elliptic to narrowly oblong, chartaceous, secondary veins prominent, but not close together, glabrous beneath, petiole mostly 3-6 cm. long, glabrous; peduncle up to 4 mm. long, entirely adnate or almost so, pedicels up to 2.5 cm. long; calyx lobes narrowly ovate or oblong, up to 5 mm. long in flowering material, up to 10 mm. in fruit; corolla glabrous, tube 9-13 mm. long, lobes 7-10 mm., patent, reflexed in age; anthers 2 mm. long; style densely hirtellous; fruit 7-8 mm. long, 5-7 mm. wide, obovoid, weakly quadrangular.

Kauai: northeast of Kipu, *Degener 9492, 11650* (D); Haupu Range, left hand side of Kipu Kai Gulch, *Forbes 719.K.* (Ho); Haupu (Hoary Head) Mts., Kipu, alt. 1,000 ft., *St. John and Fosberg 13682* (Ho) (type).

87. *Hedyotis acuminata* f. *sphaerocarpa* Fosberg, n. f.

Internodia teretia; folia late ovata vel vix obovata glabra venulosa; calycis lobi lanceolata maxime 5 mm. longi; fructus subsphaericus.

Internodes not costate; leaves up to 10 cm. long, 4.7 cm. wide, broadly ovate, oval, or even slightly obovate, firm-chartaceous, secondary veins prominent beneath, close together, glabrous, petiole glabrous, up to 2 cm. long; stipules low, rounded, mucro 1 mm. long or less; peduncle less than 0.5 mm. long, adnate, pedicels up to 15 mm. long; calyx lobes lanceolate, up to 5 mm. long; corollas not available; fruit 6-7 mm. long and wide, almost spherical, only slightly 4-costate.

Kauai: Hanalei, *Faurie 383* (Ho) (type).

88. *Hedyotis acuminata* f. *brevimucronata* Fosberg, n. f.

Internodia teretia; folia oblanceolata glabra; mucro 1 mm. longus; calycis lobi lanceolati; corollae lobi patentes.

Internodes not costate; leaves oblanceolate, slightly acuminate at apex, base long attenuate to a petiole 2-2.5 cm. long, blade 7.5-9 cm. long, 2-2.5 cm. wide, glabrous; stipules with mucro 1 mm. long; peduncle 4 mm. long, completely adnate to stem, pedicel in flower 1.5 cm. long; flowers glabrous, calyx lobes lanceolate, 8.5 mm. long, 2.5 mm. wide; corolla tube 1 cm. long, lobes patent, 5 mm. long; fruit not available.

Kauai: without locality: *Hillebrand* (B) (type).

89. *Hedyotis acuminata* f. *halawana* Fosberg, n. f.

Internodia quadricostata; folia lanceolata chartacea glabra; pedicelli maxime 3 cm. longi; calycis lobi lanceolati; corollae glabrae, lobi reflexi, tubis aequilongi; fructus costatus.

Internodes 4-costate; leaves up to 11 cm. long, 3.5 cm. wide, usually smaller, lanceolate, base acute, firm-chartaceous, glabrous, petiole glabrous, up to 2.5 cm. long; stipules triangular, mucro up to 2.5 mm. long, usually curved or twisted; peduncle up to 5 mm. long, adnate or free at apex, pedicels up to 3 cm. long; calyx lobes lanceolate, up to 6.5 mm. long in flower, to 11 mm. in fruit; corolla glabrous, tube 6-8 mm. long, lobes as long

or almost so, reflexed; anthers 2 mm. long; style hirtellous; fruit up to 7 mm. long and wide, spherical or slightly obovoid, not quadrangular but noticeably costate.

Found on Oahu on the leeward slope of the Koolau Range above Aiea.

Oahu, Koolau Range: South Halawa Gulch, *Topping 2970* (D); North Halawa Gulch, *Degener et al 11694* (D); Kalauao, Aiea, alt. 675 m., *Hume 133* (Ho); Kalauao Gulch, Aiea, alt. 1,000 ft., *Hume 450* (Ho); Kalauao-Waimalu Ridge, alt. 530 m., *Fosberg 9458* (Ho) (type); without locality, *Mann and Brigham 234* (Gr), 1841 or 1861, *Hinds* (K).

90. *Hedyotis acuminata* f. *Toppingii* Fosberg, n. f.

Internodia non costata; folia elliptico-lanceolata glabra chartacea; calycis lobi ovato-lanceolati 1 cm. longi; corollae extus puberulae lobi reflexi; antherae 1.5 mm. longae; stylus hirtellus; fructus quadrangularis.

Internodes without costae; leaves 10-14 cm. long, up to 4.5 cm. wide, elliptic-lanceolate, acute to rounded at base, chartaceous, glabrous, petiole 1.5-2.5 cm. long; stipules ovate, strongly connate, mucro 2.5 mm. long; peduncle 4-5 mm. long, adnate, pedicels 1-1.7 cm. long; calyx lobes ovate-lanceolate, 1 cm. long; corolla sparsely and minutely puberulent outside, tube 10-11 mm. long; lobes 6-8 mm. long, reflexed; anthers 1.5 mm. long; style hirtellous; fruit cup-shaped, up to 1 cm. long, 8.5 mm. wide, quadrangular.

Oahu, Koolau Range, from Nuuanu south.

Oahu, Koolau Range: Niu Valley, *Captain Araths* [?] (W); middle ridge of Niu Valley, *Degener et al 11698* (D); eastern part of Waialae Ridge, *Degener et al 11663* (D) (type); east ridge of Manoa Valley, *Meebold (Degener's) 11689* (D); Manoa Cliff Trail, *Topping 2910* (D); Nuuanu Pali, *Degener 11662* (D); without locality, *Mann and Brigham 423* (K) (in part).

Named for the late D. L. Topping, well known amateur botanist of Honolulu.

91. *Hedyotis acuminata* f. *Sherffiana* Fosberg, n. f.

Planta ramulosa; internodia non costata; folia maxime 7 cm. longa ovata vel anguste elliptica, costis subtus hirtellis; petiolus hirtellus; stipulae hirtellae glabratae; calycis lobi lanceolati vel oblongo-lanceolati; corollae tubus extus minute villosus; stylus pilosus; fructus quadrangularis late turbinatus.

Small branchlets numerous, internodes not costate; leaves up to 7 cm. long, 3 cm. wide, ovate or narrowly elliptic, firm-chartaceous, not or only somewhat venulose beneath, sides of midrib hirtellous beneath, petiole hirtellous, up to 1 cm. long; stipules ovate, hirtellous, glabrate, mucro up to 3 mm. long; peduncle up to 3 mm. long, free only at apex or completely adnate, pedicels up to 2.5 cm. long; calyx lobes up to 1 cm., lanceolate or oblong-lanceolate; corolla tube minutely villous outside, up to 12 mm. long, lobes up to 9 mm. long, soon reflexed; anthers 2 mm. long; style pilose; fruit broadly turbinate, 8-9 mm. wide, 6-7 mm. high, quadrangular.

Central Waianae Mountains, Oahu.

Oahu, Waianae Mountains: valley south of east ridge of Puu Kalena, Waianaeuka, alt. 840 m., *Fosberg 12998* (Ho) (type); third small valley northeast of Palikea, *Degener et al 11701* (D).

92. *Hedyotis acuminata* f. *kaalae* (Wawra) Fosberg, n. comb.*Kadua kaalae* Wawra, Flora 57: 273, 1874.*Kadua grandis* β var. Hillebr., Fl. Haw. Is., 160, 1888.

Internodes without costae; leaves up to 13 cm. long, 4.5 cm. wide, elliptic, base rounded to acute, thin, slightly venulose, sides of midrib and to some extent the blade hirtellous beneath, petiole hirtellous, up to 2 cm. long; stipules triangular, hirtellous, mucro 1-2 mm. long; peduncle up to 6 mm. long, free only at apex, pedicels hirtellous, up to 8 mm. long, or in fruit up to 2 cm.; calyx lobes minutely and sparsely hirtellous, linear to narrowly oblong; corolla hirtellous outside, tube up to 10 mm. long, lobes up to 6.5 mm. long, patent; anthers 2 mm. long; style pilose; fruit obovoid, somewhat contracted at apex, costate, 7-8 mm. long, 5-7 mm. wide, crowned with linear calyx lobes up to 1 cm. long.

Oahu, widespread in the central part of the Waianae Mountains.

Oahu, Waianae Mts.: Kaala, *Wawra 2226* (W, 2 sheets) (type); small gulch above Kaala Trail, east base of Puu Kalena, Waianaueka, alt. 600 m., *Fosberg 12975* (Ho); east ridge of Puu Hapapa, Honouliuli, alt. 2,600 ft., *St. John 10418* (Ho); small valley southeast of Puu Hapapa, *Degener et al 11690* (D); Puu Kanehoa, alt. 2,300 ft., *Hosaka 364* (Ho); east slope of Puu Kaua, *Degener et al 11688* (D); north fork of valley east of Palikea, Honouliuli, alt. 1,800 ft., *St. John 10359* (Ho); without locality, *Hillebrand* (E) (in part), 189 (K, B, Gr) (sheets mixed in K, B).

93. *Hedyotis acuminata* f. *koolauensis* Fosberg, n. f.

Internodia non costata; folia magna chartacea glabra elliptica ovata vel lanceolata; calycis lobi ovati; corollae glabrae maxime 15 mm. longae, lobi maxime 10 mm. reflexi; stylus hirtellus; fructus quadrangularis.

Internodes not costate; leaves variable in size, up to 17 cm. long, 6 cm. wide, ovate or elliptic to lanceolate, base acute to rounded, glabrous, chartaceous, not strongly venulose, petiole 1-2.5 cm. long, glabrous; stipules low-rounded to triangular, mucro up to 5 mm. long; peduncle up to 6.5 mm. long, upper third sometimes free, usually much shorter and more or less completely adnate, pedicels 1-2 cm. long; calyx lobes ovate, up to 14 mm. long, usually much shorter; corolla tube glabrous, up to 15 mm. long, lobes up to 10 mm., reflexed; anthers 2-2.5 mm. long; style hirtellous even up on the outside of the branches in some examples; fruit turbinate to cup-shaped, 8 mm. high, 7 mm. wide, strongly quadrangular.

Found in the southern part of the Koolau Range, Oahu.

