# PHYTOLOGIA

*Designed to expedite botanical publication*

Vol. 24 August, 1972 No. 1



CONTENTS



Published by Harold N. Moldenke and Alma L. Moldenke

303 Parkside Road
Plainfield, New Jersey 07060
U.S.A.

Price of this number, $1; per volume, $8 in advance,
or $8.50 at close of volume, 50 cents extra to foreign addresses

# JAPANESE DISCOMYCETE NOTES XVIII. HUMARIA VELENOVSKYI COMB. NOV. (PYRONEMATACEAE, MYCOLACHNEEAE)[1]

RICHARD P. KORF[2]
*Plant Pathology Herbarium*
*Cornell University, Ithaca, New York*

and

NAOHIKO SAGARA
*Biological Laboratory*
*Yoshida College, Kyoto University, Kyoto*

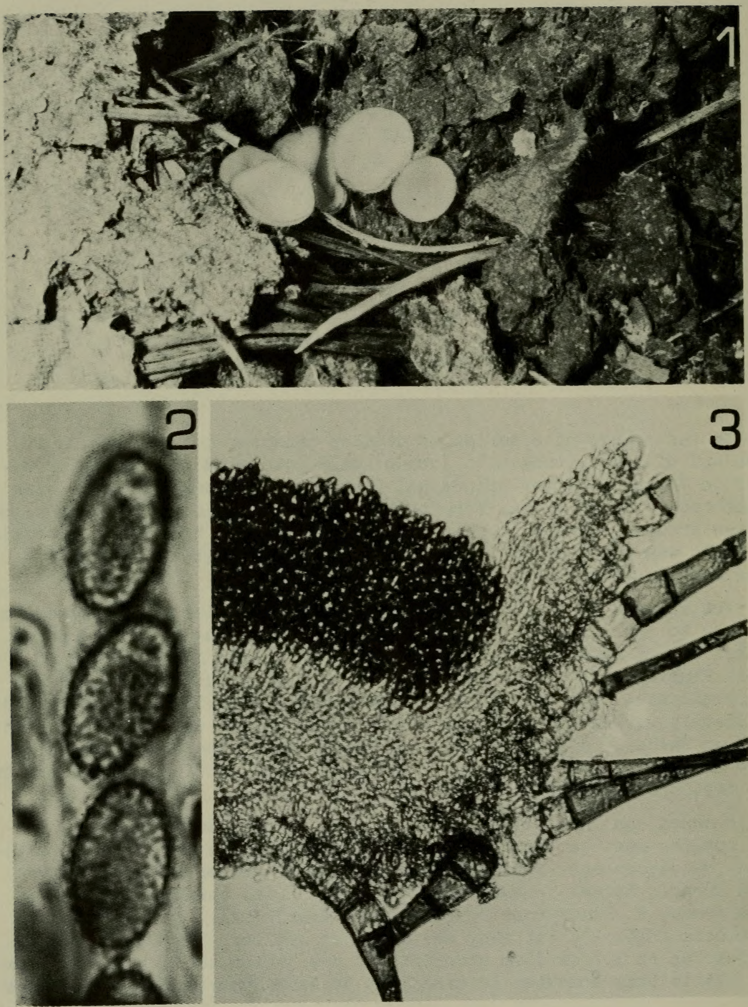
In the course of a series of studies relating to application of urea and of lime nitrogen to forest soils conducted by the junior author in Japan, a number of unusual Operculate Discomycetes have been collected. One of these, reported here on litter covering the surface of the ground, appears to be known previously only from Czechoslovakia, where it was reported by Svrček *(1948)* from two collections under the name *Lachnea velenovskyi* Vacek.

The species is highly characteristic in the color of the hymenium (luteus to ochraceous according to Svrček, "Capusine Buff," "Orange-Pink," "Light Salmon-Orange," "Salmon-Buff," "Pale Ochraceous-Buff," or "Pale Pinkish Buff" [Ridgway, *1912*] according to the junior author's observations). Its ascospores are also diagnostic, being densely and delicately warted (FIG. 2), with two, small, polar oil guttules which take up Sudan IV dye. The setae or hairs on the apothecium are also most unusual in shape in being very broad based, conically tapering to the tip, and multiseptate (FIG. 3).

*Lachnea*, an invalid name for a fungus genus, cannot be used, and the species must be transferred to some other genus of the Pyronemataceae, Mycolachneeae (Korf, *1972*). In several respects it agrees well with *Humaria* Fuckel (= *Mycolachnea* Maire). Like the type species of that genus, *H. hemisphaerica* (Wigg. per Gray) Fckl., it has cupulate apothecia (FIG. 1), but they are somewhat smaller (3-9 mm diam *fide* Svrček, up to 1.7 cm diam according to the junior author) and shallower. It is thus somewhat intermediate between *Humaria* and *Trichophaea*

1. Previous articles in this series appeared in *Science Reports of Yokohama National University, Sect. 2, 7:* 7-35 (1958); *Bulletin of the National Science Museum (Tokyo) 4:* 389-400 (1959); *Transactions of the Mycological Society of Japan 6:* 74. (1965[1966]).