Oahu, Koolau Range: Niu Valley, *Degener et al 11713* (D), alt. 1,200 ft., *Rock 4813* (Ho); right fork Wailupe Valley, *Garber and Forbes 180* (Ho); ridge between Palolo and Waialae Iki, *Forbes 2409.O.* (Ho); right fork Palolo Valley, *Garber 509* (Ho); Palolo Valley, *Hitchcock 15595* (US), *Skottsberg 897* (Ho), *Forbes 1959.O.* (Ho), Dec. 7, 1908, *Forbes* (Ho), *Forbes and Rock* (Ho), *Rock (93, 94) 148* (Ho); Mt. Olympus, *Degener 11706* (D); Tantalus, *Degener 11713, 11657* (D); Manoa Cliff Trail, *Forbes 415* (Ho), alt. 1,800 ft., *Hume 350, 433* (Ho), alt. 435 m., *Fosberg 9697* (Ho), alt. 500 m., *Fosberg 8980* (Ho) (type); Pauoa Flats, *Degener 11735* (D), 1598 (D, NY); Nuuanu Pali, *Hitchcock 13775* (US); Hillebrand's Glen, Dec. 29, 1908, *Forbes* (Ho); west side of Nuuanu Valley, *Forbes 1431.O.* (Ho); Kapa-

lama Valley, *Forbes 1855.O.* (Ho); without locality, *Hillebrand* (US), 187 (Gr, K) (in part); *Mann and Brigham 417* (Ho), 523 (Ho, US, Gr, K) (in part); Maunawili, east base Puu Konahuanui, Kailua, alt. 320 m., *Fosberg 10783* (Ho) (this seems to belong here, although the leaves are rather narrow and the pedicels much longer than usual for this form).

94. *Hedyotis acuminata* f. *Brownii* Fosberg, n. f.

Internodia non costata; folia elliptica chartacea, costis subtus hirtellis; calycis lobi ovati vel oblongi maxime 7.5 mm. longi; corollae glabrae, tubus maxime 11 mm. longus, lobis reflexis; stylus infra hirtellus; fructus quadrangularis.

Internodes not costate; leaves up to 13 cm. long, 4.5 cm. wide, elliptic, base acute to rounded and slightly attenuate, chartaceous, somewhat venulose but secondary veins not numerous, midrib hirtellous beneath, petiole glabrous, up to 2.5 cm. long; peduncle up to 5 mm. long, apex free, remaining as a tubercle on old stems, pedicels up to 2.5 cm. long, usually much shorter; calyx lobes ovate or oblong, up to 7.5 mm. long; corolla tube glabrous, up to 11 mm. long, lobes up to 7 mm. long, reflexed; anthers 2 mm. long; style hirtellous at base; fruit turbinate-cup-shaped, up to 12 mm. high and 10 mm. wide, quadrangular.

Central part of Koolau Range, Oahu.

Oahu, Koolau Range: Waimalu, alt. 1,000 ft., *Degener et al 11672* (D) (type), *Brown 1281* (Ho); Nuuanu Peak, Feb. 3, 1866, *Alexander* (K); windward side of Koolau Range, just below Nuuanu Pali, *Harris C242014* (Ho); without locality, *Degener 11661* (D), *Hillebrand* (K, E); *Hillebrand 189* (K) (sheet labeled Waianae Range, but one of the plants on it doubtless from Koolau Range).

Named for Dr. F. B. H. Brown, of Honolulu, for many years a student of the Polynesian flora.

95. *Hedyotis acuminata* f. *elliptica* Fosberg, n. f.

Internodia non costata; folia elliptica vel elliptici-lanceolata chartacea glabra vel subtus puberula; pedunculus maxime 12 mm. longus supra liberus; calycis lobi ovati; corollae tubus sparse hirtellus; stylus pilosus; fructus alatus.

Internodes not costate; leaves up to 14 cm. long, 4.5 cm. wide, elliptic or elliptic-lanceolate, base acute to obtuse, firm-chartaceous, not strongly venulose, glabrous or sparsely puberulent beneath, especially on midrib, petiole glabrous, up to 2 cm. long; stipules ovate or triangular, mucro up to 2.5 mm. long; peduncle up to 12 mm. long, upper third free except on shorter ones, pedicels up to 2 cm. long; calyx lobes ovate, up to 9 mm. long; corolla tube sparsely hirtellous, up to 1 cm. long, lobes 5-6 mm. long, patent to somewhat reflexed; anthers 2.5 mm. long; style pilose; fruit cup shaped to somewhat turbinate, up to 1 cm. high, 9 mm. wide, strongly winged.

Found on the windward side of the Koolau Range, Oahu.

Oahu, Koolau Range: southeast of Kahana Bay, *Degener 11699* (D); Castle (Pig-god) Trail, Kaluanui, alt. 650 m., *Fosberg 12956* (Ho) (type); Laie-Malaekahana Ridge, alt. 1,000 ft., *St. John 11553* (Ho).

96. *Hedyotis acuminata* f. *Grayana* Fosberg, n. f.

Kadua petiolata Gray, Ann. Acad. Arts. Sci., Proc. 4: 318, 1860 (in part).

Internodia non costata; folia lanceolata chartacea, costis subtus hirtellis; stipulae glabrae vel glabratae; calycis lobi lineares vel anguste lanceolati; corolla glabra; stylus infra hirtellus; fructus non vel vix quadrangularis.

Internodes without costae; leaves up to 13 (-15) cm. long, 3 (-4) cm. wide, lanceolate oblong-lanceolate, or elliptic-lanceolate, base acute to obtuse, chartaceous, not strongly venulose, hirtellous beneath along midrib, petiole glabrous or rarely hirtellous at base, up to 2 (-3) cm. long; stipules glabrous or at first slightly hirtellous, low-triangular, mucro up to 3 mm. long; peduncle up to 4 mm. long, free at apex, pedicels up to 17 (-25) mm. long; calyx lobes linear or narrowly lanceolate, up to 1 cm. long; corolla glabrous, tube up to 11 mm. long, lobes patent, soon reflexed; anthers 2 mm. long; style hairy at base; fruit cup shaped to almost spherical, up to 8 mm. high, 7 mm. wide, weakly or not at all quadrangular.

Found in both ends of the Waianae Mountains, and at least in Kipapa Gulch, in the Koolau Range, Oahu.

Oahu, Waianae Mts.: 2d gulch east of Puu Kaupakuhale, Mokuleia, alt. 820 m., *Fosberg and St. John 8910* (Ho); west-central branch of Makaleha Valley, *Degener et al 11674* (D); Pahole (Kukuiula) Gulch, near head of right branch, Mokuleia, alt. 550 m., *Fosberg 13063* (Ho) (type); west branch of Kaaawa Gulch (north of Kaala), *Degener 13024* (D, USNA), *13018* (D, USNA) (leaves more hairy and smaller than usual); Kaaawa Gulch (north of Kaala) *Degener and Ordonez 12201* (D) (calyx lobes broader than usual); south side of Makua Valley, alt. 400 m., *Fosberg 12344* (Ho); east of Palikea, *Degener 11703* (D); between Palehua and Palikea, *Degener et al 11690* (D). Oahu, Koolau Range: "Waialua range", *Hillebrand 192* (K); Kipapa Gulch, north ridge, alt. 900 ft., *Hosaka 567* (Ho); Kipapa Gulch, 2d north fork, alt. 1,000 ft., *Hosaka 1034* (Ho). Without locality: *Hillebrand* (E) (in part), *Hillebrand* (K) (in part), *190* (K), *Nuttall* (K), *Seemann 2270* (Gr), *U.S. Expl. Exped.* (NY) (marked *K. petiolata*, n. sp.), *Wawra 2374* (W).

The Koolau specimens have larger and thinner leaves than most of the specimens from the Waianae Mountains.

97. *Hedyotis acuminata* f. *hirtella* Fosberg, n. f.

Internodia non costata; folia chartacea subtus hirtella; petiolus hirtellus; stipulae glabrae vel glabratae; calycis lobi anguste oblongi maxime 1 cm. longi; corolla glabra; stylus hirtellus; fructus turbinatus quadrangularis.

Internodes not costate; leaves up to 9.5 cm. long, 3.5 cm. wide, chartaceous, not venulose, hirtellous beneath, especially along midrib, petiole hirtellous, under 1 cm. long; stipules triangular, glabrous or slightly hirtellous and glabrate, mucro up to 2 mm. long; corolla glabrous, tube up to 11 mm. long, lobes up to 6 mm. long, patent to reflexed; anthers 2 mm. long; style hirtellous part way up; fruit turbinate, up to 8 mm. high and wide, sharply quadrangular.

Central Waianae Mountains, Oahu.

Oahu, Waianae Mts.: north ridge of Puu Kumakalii, Waianaueka, alt. 775 m., *Fosberg 13634* (Ho) (type); east ridge of Puu Kalena, Waianaueka, alt. 740 m., *Fosberg 13018* (Ho); Palikea, *Degener et al 11685* (D).

98. *Hedyotis acuminata* f. *acuminata* (Cham. and Schlecht.) Fosberg, n. comb.

Kadua acuminata Cham. and Schlecht., *Linnaea* 4: 163, 1829.

Kadua petiolata Gray, *Am. Acad. Arts Sci., Proc.* 4: 318, 1860 (in part).

Internodes not or only faintly costate; leaves up to 8 (rarely 12) cm. long, 3 cm. wide, lanceolate or ovate-lanceolate to narrowly oblong, base acute to rounded or (rarely) subcordate, thick chartaceous, glabrous, not strongly venulose, petiole glabrous, up to 1.5 cm. long, usually under 1 cm.; stipules low-triangular, mucro 1-2 mm. long; peduncle 2 mm. long, free only at apex, pedicels 1-2 cm. long; calyx lobes lanceolate, up to 8 mm. long; corolla glabrous, tube 9 mm. long, lobes about 4 mm. long, not strongly reflexed; anthers 1.8 mm. long; lower half of style hirtellous; fruit obovoid-globose, 5-7 mm. high and wide, somewhat costate but not quadrangular, usually slightly contracted at apex.

Southern part of Koolau Range, between Wailupe and Moanalua, Oahu.

Oahu, Koolau Range: Wailupe, *Hillebrand* (B); northwest slope of Tantalus, *Degener 11660* (D); at the [Nuuanu] Pali, *Heller 2360* (NY, Gr, K, US, Ho, E); Nuuanu Pali, *Bush (Degener's) 11649* (D), *Forbes 1519* (Ho), *Hitchcock 14056* (US); southeast side of Nuuanu Pali, *Degener and Shear 11714* (D); Nuuanu Valley, *Hillebrand 193* (K), 1912, *Rock* (Ho); Kalihi Pali, *Christophersen 1269* (Ho); without locality, *Seemann 2270* (K), *Nuttall* (K), (in part), *Gaudichaud* (Gr), *Beechey* (K), *U. S. Expl. Exped.* (Gr, US), 1869, *Hillebrand* (US); Moanalua Valley, April 6, 1909, *Forbes* (Ho) (possibly a hybrid with f. *halawana* as the leaves are very long and the internodes slightly costate).

The type of *Kadua acuminata* cannot be found in Berlin, but the careful and detailed description fits this form in all particulars. Gray's *K. petiolata* was based on mixed material, mostly this form, but some f. *Grayana*. It seems best to consider the name a synonym of this form, selecting the U. S. Exploring Expedition specimen at the Gray Herbarium as the type of *K. petiolata*.

99. *Hedyotis acuminata* f. *Violetana* Fosberg, n. f.

Internodia non costata; folia anguste elliptica vel lanceolata glabra chartacea; calycis lobi lanceolati; corollae glabrae, lobi patentes; stylus hirtellus; fructus costatus vix quadrangularis ad apicem non contractus.

Internodes not costate; leaves up to 10 cm. long, 3.5 cm. wide, narrowly elliptic or lanceolate, glabrous, chartaceous, not venulose, petiole glabrous, up to 2 cm. long; stipules ovate to low-triangular, mucro 1.5 mm. long; peduncle up to 4 mm. long, adnate except at extreme apex, pedicels up to 2 cm. long; calyx lobes lanceolate, up to 1.2 cm. long; corolla glabrous, tube 9 mm. long, lobes 5 mm. long, patent; anthers 2.2 mm. long; style hirtellous; fruit costate but only weakly quadrangular, turbinate to somewhat cup-shaped, up to 9-10 mm. high, 7-8 mm. wide, not at all contracted at apex.

Known from the north end of the Waianae Mountains, Oahu, with one doubtful collection from the central part of the range.

Oahu, Waianae Mts: head of Kawaihapai Gulch, alt. 600 m., *Fosberg 13603* (Ho) (type); Pahole (Kukuiula) Gulch, near head of right branch, Mokuleia, alt. 560 m., *Fosberg 13057* (Ho); summit ridge northwest of Puu

Kanehoa, *Degener et al 12734* (D). The last collection cited has only fruit. The leaves have a few hairs beneath.

Named for Mrs. Violet Fosberg, whose help in reading and criticizing this manuscript is greatly appreciated.

100. *Hedyotis acuminata* f. *alicarpa* Fosberg, n. f. (fig. 8).

Kadua grandis Gray, Am. Acad. Arts Sci., Proc. 4: 318, 1860 (in part).

Internodia non costata; folia elliptica ovalia vel obovata chartacea subtus glabra vel vix hirtella; calycis lobi ovati vel rotundi; corollae glabrae, lobi reflexi; stylus pilosus; fructus alatus.

Internodes not costate; leaves up to 15 cm. long, 7 cm. wide, narrowly or broadly elliptic, oval or obovate, base acute to rounded, chartaceous, glabrous or somewhat hirtellous beneath, petiole glabrous or hirtellous, up to 2.5 cm. long; stipules triangular, mucro up to 2 mm. long; peduncle up to 6 mm. long, free at apex, pedicels heavy, up to 2.5 cm. long; calyx lobes ovate to orbicular, up to 10 mm. long; corolla glabrous, tube up to 11 mm. long, lobes up to 8 mm., reflexed; anthers 2.5-3.5 mm. long, oblong to linear; style pilose; fruit up to 10 mm. long, 8 mm. wide, cup shaped, quadrangular, strongly winged.

North end of the Koolau Range, Oahu, and, perhaps, Hawaii.

Oahu, Koolau Range: Sacred Falls, Kaluanui Gulch, *Fosberg 14127* (Ho); western ridge of Kaipapau [Kaipapau], *Degener and Park 11666* (D) (type); Kawailoa, April 12, 1935, *Welch* (Ho); Kawaiiki, *Degener 11684* (D).

Hawaii [?]: without locality, *U. S. Expl. Exped.* (US).

The Hawaii specimen is a part of the original material of *K. grandis* Gray. I cannot distinguish it, by any constant character, from the Oahu specimens. It has only young fruit. If flowers and mature fruits were available, it might prove to be distinct, but as the locality is only "Hawaii", the plant may have come from Oahu. The labeling of the U. S. Exploring Expedition plants was not particularly exact as to detailed localities.

101. *Hedyotis acuminata* f. *pilicalyx* Fosberg, n. f.

Internodi valde costata; folia elliptica vel elliptico-lanceolata chartacea subtus hirtella; calycis lobi oblongo-lanceolati extus minute pilosi; fructus turbinatus quadrangularis.

Internodes strongly costate; leaves up to 12 cm. long, 3 cm. wide, elliptic or elliptic-lanceolate, base acute to attenuate, rarely rounded, chartaceous, only slightly venulose, hirtellous beneath on midrib and secondary veins, petiole glabrous, up to 2 cm. long; free only at apex, pedicels 7-12 mm. long; calyx lobes oblong-lanceolate, up to 1 cm. long, pilosulous outside; corolla not available; fruit turbinate, 9-10 mm. high, 8 mm. wide, quadrangular.

Molokai: Kahuaawi Gulch, *Degener 11717* (D); small ravine northwest of Maunahui, *Degener 11716* (D) (type).

102. *Hedyotis acuminata* f. *variabilis* Fosberg, n. f.

Internodia non costata; folia elliptica vel ovata chartacea venulosa subtus hirtella; calycis lobi oblongi vel oblongi-lanceolati; corolla variabilis; stylus infra hirtellus; fructus turbinatus quadrangularis vel vix alatus.

Internodes without ridges; leaf blades up to 17 cm. long, 9 cm. wide, elliptic to ovate, base acute to attenuate, chartaceous, venulose beneath, hirtellous beneath on veins, petiole glabrous, 1-3.5 cm. long; stipules low-triangular, mucro 2-6.5 mm. long; peduncle up to 7 mm. long, free at apex only, pedicels 2-3 cm. long; calyx lobes oblong or oblong-lanceolate, up to 10 mm. long; corolla tube glabrous, 10-12 mm. long, lobes up to 10 mm. long, soon reflexed, corolla variable in size even on same plant; anthers 2-2.3 mm. long; style hairy in lower 2-3 mm.; fruit turbinate, 6-7 mm. high, 6-9 mm. wide, quadrangular or somewhat winged, disk prominent.

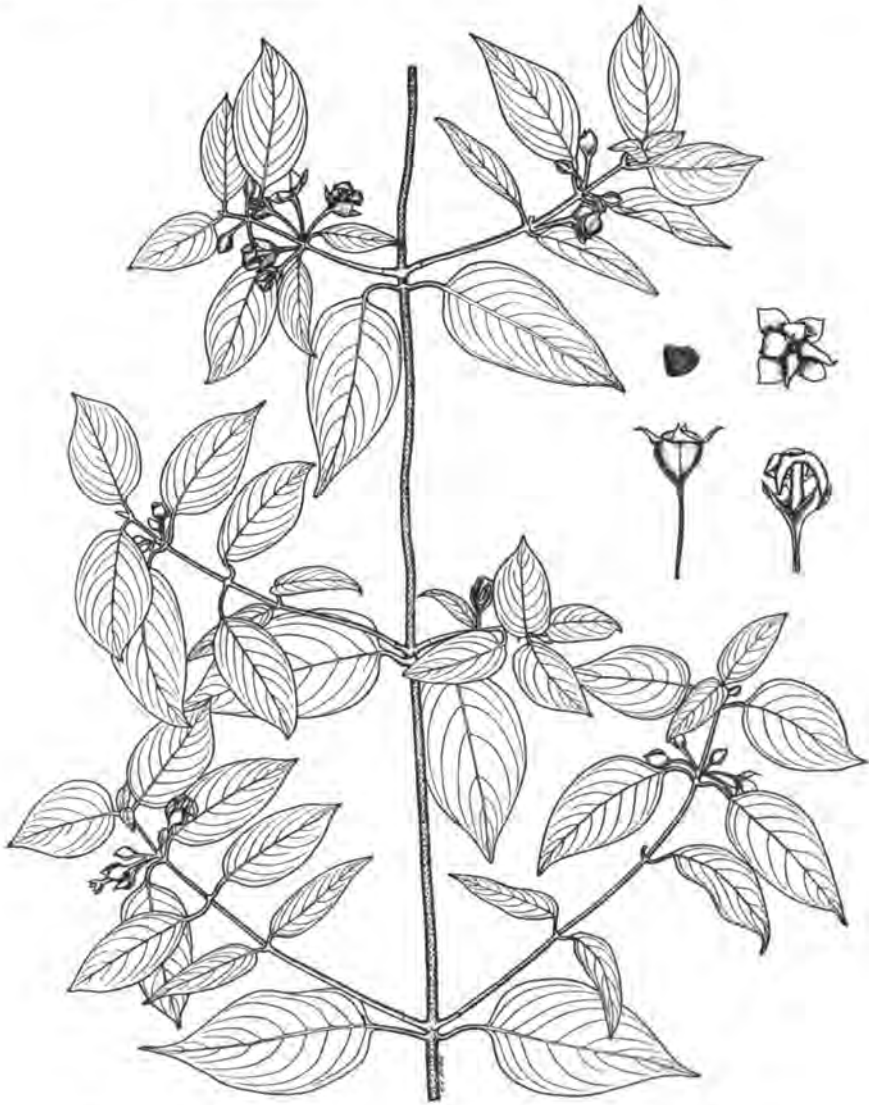


FIGURE 8.—*Hedyotis acuminata* f. *alicarpa* (drawing loaned by Degener).

Southeastern Molokai.