2. Supported in part by National Science Foundation Grant GB-8548.




FIGS. 1-3. *Humaria velenovskyi*. FIG. 1. Apothecia developed on the forest ground where nightsoil had been illegally dumped, approx. × 1.5 (#790). FIG. 2. Ascospores in an ascus, showing the warted epispore, approx. × 1500 (#1657). FIG. 3. Vertical section of a portion of an apothecium, approx. × 150 (#1657). Photographs by N. Sagara.

Boudier, which tends to have still smaller, discoid or lenticular apothecia, and a hymenium always devoid of carotenoid pigments (white to buff or brown). In size and shape the Japanese collections recall *T. hemisphaerioides* (Mouton) Graddon, an unusually large and unusually cupulate species for that genus. Whether these two genera can be kept apart, as treated by Korf *(1972)* and by most of the French school of discosystematists, or whether they should be merged as advocated by Eckblad *(1968)*, is as yet unanswered. We have decided to assign the species to *Humaria* sensu stricto. If the two genera are merged later, *Humaria* being the older name will stand, and no new combination will be required.

Thirteen Japanese collections are reported here, all but one (#790) from field experimental plots in various types of forest (TABLE I). It has also been seen but not collected on other plots.

TABLE I

| Specimen No.[a] | Treatment[b] | Date of Treatment | Date Collected |
|---|---|---|---|
| (KYOTO Prefecture, 200 m., *Pinus densiflora & Chamaecyparis obtusa*)[c] | | | |
| 844 | urea | 19. II.67 | 3. XI.67 |
| 983 | urea | 13.VIII.67 | 4. XII.67 |
| 1870 | urea | 4. VI.70 | 13. X.70 |
| (SHIGA Prefecture, 100 m., *Pinus densiflora*) | | | |
| 785 | urea | 25. XI.66 | 26. X.67 |
| 790 | nightsoil | unknown | 26. X.67 |
| (TOYAMA Prefecture, 1400 m., *Fagus crenata*) | | | |
| 1349 | urea | 10.VIII.68 | 25. IX.68 |
| (TOYAMA Prefecture, 1750 m., *Abies mariesii & Tsuga diversifolia*) | | | |
| 1360 | urea | 9.VIII.68 | 27. IX.68 |
| 1467 | urea | 9.VIII.68 | 9. XI.68 |
| 1628 | urea | 9.VIII.68 | 19. VII.69 |
| 1657 | urea | 9.VIII.68 | 30.VIII.69 |
| 1685[d] | urea | 9.VIII.68 | 6. X.69 |
| (TOYAMA Prefecture, 2300 m., *Pinus pumila*) | | | |
| 1659 | urea | 9.VIII.68 | 30.VIII.69 |
| 1660 | lime nitrogen | 9.VIII.68 | 30.VIII.69 |

[a]. Collections in personal herbarium of N. Sagara.

[b]. Urea and lime nitrogen hand scattered on individual plots 0.5 × 1.0 m., at rates of 40, 80, 160, or 320 g N per plot.

[c]. Elevation and dominant trees noted for each of 5 localities.

[d]. A portion of this collection is on deposit in CUP-JA 3508.

We find the hairs to be commonly up to 500 µm long, even rarely as long as 700 µm, with the base 20-40 (-50) µm broad, whereas Svrček reported them as 200-350 × 18-36 µm. We find the ascospores rather consistently 14-16 × 7-9 µm, while Svrček reported them as 12-17 × 7-8.5 µm. The type collection was from a burn site, with the second Czechoslovakian collection from humid soil among mosses and conifer needles.

The following new combination is formally proposed:

Humaria velenovskyi (Vacek in Svrček) comb. nov.

(basionym: *Lachnea velenovskyi* Vacek in Svrček (as *"Velenovskýi"*), Sborn. Nár. Mus. v. Praze, Řada B, Přír. Vědy *4B(6):* 51. Pl. V, fig. 5-6. 1948).

## *LITERATURE CITED*

ECKBLAD, F.-E. 1968. The genera of operculate Discomycetes. A re-evaluation of their taxonomy, phylogeny and nomenclature. Nytt Mag. Bot. *15:* 1-191.

KORF, R. P. 1972. Synoptic key to the genera of the Pezizales. Mycologia *64(5):* (in press).

RIDGWAY, R. 1912. Color standards and color nomenclature. Washington, D.C.