Molokai: Pelekunu Trail, *Forbes 247.Mo.* (Ho); east branch of Kaluaaha Valley, *Degener 11732* (D) (leaves very narrow); west branch of Mapulehu Valley, *Degener 11725, 11727* (D); Mapulehu Valley, *Forbes 311.Mo.* (Ho); sloping plateau east of Mapulehu Valley, alt. 800 m., *Fosberg 13386* (Ho) (type); Halawa, *Hillebrand* (B); without locality: *Hillebrand* (B).

103. *Hedyotis acuminata* f. *quadricosta* Fosberg, n. f.

Internodia costata; folia oblonga vel late elliptica tenuia subtus hirtella; calycis lobi ovati; corollae glabrae, tubus maxime 13 mm. longus, lobis reflexis; stylus infra hirtellus; fructus alatus.

Internodes 4-costate; leaves up to 11.5 cm. long, 5 cm. wide, oblong or broadly elliptic, base rounded, thin, not strongly venulose, hirtellous beneath along midrib and veins, petiole glabrous, up to 1.5 cm. long; stipules low-triangular, mucro 2-2.5 mm. long; peduncle up to 7 mm. long, upper 1-2 mm. free, pedicels up to 3 cm. long; calyx lobes ovate, up to 1 cm. long; corolla tube up to 13 mm. long, glabrous, lobes up to 8 mm. long, reflexed; anthers 2.5 mm. long; style hairy only at base; fruit quadrangular, strongly winged, cup shaped or somewhat turbinate, 8 mm. high and wide.

Eastern end of Molokai.

Molokai: near Brown's Ranch, west of Halawa Valley, *Degener 2356* (D) (type); Kalae, *Hillebrand* (B) (indicated by a herbarium name as a distinct variety by Hillebrand); without locality, *Hillebrand* (W) (this specimen a fragment doubtfully placed here).

104. *Hedyotis acuminata* f. *duripes* Fosberg, n. f.

Internodia costata; folia elliptica vel oblonga chartacea subtus vix hirtella; calycis lobi ovati; fructus alatus.

Internodes 4-costate; leaves up to 9 cm. long, 3.5 cm. wide, elliptic to oblong, base rounded, chartaceous, not strongly venulose, slightly hirtellous beneath along sides of midrib, petiole up to 1.7 cm. long; stipules low-ovate, mucro 1 mm. long; peduncle up to 7 mm. long, upper third free or more or less adnate, pedicels stout, up to 3.5 cm. long; calyx lobes ovate, somewhat dilated at base, up to 1 cm. long (in fruit); flowers not available; fruit cup shaped, strongly winged, 8 mm. wide and long.

Molokai: east of Puahonui Point, *Degener 11731* (D) (type).105. *Hedyotis acuminata* f. *Storeyi* Fosberg, n. f.

Planta glabra; internodia non costata; folia elliptica vel vix obovata; calycis lobi oblongi; fructus quadrangularis.

Plant glabrous, internodes not costate, green; leaves elliptic to slightly obovate, chartaceous, slightly venulose, weakly acuminate, 11 cm. long, 4 cm. wide, mostly about 7 cm. long, 2.5 cm. wide, petiole 1-2.5 cm. long; stipules low triangular, mucro 1 mm. long; peduncle up to 6 mm. long, free at extreme apex, pedicels 7-10 mm. long; calyx lobes oblong, 5.5 mm. long; corolla tube 9 mm. long, lobes 6 mm., reflexed; fruit broadly cup shaped, quadrangular, 6 mm. high, 5-7 mm. wide.

Molokai: Wailau Valley, Kukuinui ridge, alt. 2,000 ft., *St. John, Dunn and Storey 13279* (Ho) (type).

Named for W. B. Storey, of Honolulu, one of the collectors of the type.

106. *Hedyotis acuminata* f. *wailauensis* Fosberg, n. f.

Internodia non costata; folia elliptica vel elliptico-lanceolata subtus hirtella; calycis lobi late ovati vel rotundi glabri; corollae glabrae tubus maxime 15 mm. longus; stylus infra vix hirtellus; fructus late turbinatus alatus.

Internodes not costate; leaf blades up to 15 cm. long, 7 cm. wide, broadly elliptic to elliptic-lanceolate, base acute to rounded, chartaceous to subcoriaceous, venulose beneath, hirtellous beneath on veins, petiole glabrous, up to 4 cm. long; stipules low-triangular, mucro 1.5-4 mm. long; peduncle up to 5 mm. long, free only at apex, pedicels up to 3 cm. long, usually much shorter; calyx lobes broadly ovate or orbicular, up to 8 mm. long, glabrous; corolla tube glabrous, up to 15 mm. long, lobes 6-9 mm. long, patent, soon reflexed; anthers 2-2.3 mm. long; style slightly hairy at base; fruit broadly turbinate, up to 9 mm. high and 10 mm. wide, winged.

Found in the vicinity of Wailau Valley, east Molokai, in the northern end of the Koolau Range, Oahu, and in the west Maui mountains.

Molokai: Wailau Valley, *Degener 11720* (D), *Forbes 540.Mo., 565.Mo.* (Ho), alt. 200 m., *Fosberg 9609, 9606a* (Ho) (type); pali above peninsula west of Wailau Valley, alt. 175 m., *Fosberg 9654* (Ho).

Oahu, Koolau Range: Oio-Paumalu trail, *Degener 13019, 13020* (D, USNA).

Maui, west: mountain *mauka* of Waihee, *Degener 11708* (D); Honokahau Drainage Basin, *Forbes 489.M.* (Ho).

107. *Hedyotis acuminata* f. *heteripes* Fosberg, n. f.

Internodia non costata; folia magna elliptica tenues subtus vix hirtella; pedicelli filiformes centrale lateralem excedente; calycis lobi anguste lanceolati.

Internodes not costate; leaf blades up to 18 cm. long, 7 cm. wide, elliptic, base acute-attenuate, thin, somewhat venulose, veins not numerous, midrib slightly hirtellous beneath, petiole glabrous, up to 2 cm. long; stipules broadly ovate, mucro 2 mm. long; peduncle 3 mm. long, completely adnate, pedicels filiform, center one much longer than lateral ones, at least in bud, center one up to 3.2 cm. long, lateral ones up to 5 mm.; calyx lobes narrowly lanceolate, at least 7 mm. long; flowers and fruit not available.

Lanai: Kaiholena, *Munro 463, 250* (Ho) (type).

108. *Hedyotis acuminata* f. *lanaiensis* Fosberg, n. f.

Internodia non costata; folia chartacea venulosa subtus hirtella; calycis lobi oblongo-lanceolati; corollae glabrae, tubus 1 cm. longus, lobis patentibus; stylus infra hirtellus; fructus late turbinatus quadrangularis.

Internodes not costate; leaves up to 12 cm. long and 5 cm. wide, chartaceous, somewhat venulose, hirtellous beneath on sides of midrib and secondary veins, secondary veins few, petiole 1-2 cm. long, glabrous; stipules broadly ovate, mucro 2.5-3 mm. long; peduncle up to 4 mm. long, free only at apex, pedicels up to 1 cm. long; calyx lobes oblong-lanceolate, up to 6 mm. long in flower, 10 mm. in fruit; corolla tube glabrous, 1 cm. long, lobes 5-6 mm. long, patent; anthers 2 mm. long; style hairy only at base; fruit broadly turbinate, quadrangular, 5 mm. high, 5-6 mm. wide.

Lanai: head of Hulopoe Gulch, alt. 700 m., *Fosberg 12498* (Ho) (type).

109. *Hedyotis acuminata* f. *St.-Johnii* Fosberg, n. f.

Internodia non costata; folia late elliptica ovalia vel oblonga subcoriacea venulosa subtus hirtella; calycis lobi foliacea oblonga; corollae glabrae, tubus 1-1.5 cm. longus; stylus infra hirtellus; fructus quadrangularis.

Internodes not costate; leaves up to 13 cm. long, 6.5 cm. wide, broadly elliptic, oval or oblong, rounded to acute at base, subcoriaceous, venulose beneath, secondary veins close together, midrib and secondary veins hirtellous beneath, petiole glabrous or slightly hirtellous, 0.5-1 cm. long, rarely 2 cm.; stipules broadly ovate, mucro 3-4 mm. long; peduncle up to 4 mm. long, free only at apex, pedicels 1-3 cm. long, usually 1.5-2 cm.; calyx lobes large, foliaceous, oblong, up to 1 cm. long, usually shorter; corolla tube glabrous, 1-1.5 cm. long, lobes 7-10 mm. long; style hirtellous only in the basal 1 mm.; fruit broadly cup shaped, 5-6 mm. high, quadrangular, disk convex.

Known from the Lanai mountains.

Lanai: Kaiholena, *Munro 217* (Ho); ridge below Puu Aalii, between Maunalei drainage and Hauola drainage, alt. 850 m., *Fosberg 12479* (Ho) (type); Haalelepaakai, April 6, 1915, *Munro* (Ho); Lanaihale, Palawai, *St. John and Hosaka 18874* (Ho).

Named for Dr. Harold St. John, of the University of Hawaii, authority on the Hawaiian flora.

110. *Hedyotis acuminata* f. *Eamesii* Fosberg, n. f.

Internodia non costata; folia oblonga vel elliptica parva coriacea venulosa subtus hirtella; petiolus latus; calycis lobi ovati vel oblongi-ovati rare lanceolati maxime 6 mm. longi; corollae glabrae lobi patentes; stylus infra pilosus; fructus quadrangularis.

Internodes not costate; leaves up to 9 cm. long and 4 cm. wide, usually smaller, oblong or elliptic, acute or slightly acuminate, base acute, coriaceous, venulose beneath, hirtellous beneath, especially on midrib and veins, petiole glabrous, winged, at least 2 mm. wide including wings, up to 4 (-7) mm. long; stipules broadly ovate, mucro 1-1.5 mm. long; peduncle up to 3 mm. long, apex free, persisting as a prominent tubercle on the old stem, pedicels up to 8 mm. long; calyx lobes ovate or oblong-ovate, rarely broadly lanceolate, up to 6 mm. long; corolla tube glabrous 10-12 mm. long, lobes 6-9 mm. long, patent; anthers 2 mm. long; style pilose at base; fruit usually turbinate, 5-8 mm. high, 6-8 mm. wide, quadrangular.

Lanai: Kaiholena Valley, July 1910, *Rock* (Ho); Kaiholena ridge, June 1910, *Rock* (Ho); Kaiholena, April 3, 1915, *Munro* (Ho) (large leafed); ridge above Koele, *Rock* (Ho) (type); mountains near Koele, *Forbes 205.L.* (Ho); upper part of mountain, *Hitchcock 14655* (US); Mahana, Hulopoe Gulch, alt. 2,000 ft., *St. John and Eames 18744* (Ho) (has slightly longer petioles and pedicels than normal); without locality, *Hillebrand* (US); Lanaihale, *Ordonez (Degener's) 12857* (D); Waialala Gulch, *Ordonez (Degener's) 12863* (D).

Named for Dr. A. J. Eames, of Cornell University.

111. *Hedyotis acuminata* f. *tuberculata* Fosberg, n. f.

Internodia non costata; folia elliptica coriacea glabra; calycis lobi ovati vel oblongi breves; corollae glabrae, lobi patentes; antherae 1.5 mm. longae; stylus dense hirtellus; fructus quadrangularis.

Internodes not costate; leaves up to 6 cm. long, 2.4 cm. wide, elliptic, apex acute, base acute, coriaceous, only slightly venulose, glabrous, petiole up to 6 mm. long, glabrous; stipules very low, rounded, mucro 0.5-0.7 mm. long; peduncle 3 mm. long, apex free, persisting as a tubercle on old stems; calyx lobes ovate to oblong, 3 mm. long or less; corolla

tube glabrous, 7-8 mm. long, lobes 4 mm. long, patent; anthers 1.5 mm. long; style densely hirtellous; fruit 6-7 mm. high, 5 mm. wide, cup shaped, sharply quadrangular.

Lanai: without locality: *Munro 7, 41* (Ho) (type).

112. *Hedyotis acuminata* f. *subsessilis* Fosberg, n. f.

Internodia non costata; folia parva ovata oblonga vel ovalia subcordata dura coriacea valde venulosa subtus lanato-hirtella subsessilia; calyx extus vix hirtellus, lobis ovatis vel ovato-oblongis; stylus infra hirtellus; fructus quadrangularis.

Internodes not costate; leaves up to 9 cm. long, 4 cm. wide, ovate or oblong to oval, subcordate at base, margin revolute, stiff-coriaceous, strongly venulose beneath, veins close together, sparsely woolly-hirtellous beneath on veins and midrib, subsessile, petiole up to 2 mm. long, broader than long, glabrous; stipules very broadly ovate, mucro 1 mm. long; peduncle 3-5 mm. long, free at apex, pedicels up to 1 cm. long in flower, 1.5 cm. in fruit; calyx very slightly hirtellous outside, lobes ovate to ovate-oblong, up to 5 mm. long; corolla tube glabrous, 10-11 mm. long, lobes 7-8 mm. long, patent to somewhat reflexed; anthers 2 mm. long; style hairy at base; fruit cup shaped, 5 mm. high, 6 mm. wide, quadrangular.

Lanai: mountains near Koele, *Forbes 39.L.* (Ho); Kaiholena Gulch, alt. 750 m., *Fosberg 12602* (Ho) (type); without locality: *Forbes* (Ho).

113. *Hedyotis acuminata* f. *ovalifolia* (Gray) Fosberg, n. comb.

Kadua petiolata var. *ovalifolia* Gray, Am. Acad. Arts Sci., Proc. 4: 318, 1860.

Internodes with 4 costae; leaves up to 12 cm. long, 6 cm. wide, usually smaller, broadly elliptic, ovate, or oblong, base acute to rounded but slightly attenuate, firmly chartaceous, not strongly venulose, midrib and secondary veins slightly pilosulous beneath, petiole glabrous, up to 12 (-25) mm. long; stipules low-triangular, mucro up to 2.5 mm. long; peduncle up to 4-5 mm. long, free at apex, which remains on old stems as a prominent tubercle, pedicels 7-23 mm. long; calyx lobes up to 5 mm. long, lanceolate or ovate-lanceolate, apex subulate, hirtellous inside; corolla tube glabrous, 12 mm. long, lobes 5-6 mm. long, somewhat reflexed; style hirtellous at base; fruit turbinate, 5 mm. long and wide; slightly or not at all quadrangular.

Known only from west Maui.

Maui, west: Iao Valley, *Forbes 100.M.* (Ho); Wailuku, *Mann and Brigham* (K), *Mann and Brigham 382* (Gr); without locality, *Wawra 1830* (NY, W), *Mann and Brigham 417* (Ho, Y, Gr) (Gray specimen mislabeled "Oahu"), *Mann and Brigham* (K), *U. S. Expl. Exped.* (Gr). "Mts. Maui," *U. S. Expl. Exped.* (US) (type); without locality, *Wawra 1830* (W).

114. *Hedyotis acuminata* f. *iaensis* Fosberg, n. f.

Internodia 4-costata; folia parva ovalia vel late elliptica venulosa subtus hirtella; calycis lobi ovato-lanceolati maxime 4 mm. longi; stylus glaber.

Internodes 4-costate; leaf blades up to 9 cm. long, 5.2 cm. wide, oval or broadly elliptic, firm-chartaceous, base acute or obtuse, slightly hirtellous beneath on midrib and secondary veins, petiole glabrous, up to 3 cm. long; stipules low-triangular, mucro up to 2 mm. long, curved; peduncle up to 5 mm. long, free at apex, which remains on old stems as a tubercle, pedicels up to 8 mm. long; calyx lobes ovate-lanceolate, acuminate, up to 4 mm. long, in fruit 15 mm.; corolla glabrous, mature ones not available; style completely glabrous; fruit turbinate, with 4 prominent costae, 5 mm. thick, 7 mm. long.

Maui, west: Iao Valley, *Forbes 91.M.* (Ho) (type); southwest ridge of Iao Valley, *Degener et al 12520* (D).

115. *Hedyotis acuminata* f. *ovalicalyx* Fosberg, n. f.

Internodia 4-costata; folia ovata vel elliptica chartacea venulosa subtus hirtella; hypanthium alatum; calycis lobi foliacei ovales vel rotundi; corollae lobi reflexi; stylus pilosus; fructus quadrangularis alatus.

Internodes with 4 costae; leaves up to 15 cm. long, 6.5 cm. wide, ovate to elliptic, base obtuse but slightly attenuate, chartaceous, venulose beneath, hirtellous beneath on sides of midrib and veins, petiole glabrous, up to 18 mm. long; stipules low-triangular, mucro 3-7 mm. long; peduncle up to 5 mm. long, adnate almost to apex, or if longer, top third or more free on some nodes (*Degener 2359*), pedicels heavy, winged toward top, up to 3.5 cm. long; hypanthium winged; calyx lobes foliaceous, oval to orbicular, acute to slightly acuminate, up to 1 cm. long; corolla tube glabrous, up to 1 cm. long, lobes 6-10 mm. long, reflexed; anthers 2 mm. long; style pilose 2-5 mm. from base, particularly at base; fruit turbinate, 7-10 mm. high, 6-7 mm. wide, quadrangular-winged.

Mountains of east and west Maui.

Maui: west, near last ditchman's house on way to Mt. Eke from north, *Degener 2359* (D) (type); half mile north of Keahikauo, *Degener 11707* (D). East: Haleakala, upper ditch trail, *Skottsberg 802* (Ho).

Two forms may be represented here, as the Skottsberg specimen is a much more robust plant, with a long stipular mucro.

116. *Hedyotis acuminata* f. *Forbesii* Fosberg, n. f.

Internodia 4-costata; folia parva obovata chartacea subtus sparse hirtella; calycis lobi ovato-lanceolati; corolla alba extus infra hirtella; fructus turbinatis quadrangularis.

Internodes 4-costate, at least when young; leaves up to 8 cm. long, 3 cm. wide, obovate, apex rounded but slightly acuminate, base acute, firm chartaceous, not strongly venulose, very sparsely hirtellous beneath on midrib and veins, petiole glabrous, up to 1 cm. long; stipules ovate, mucro about 1 mm. long; peduncle up to 5 mm. long, free only at apex, pedicels 17 mm. long; calyx lobes ovate-lanceolate, up to 7 mm. long; corolla white (acc. to data on label), tube hirtellous near base, tube 11 mm. long, lobes 7 mm. long, somewhat reflexed; anthers 2 mm. long; style not available; fruit turbinate, 7 mm. high, 5 mm. wide, quadrangular.

Maui, east: ridge right side Kipahulu, *Forbes 1690.M.* (Ho) (type).

A note on the label says that the flowers are white. This suggests that this form may be allied to *H. fluvialis*, but in all other characters it agrees with *H. acuminata*. I should like to have the color of the flowers confirmed by further collections and observations.

117. *Hedyotis acuminata* f. *obovata* Fosberg, n. f.

Internodia non vel vix costata; folia elliptica vel obovata chartacea subtus hirtella; calycis lobi oblongo-lanceolati intus hirtelli; corollae glabrae, lobi reflexi; stylus infra hirtella; fructus quadrangularis.

Internodes not or weakly costate; leaves up to 11 cm. long, 4 cm. wide, elliptic to obovate, base acute or attenuate to obtuse, chartaceous, not strongly venulose, hirtellous beneath on midrib and veins, petiole glabrous, up to 1.5 cm. long; stipules broadly ovate, mucro 1 mm. long; peduncle up to 5 mm. long, free at apex, persisting as a tubercle on the old stems, pedicels slender, 3-4.5 cm. long; calyx lobes oblong-lanceolate, 1 cm. long, hirtellous inside; corolla tube glabrous, 10-11 mm. long, lobes reflexed, 9 mm. long; anthers

2 mm. long; style hirtellous at base; fruit turbinate, up to 10 mm. long, 7 mm. wide, quadrangular.

Maui, east: ridge left side Kipahulu Valley, *Forbes 1645* (Ho) (type).

118. *Hedyotis acuminata* f. *hirticalyx* Fosberg, n. f.

Internodia 4-costata; folia parva lanceolata vel anguste elliptica tenues, costa subtus hirtella, calycis lobi lanceolati intus hirtelli, corolla glabra, lobis patentibus, stylus infra hirtellus, fructus 4-costatus.