SVRČEK, M. 1948. České druhy podčeledi Lachneoideae (čel. Pezizaceae). Bohemian species of Pezizaceae subf. Lachneoideae. Sborn. Nár. Mus. v. Praze, Řada B, Přír. Vědy *4B(6):* 1-95. 12 pl.

# A NEW SPECIES OF THE GENUS RHIZOBLEPHARIA FROM THE NEOTROPICS, AND A REDISPOSITION OF THE GENUS IN THE PYRONEMATACEAE, PSEUDOMBROPHILEAE

ROBERT W. ERB[1]

*Plant Pathology Herbarium*
*Cornell University, Ithaca, New York*

*Rhizoblepharia,* erected as a monotypic genus by Rifai *(1968),* was known only from a single Australian collection deposited in the Herbarium of the Royal Botanic Gardens, Kew, England. Rifai's awareness that the delicate transverse wrinkling of the ascospore wall (FIG. 1) was "unique among the Pezizineae" led him to erect a new genus and species on the single collection. That species, *R. jugispora* Rifai, was classified among the Ciliarieae, a tribe established by Boudier *(1907)* to include members of the Humariaceae with well-developed hairs and later modified by Le Gal *(1947)* to include only those genera with red or yellow hymenia. Rooting or deeply embedded hairs are known in the Pezizales in only two other genera, *Scutellinia* and *Cheilymenia,* both members of the Ciliarieae *sensu* Le Gal. *Rhizoblepharia* was included in that tribe solely because of Rifai's contention that its hairs are of this type (the etymology of the generic name is self-explanatory).

During the Second Discomycete Exploration of the Neotropics in January, 1971, on the island of Jamaica, B.W.I., a Discomycete described here as a new species of *Rhizoblepharia* was collected. The new species, *R. neotropica,* differs from *R. jugispora* most obviously in that it is distinctly stipitate (FIG. 4). Though *R. jugispora* was originally described as "broadly sessile," my study of the type specimen has shown that it is at least distinctly substipitate (FIG. 3). The two species are similar in overall size, habitat, in the presence of stiff, pointed, thick-walled hairs (setae), in excipular structure, in non-blueing of the asci in Melzer's Reagent (J —), and in the essential features of the ascospores (differing notably in size between the two species), including the transverse wrinkling of the spore wall (FIG. 2). The arrangement of the hairs on the apothecium differs markedly between the two species.

A discussion of taxonomic criteria in the genus, and of generic relationships, precedes the formal taxonomic portion of this paper.

---

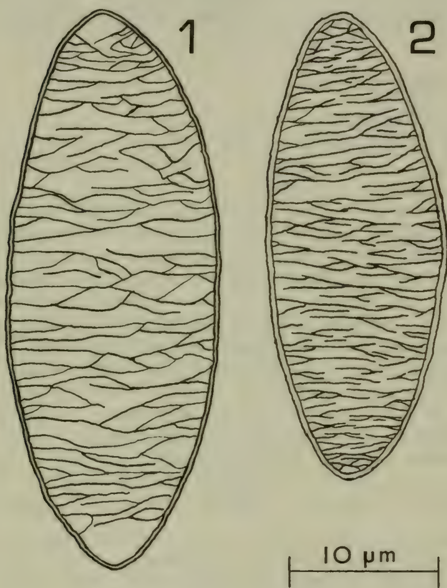
[1]. Based on a thesis submitted to the Graduate School of Cornell University for the degree of Master of Science, and supported in part by National Science Foundation Grant GB-8548, "Monographic and Floristic Studies of the Discomycetes."