Internodes 4-costate; leaves up to 6 cm. long, 2 cm. wide, lanceolate or narrowly elliptic, base acute, thin, not venulose, hirtellous on sides of midrib beneath, petiole glabrous, 5 (-10) mm. long; calyx lobes lanceolate, hirtellous inside, 4-6 mm. long in flower, 9 mm. long in fruit; corolla tube glabrous, 1 cm. long; lobes patent, up to 6 mm. long; anthers 2 mm. long; style hirtellous at base; fruit cup shaped, round, 5-6 mm. high, 4-5 mm. wide, 4-costate.

Maui, west: Olowalu Valley, *Forbes 2430.M.* (Ho) (type).

119. *Hedyotis acuminata* f. *turbinata* Fosberg, n. f.

Kadua acuminata β var. Hillebr., Fl. Haw. Is. 159, 1888.

Internodia 4-costata; folia parva lanceolata duro-chartacea glabra; calycis lobi lanceolati maxime 11 mm. longi; stylus glaber; fructus turbinatus vix 4-costatus.

Internodes with 4 costae; leaves up to 7.5 cm. long, 2.5 cm. wide, lanceolate, base acute, stiff-chartaceous, not venulose, glabrous, petiole glabrous, up to 18 mm. long; stipules triangular, mucro 2.5-5 mm. long; peduncle 3 mm. long, free at extreme apex, pedicels 2.5-3 cm. long; calyx lobes (on one flower 5) lanceolate, up to 11 mm. long; corolla tube glabrous, 9 mm. long, lobes 6-8 mm. long; anthers 2-2.3 mm. long; style entirely glabrous (one with 3 branches); fruit turbinate, 7-10 mm. long, 5-7 mm. wide, weakly 4-costate.

Maui, west: ridge, upper part of Olowalu Valley, *Forbes 2468.M.* (Ho); Kanapali [Kaanapali], 1870, *Hillebrand* (B); Olualu [Olowalu], 1870, *Hillebrand* (B) (type). The last two collections are the type material of Hillebrand's variety.

120. *Hedyotis acuminata* f. *Skottsbergiana* Fosberg, n. f.

Internodia 4-costata; folia elliptica ovato-elliptica vel oblonga chartacea subtus hirtella; calycis lobi late ovati acuti; corollae glabrae, tubus 12 mm. longus, lobis maxime 17 mm. longis valde reflexis; stylus pilosus; fructus 4-costatus.

Internodes 4-costate; leaves up to 11 cm. long, 4.5 cm. wide, elliptic or ovate-elliptic to oblong, firm chartaceous, not conspicuously venulose beneath, hirtellous beneath along veins, petiole glabrous, 8-15 mm. long (8 mm. in *Forbes 475.H.*); stipules low-ovate or triangular, mucro 1-1.5 mm. long; peduncle up to 8 mm. long entirely adnate or the top 3 mm. free, pedicels 2-4 cm. long in flower, heavy, up to 5.5 cm. in fruit; calyx lobes broad-ovate, acute, 6.5 mm. long; corolla tube 12 mm. long, glabrous, lobes up to 17 mm. long, strongly reflexed; anthers 2.2 mm. long; style pilose; fruit 8 mm. long and wide, cup shaped, 4-costate.

Found in the Kohala Mountains of Hawaii.

Hawaii: Hiilawe, Waipio Valley, *Rock 4599* (Ho) (type); Kohala, July 1910, *Rock* (Ho); Kohala Mts., Waimea, *Forbes 475.H.* (Ho); without locality: *Hillebrand 191* (K), *188* (K, Gr).

Named for Dr. Carl Skottsberg, of Göteborg, Sweden, whose work on Polynesian plants is well known.

121. *Hedyotis acuminata* f. *cylindrica* Fosberg, n. f.

Internodia non costata; folia elliptica vel ovata glabra; calycis lobi late ovati; fructus cylindricus 4-costatus.

Internodes without costae; leaves up to 12 cm. long, 4 cm. wide, elliptic to ovate, base rounded or obtuse, rarely acute, somewhat venulose beneath, glabrous, petioles glabrous, up to 1 cm. long; stipules low-triangular, mucro 3 mm. long; peduncle 3 mm. long, completely adnate, pedicels 1 cm. long; calyx lobes broadly ovate, 5 mm. long (in fruit); flowers not available; fruit cylindrical cup shaped, somewhat quadrangular, up to 8 mm. long, 6.5 mm. wide, variable.

Hawaii: *mauka* of Punaluu, *Degener 11659* (D) (type).

122. *Hedyotis acuminata* f. *pololuensis* Fosberg, n. f.

Internodia glauca non costata; folia elliptica chartacea venulosa glabra; calycis lobi ovati vix acuminati; corolla glabra; stylus infra pilosus.

Internodes glaucous, not costate; leaves elliptic, up to 14 cm. long, 5 cm. wide, base acute, slightly contracted, chartaceous, venulose beneath, glabrous, petiole up to 2 cm. long; stipules broadly ovate to low-triangular, mucro less than 1 mm. long; peduncle 1-2 mm. long, completely adnate, pedicels up to 25 mm. long; calyx lobes ovate, slightly acuminate, about 5 mm. long; corolla glabrous, tube 1 cm. long, lobes 7 mm. long, becoming reflexed; anthers 2 mm. long; lower 2.5 mm. of style pilose; fruit unavailable.

Hawaii: east slope of Pololu Valley, *Degener 11658* (D) (type).

123. *Hedyotis acuminata* f. *grandis* (Gray) Fosberg, n. comb.

Kadua grandis Gray, Am. Acad. Arts Sci., Proc. 4: 318, 1860 (in part).

Differs from f. *Skottsbergiana* in that the petioles are 7-8 mm. long; peduncles not over 6 mm., free at apex; calyx lobes 7-8 mm. long, sparsely hirtellous outside near base, hypanthium hirtellous; style hairy only at base; corolla lobes patent; fruit quadrangular.

Hawaii: without locality: *Remy 390* (?) (Gr) (type). The number on the label is not clear.

The other specimen referred by Gray to his *K. grandis* belongs to f. *alicarpa* of Oahu, though the specimen is labeled "Hawaii."

124. *Hedyotis fluviatilis* (Forbes) Fosberg, n. comb.

Kadua fluviatilis Forbes, B. P. Bishop Mus., Occ. Papers 5(1): 6, 1912.

Kadua kamapuaana Degener, Fl. Haw. 332: K: k, Aug. 10, 1932.

Leaves lanceolate to narrowly elliptic or oblong, base attenuate to strongly contracted, apex strongly acuminate, firm chartaceous; cymes triflorous, 2 lateral flowers often aborted, pedicels quadrangular, heavy and stiff, usually 3-5 cm. long; hypanthium quadrangular; corolla white, waxy, drying purplish, throat usually more or less funnel-form, tube 2-2.5 cm. (or 13 mm.) long; anthers 2.5-4 mm. long, linear to oblong, fruit broadly turbinate to cup shaped, strongly quadrangular or winged; seeds dull, dark reddish brown.

Close to *H. acuminata*, but larger and heavier in all parts, corolla white instead of yellow or green, and of a waxy texture. Three varieties known, with well-marked geographic ranges, on Oahu and Kauai, Hawaiian islands.

125. *Hedyotis fluviatilis* var. *typica* Fosberg, n. var.

Kadua fluviatilis Forbes, B. P. Bishop Mus., Occ. Papers 5(1): 6, 1912.

Internodia non costata; folia anguste lanceolata petiolata; pedunculus 8 mm. longus supra liberus; calycis lobi lanceolati vix accrescentes; corollae lobi anguste ovati; antherae 3 mm. longae; stylus glaber; fructus alatus.

Internodes not costate; leaves narrowly lanceolate, attenuate at base, blade up to 18 cm. long, 5 cm. wide, petiole up to 4 cm. long; stipules low-triangular, mucro up to 4 mm. long; peduncles at older nodes up to 8 mm. long with top half free; calyx lobes lanceolate, up to 1 or 1.5 cm. long, not strongly accrescent in fruit, strongly dilated at base in fruit; corolla tube 2-2.5 cm. long, lobes narrowly ovate, 7-9 mm. long; anthers 3 mm. long; style glabrous; fruit cup shaped, 7-8 mm. high, 10 mm. wide, winged.

Found in the leeward gulches of the central Koolau Range, Oahu, on wet rocky walls near streams, and in rocky stream beds.

Oahu, Koolau Range: upper Wahiawa, *Forbes 1621.O* (Ho) (type); Wahiawa, head gate house, "type locality", *Forbes 2200.O*. (Ho) (leaves very narrow); Kipapa Gulch, Feb. 15, 1931, *Koike* (Ho); Kipapa Gulch, near stream, alt. 425 m., *Hume 85* (Ho), alt. 1,000 ft., *Hosaka 150* (Ho); Kipapa Gulch, 2d north fork, alt. 1,100 ft., *Hosaka 836* (Ho), alt. 1,400 ft., *St. John 11023* (Ho); Kipapa Gulch, north fork, alt. 1,100-1,400 ft., *Storey 115* (Ho).

126. *Hedyotis fluviatilis* var. *kamapuaana* (Degener) Fosberg, n. comb.

Kadua kamapuaana Degener, Fl. Haw. 332: K: k, Aug. 10, 1932.

Internodes not costate; calyx lobes ovate, accrescent; style hirtellous.

Found in the wet gulches and on wet palis of the windward side of the northern part of the Koolau Range, Oahu. Two forms are known.

127. *Hedyotis fluviatilis* f. *kamapuaana* (Degener) Fosberg, n. comb.

Kadua kamapuaana Degener, Fl. Haw. 332: K: k, Aug. 10, 1932.

Leaves broadly lanceolate to narrowly elliptic, blade up to 16 cm. long, petiole 1-2.5 cm. long; stipules triangular, mucro 1-2 mm. long; calyx lobes in fruit at least 1.5 cm. long; corolla tube 2-2.5 cm. long, lobes ovate, 13-15 (rarely 10) mm. long, patent; anthers 3 mm. long; fruit broadly turbinate, 8-10 mm. long, 9-13 mm. wide, strongly quadrangular.

Oahu, Koolau Range: along Pig-god or Kamapuaa Trail, Punaluu Valley, *Degener and Park 4172* (US, NY, D) (type); Castle (Pig-god) Trail, Punaluu, alt. 2,000 ft., *Hosaka et al 2376* (Ho), alt. 1,900 ft. in 1938, *Williams* (Duke); Punaluu Mountains, Oct. 1914, *Rock* (Ho), Oct. 31, 1914, *Rock* (Ho), Nov. 1914, *Rock* (Ho); Sacred Falls, Kaluanui Gulch, alt. 150 m., *Fosberg 14128* (Ho) (leaves narrower than usual); Pupukeya, *Degener 11734* (D).

128. *Hedyotis fluviatilis* f. *breviflora* Degener and Fosberg, n. f. (fig. 9).

Folia oblongo-elliptica; calycis lobi mucronati; corollae tubus 13 mm. longus extus infra puberulus, lobis valde recurvis.

Differs from f. *kamapuaana* in the oblong-elliptic leaves; calyx lobes 7 mm. long, mucronate; corolla tube 13 mm. long, slightly puberulent outside near base, lobes strongly recurved.

Oahu, Koolau Range: Sacred Falls, *Degener et al 11677* (D) (type).

This is conceivably a hybrid between *H. fluviatilis* var. *kamapuaana* and *H. acuminata* f. *allicarpa*, both growing at this locality, though the characters are mostly those of *H. fluviatilis*.



FIGURE 9.—*Hedyotis fluviatilis* var. *kamapuaana* f. *breviflora* (drawing loaned by Degener).

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129. *Hedyotis fluviatilis* var. *kauaiensis* Fosberg, n. var.

Internodia 4-costata; folia ovata vel elliptica; stylus glaber.

Differs from var. *kamapuama* in the 4-costate internodes; smaller, ovate or elliptic leaves; glabrous style.

Kauai: Kalalau Trail, near Hanakapiae [Hanakapiai] *Forbes 460.K.* (Ho) (type).

The costae on the internodes are made less conspicuous in dry specimens by the wrinkling of the cortex.

EXCLUDED NAMES

Hedyotis chamissonis Steud., Nom., ed. 2, 1: 727, 1840 = *Gouldia terminalis* (Hook. and Arn.) Hillebr.

Kadua affinis Cham. and Schlecht., DC., Prodr. 4: 431, 1830 = *Gouldia terminalis* (Hook. and Arn.) Hillebr.

SPECIMENS CITED

Alexander	4142 (14)	Degener et al	
Feb. 3, 1866 (94)	9430 (60)	10768 (63)	
Araths	9431 (60)	11647 (55)	
s.n. (90)	9432 (60)	11647 (84)	
Beaglehole	9492 (86)	11663 (90)	
50 (83)	11648 (70)	11664 (24)	
Beechey	11650 (86)	11665 (78)	
s.n. (21)	11651 (38)	11668 (21)	
" (78)	11653 (39)	11669 (18)	
" (83)	11655 (70)	11672 (94)	
" (98)	11656 (85)	11673 (14)	
Bennett	11657 (93)	11674 (96)	
9 (5)	11658 (122)	11677 (128)	
Bergman	11659 (121)	11678 (21)	
Feb. 11, 1928 (22)	11660 (98)	11679 (17)	
Feb. 22, 1928 (78)	11661 (94)	11682 (21)	
12 (83)	11662 (90)	11683 (14)	
Brigham	11676 (18)	11685 (97)	
569 (48)	11684 (100)	11686 (18)	
Brown, F. B. H.	11699 (95)	11687 (19)	
305 (83)	11703 (96)	11688 (92)	
313 (83)	11705 (81)	11690 (92)	(96)
1281 (94)	11706 (93)	11692 (21)	
Bryan, W. A.	11707 (115)	11693 (21)	
Jan. 10, 1904 (78)	11708 (106)	11694 (89)	
Bryan, E. H., Jr.	11709 (73)	11695 (65)	
848 (78)	11710 (73)	11697 (78)	
13 (83)	11712 (22)	11698 (90)	
Bush (Degener's)	11713 (93)	11701 (91)	
11649 (98)	11715 (73)	11702 (22)	
Chamisso	11716 (101)	11704 (14)	
s.n. (4)	11717 (101)	11713 (93)	
" (83)	11718 (74)	12187 (22)	
" (42)	11720 (106)	12321 (14)	
Christophersen	11721 (74)	12517 (73)	
1291 (14)	11722 (58)	12520 (114)	
1269 (98)	11723 (56)	12731 (18)	
Christophersen & Hume	11724 (74)	12733 (18)	
1424 (78)	11725 (102)	12734 (99)	
Davis, H.	11726 (56)	12749 (14)	
Jan. 8, 1933 (22)	11727 (102)	12749a (19)	
Diell	11728 (44)	12808 (63)	
s.n. (70)	11731 (104)	Degener & Martinez	
Degener, O.	11732 (102)	11675 (14)	
1554 (21)	11733 (56)	Degener & Kepaa	
1597 (70)	11734 (127)	12726 (51)	
1598 (93)	11735 (93)	12727 (66)	
2356 (103)	13016 (84)	Degener & Nitta	
2357 (73)	13018 (96)	11729 (44)	
2358 (73)	13019 (106)	11730 (56)	
2359 (115)	13020 (106)	Degener & Ordonez	
2360 (80)	13024 (96)	12050 (78)	
2361 (73)	May 19, 1940 (51)	12201 (96)	

- | | | |
|----------------------------|------------------|-------------------------|
| 12643 (67) | 234.Mo. (29) | 2200.O. (125) |
| 12644 (85) | 237.M. (60) | 2347.M. (28) |
| 12856 (31) | 240.L. (54) | 2409.O. (93) |
| 12857 (110) | 247.Mo. (102) | 2430.M. (118) |
| 12861 (73) | 249.H. (5) | 2468.M. (119) |
| 12863 (110) | 279.H. (73) | 2624.M. (73) |
| 13027 (73) | 307.K. (36) | June 28, 1908. (24) |
| Degener & Park | 309.Mo. (56) | Oct. 7, 1908. (84) |
| 4172 (127) | 311.Mo. (102) | Nov. 14-21, 1908. (78) |
| 11666 (100) | 312.L. (84) | Dec. 7, 1908. (93) |
| 11670 (78) | 315.L. (31) | Dec. 10, 1908. (24) |
| 11671 (14) | 349.K. (38) | Dec. 29, 1908. (93) |
| Degener & Salucop | 357.M. (6) | Feb. 12-19, 1909. (22) |
| 11680 (17) (14) | 363.Mo. (56) | Apr. 6, 1909. (98) (21) |
| 11681 (65) | 366.Mo. (44) | Sept. 1909. (85) |
| 12518 (81) | 385.K. (38) | s.n. (112) |
| 12519 (73) | 395.K. (82) | Forster |
| Degener & Shear | 410.K. (82) | s.n. (1) |
| 11711 (21) | 411.H. (72) | Fosberg & Duker |
| 11714 (98) | 415. (93) | 8778 (78) |
| Faurie | 454.K. (85) | 8808 (78) |
| 364 (14) | 460.K. (129) | Fosberg & Hosaka |
| 365 (38) | 475.H. (120) | 13931 (78) |
| 368 (43) | 489.M. (106) | Fosberg & St. John |
| 373 (46) | 511.H. (71) | 8906 (17) |
| 374 (60) | 526.Mo. (60) | 8910 (96) |
| 375 (60) | 530.Mo. (44) | 8915 (17) |
| 376 (78) | 540.Mo. (106) | 8932 (17) |
| 377 (70) | 556.K. (26) | Fosberg, V. O. |
| 383 (87) | 565.Mo. (106) | 58 (70) |
| Forbes & Cooke | 571.Mo. (44) | Fosberg, F. R. |
| s.n. (28) | 690.Mo. (74) | 8710 (78) |
| 30.M. (73) | 696.H. (70) (73) | 8955 (78) |
| May 3-8, 1909 (24) | 719.K. (867) | 8980 (93) |
| Forbes & Dole | 802.K. (36) | 9084 (22) |
| 63.K (85) | 805.K. (38) | 9458 (89) |
| Forbes & Rock | 809.K. (67) | 9461 (21) |
| Aug. 5, 1908 (14) | 848.K. (26) | 9606a (106) |
| Dec. 7, 1908 (85) (93) | 895.K. (82) | 9609 (106) |
| Forbes, Brigham & Thompson | 997.M. (81) | 9654 (106) |
| Sept. 1908 (70) | 1024.K. (85) | 9675 (60) |
| Forbes | 1253. (84) | 9692 (21) |
| 33.L. (31) | 1264.M. (73) | 9697 (93) |
| 39.L. (112) | 1303 (24) | 9763 (78) |
| 40.M. (73) | 1431.O. (93) | 10101 (70) |
| 67.Mo. (73) | 1519. (98) | 10108 (70) |
| 91.M. (114) | 1621.O. (125) | 10110 (70) |
| 100.M. (113) | 1622.O. (47) | 10220 (71) |
| 139.M. (6) | 1645. (117) | 10379 (17) |
| 142.M. (53) | 1690.M. (116) | 10449 (70) |
| 167.L. (54) | 1774.O. (66) | 10740 (84) |
| 205.L. (84) (110) | 1789.O. (17) | 10742 (84) |
| 206.M. (73) | 1855.O. (93) | 10783 (93) |
| 226.K. (82) | 1943.M. (73) | 10849 (14) |
| 228.K. (46) | 1959.O. (93) | 10852 (14) |

10867	(78)	698	(1)	In 1870	(31) (6) (60)
10952	(19)	969	(1)		(119)
10972	(19)	1019	(1)	In 1874	(56)
11162	(83)	1022	(2)	s.n. (24) (21) (6) (5)	
11370	(8)	1084	(1)	(4) (16) (72) (73)	
11371	(8)	Garber & Forbes		(74) (60) (62) (50)	
11488	(8)	180	(93)	(59) (54) (55) (44)	
11631	(8)	Gaudichaud		(88) (92) (93) (96)	
12093	(83)	s.n. (5) (78) (98)		(98) (102) (103)	
12094	(83)	Graham		(110)	
12250	(78)	13	(2)	Hinds	
12344	(96)	Grant		In 1841 (or 1861)	(89)
12369	(84)	4957	(11)	Hitchcock	
12402	(73)	Guppy		13775	(93)
12409	(74)	in 1897	(14) (73)	13983	(79)
12463	(31)	Haines, Capt.		14056	(98)
12479	(109)	s.n. (70)		14608	(70)
12498	(108)	Harris		14655	(110)
12498a	(84)	C242014	(94)	14660	(31)
12503	(31)	C242230	(78)	15203	(85)
12602	(112)	Heller		15215	(85)
12668	(38)	2181	(21)	15275	(67)
12694	(82)	2360	(98)	15347	(38)
12718	(38)	2440	(46)	15595	(93)
12956	(95)	2442	(36)	15596	(38)
12975	(92)	2608	(26)	15602	(31)
12998	(91)	2615	(39) (26)	Hosaka	
13009	(22)	2703	(82)	150	(125)
13018	(97)	2907	(78)	236	(78)
13057	(99)	Hillebrand & Lydgate		359	(63)
13062	(17)	s.n. (14) (28) (6)		364	(92)
13063	(96)	(56) (40) (73)		566	(84)
13194	(83)	Hillebrand		567	(96)
13234	(83)	187	(93)	719	(78)
13284	(83)	188	(120)	836	(125)
13386	(102)	189	(92) (94)	1034	(96)
13451	(60)	190	(96)	1173	(78)
13603	(99)	191	(120)	2376	(127)
13633	(14)	192	(96)	Hosaka et al	
13634	(97)	193	(98)	2398	(24)
13659	(14)	194	(60)	Hume	
13660	(14)	195	(21)	85	(125)
13797	(18)	196	(21)	115	(63)
13841	(21)	197	(74) (78) (79)	133	(89)
14127	(100)	198	(24)	350	(93)
14128	(128)	199	(4)	433	(93)
Garber		201	(72)	450	(89)
240	(78)	203	(72)	Jones	
250	(25)	April, 1861	(14) (21)	963	(83)
251	(78)	In 1862	(16)	1009	(83)
487	(78)	In 1864	(40)	Knudsen	
489	(78)	In 1869	(66) (98)	s.n. (26) (36) (38) (67)	
496	(21)	August, 1870	(40) (6)	Koike	
497	(21)	(73)		Feb. 15, 1931	(125)
509	(93)				

Krauss	414 (74)	Rock	93 (39)
Jan. 8, 1933 (22)	425 (84)		143 (26)
Kuntze	431 (54)		(93, 94) 148 (93)
23088 (70)	436 (31)		795 (78)
Lister	463 (107)		1075 (78)
March, 1891 (83)	569 (74)		1884 (38)
Lum, M.	D (73)		1886 (38)
Jan. 8, 1933 (22)	E (73)		1888 (67)
Lydgate	F (31)		1936 (39)
13 (46)	Oct. 11, 1913 (31)		1942 (38)
149 (46)	Dec. 23, 1913 (31)		2056 (67)
s.n. (16) (40) (82)	Feb. 18, 1915 (54)		2454 (26)
(74) (46)	Apr. 3, 1915 (110)		4198 (78)
Macrae	Apr. 6, 1915 (109) (73)		4599 (120)
June, 1825 (70)	June 24, 1915 (31)		4813 (93)
Mann & Brigham	Neal		5787 (38)
186 (48)	July 28, 1927 (70)		5788 (82)
210 (21)	Apr. 30, 1929 (67)		5789 (82)
234 (89)	Aug. 13, 1929 (70)		5795 (38)
319 (71) (74)	Aug. 22, 1930 (38)		5798 (38)
382 (113)	s.n. (37)		5799 (67)
417 (113) (93)	Nuttall		5860 (67)
422 (53)	s.n. (33) (96) (98)		6022 (82)
423 (90)	Oliveira		6124 (76)
523 (93)	27 (14)		6132 (32)
568 (36)	Parks		7003 (60)
569 (46)	16235 (2)		8116 (31)
s.n. (73) (74) (78)	Powell		8156 (73)
(113)	22 (83)		8368 (70)
Meebold	Quayle		8536 (73)
June 1932 (14)	X (83)		8629 (81)
May 1932 (78)	XX (83)		8766 (70)
June 1932 (79)	XXX (83)		8835 (24)
Meebold (Degener's No.)	XXXX (83)		9005 (82)
11689 (90)	562 (83)		L (70)
11696 (79)	1266 (83)		M (70)
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Moore, H. F.	2012 (83)		17001 (14)
408 (2)	2077 (83)		O (25)
Moore, J. W.	2102 (83)		May 23, 1908 (24)
671 (10)	2169 (83)		Aug. 23, 1908 (78)
Munro	Quayle & Curtis		July 1910 (120) (110)
7 (111)	498 (83)		June 1910 (110)
9 (31)	500 (83)		1911 (38)
10 (54)	530 (83)		May 1911 (73)
41 (111)	580 (83)		Oct. 1911 (82) (26)
68 (54)	Rechinger		1912 (53) (98)
158 (31)	2065 (72)		Oct. 1914 (127)
217 (109)	Reinecke		Oct. 31, 1914 (127)
228 (73)	564 (1)		Nov. 1914 (127)
231 (74)	Remy		Oct. 1916 (38) (67)
241 (54)	352 (31)		Sept. 1918 (6)
249 (54)	353 (24)		s.n. (110)
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270½ (31)	390 (123)		

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Setchell	12309 (75)	2910 (90)
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Setchell & Parks	13279 (105)	3181 (21)
15252 (2)	St. John & Eames	U. S. Expl. Exped.
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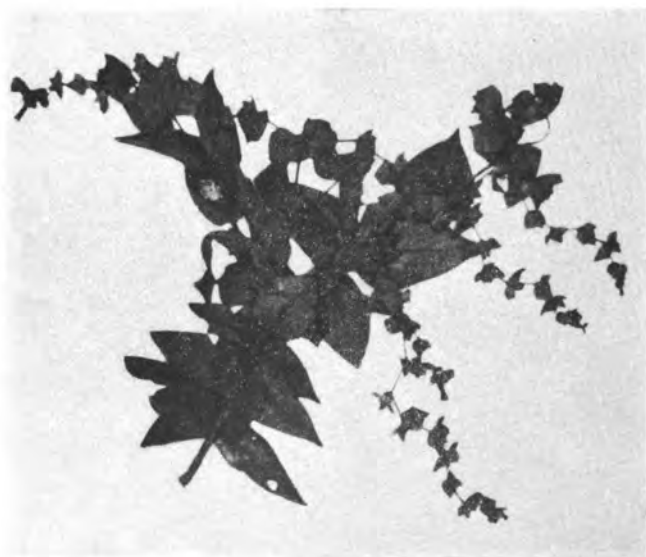
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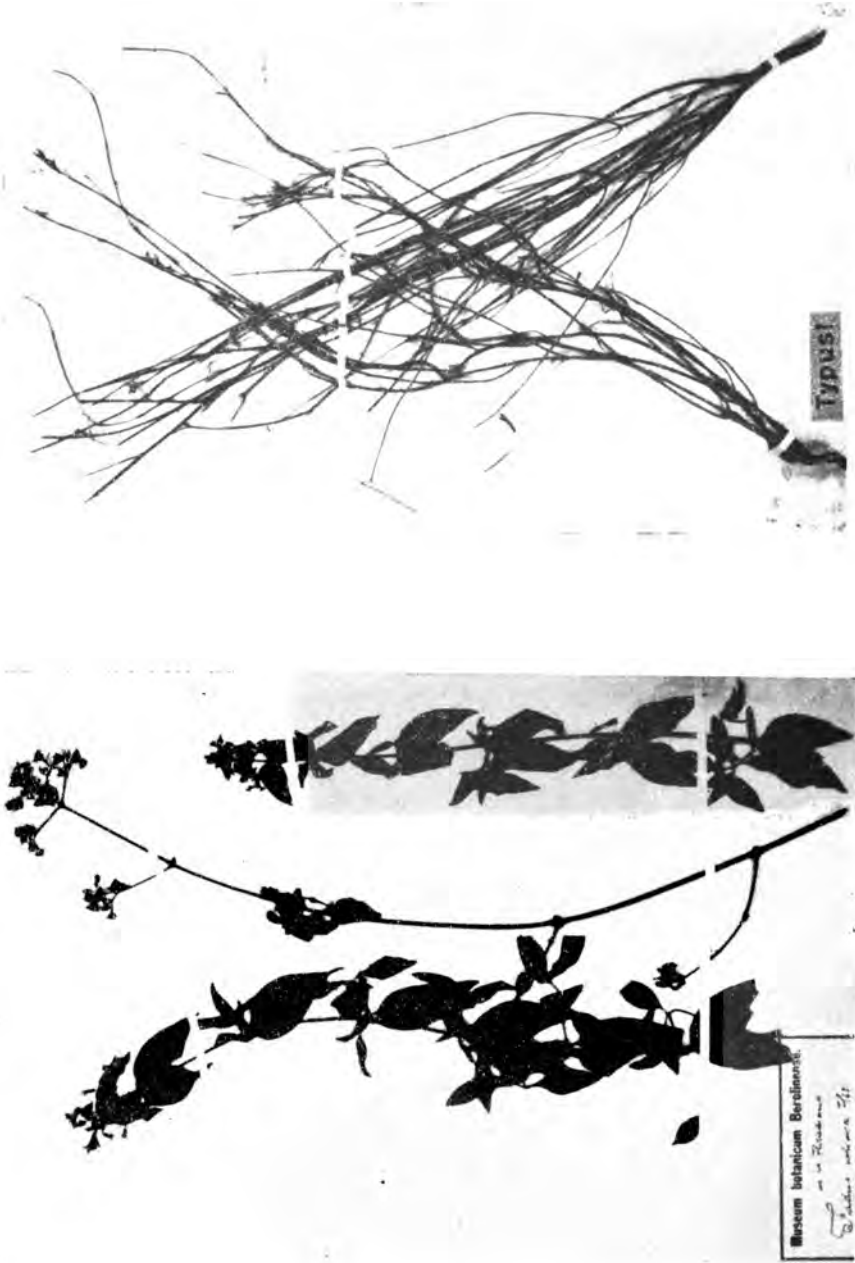


A



B

A, *HEDYOTIS GRANTII*; B, *H. SCHLECHTENDAHLIANA* VAR. *NUTTALLI*.



A, *HEDYOTIS FOLIOSA*; B, *HEDYOTIS COOKIANA* VAR. *COOKIANA*.



A, *HEDYOTIS ANGUSTA* VAR. *ANGUSTA*; B, *H. MOLOKAIENSIS*.



A



B



A

A, *HEDYOTIS DEGENERI* VAR. *DEGENERI*; B, *HEDYOTIS FOGGIANA*.

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