## SOME TAXONOMIC CRITERIA IN RHIZOBLEPHARIA

### HAIRS

*ROOTING HAIRS:*

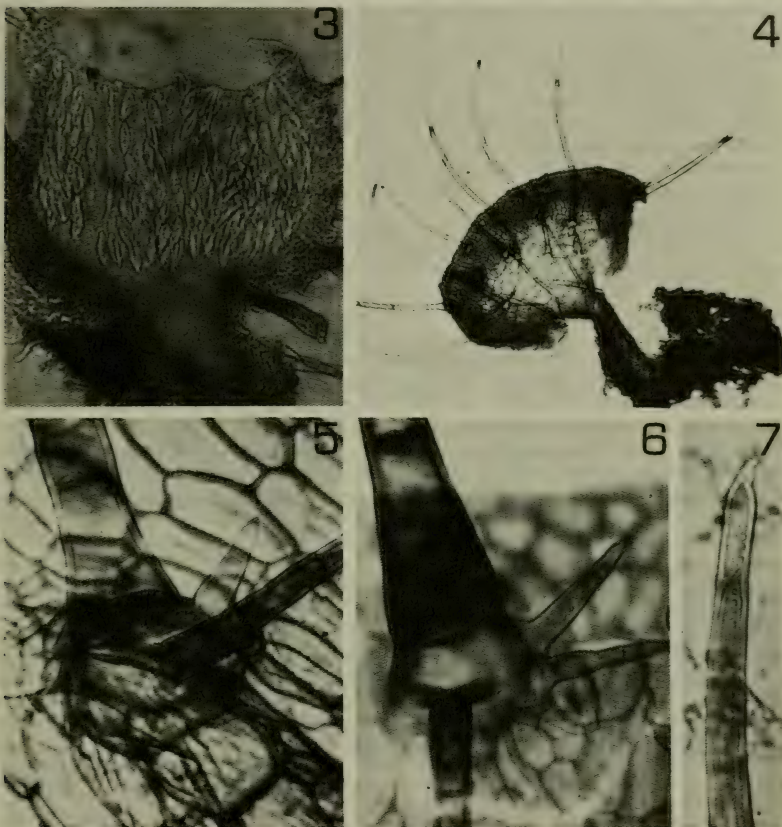
A feature held in high regard taxonomically is the so-called rooting hair. These are a diagnostic feature of *Scutellinia*, but also occur in several species of *Cheilymenia*, a closely related genus. Rooting hairs are typically thick-walled, dark brown, septate, acuminate, and arise deep within the sterile tissues near the junction of the ectal and medullary excipula. Frequently the bases of the hairs are bifurcate, but division into 3, 4, 5 or more parts is not uncommon (Boudier, *1905-10:* pl. 368, 370, 371, 373-378, 384, 385; Denison, *1961*). The presence of hairs with furcate bases raises the interesting yet surprisingly little investigated question of how such development takes place.




FIGS. 1-2. Camera lucida drawings of ascospores of *Rhizoblepharia* spp. × 2000. FIG. 1. *R. jugispora*. FIG. 2. *R. neotropica*.

Massee *(1897)* likened the development of rooting hairs in various species of *Scutellinia* (as *Lachnea*) to the process described by Dangeard *(1894)* for ascus formation in *Peziza vesiculosa* Bull. That is, the tips of two hyphae, "gametes," coalesce and their nuclei fuse to form an "oospore." This is followed by divisions of the fusion nucleus, and the subsequent movement of these nuclei into the gradually elongating hair (ascus). Massee held that more than two "gametes" could fuse, thus producing multiple divisions of the hair bases.

Gwynne-Vaughan and Williamson *(1933)* offered an explanation for rooting hair formation in *Scutellinia scutellata* (L. per St.-Amans) Lamb. comparing the process again to ascus formation, but rather to that in *Pyronema confluens* (Pers. per Pers.) Tul., in which crozier formation takes place. Thus the hair would arise from the elongation of an intercalary cell of a recurved hypha with the adjacent cells giving the characteristic forked appearance of the base. In answer to the problem of how more than two basal branches could be formed from



FIGS. 3-7. Photomicrographs of *Rhizoblepharia* spp. FIG. 3. *R. jugispora,* from holotype material. Vertical section of apothecium, showing stipe, × 135. (Note displaced hair at lower right.) FIGS. 4-7. *R. neotropica,* from holotype material. FIG. 4. Vertical hand section of apothecium showing stipe and setae, × 45. FIGS. 5, 6. Piliferous cells; note widely diverging setae, × 350. FIG. 7. Internal proliferation of a hair, × 350.

such a mechanism, they offered the following explanation: "Additional branches may grow out, either as lateral supports or in search of further nutriment ...."

There is no evidence to support Massee's contention that in hairs the nuclei fuse in the formation of an "oospore," nor Gwynne-Vaughan and Williamson's theory that the hairs are intercalary on growing hyphae, since no free growing apices of such postulated hyphae have been reported. Professor E. J. H. Corner *(pers. comm.)*, however, thinks that the rooting hairs of *Scutellinia* are probably formed from the fusion of separate hyphal strands, and that the number of basal branches of a hair is indicative of the number of separate hyphal strands which fused during the early development of the hair. His unpublished note on this phenomenon was given to Mme Le Gal some years ago; she has indicated (Le Gal, *1953:* 117) that she intends to include this in her monographic treatment of the genus, soon to be published.

In *Rhizoblepharia jugispora* the hairs have been described by Rifai as rooting. They do arise, because of the reduced nature of the ectal excipulum, near the junction of the ectal and medullary excipula, but the bases of the hairs are not divided. They arise as single outgrowths from a superficial, usually swollen cell which is here termed a PILIFEROUS CELL. At the margin of the apothecium, the piliferous cells usually retain their turgidity, allowing the origin of the hairs to be easily demonstrated. Farther down the receptacle the piliferous cells either do not become swollen or do so and later collapse, making detection of the origin of these hairs much more difficult. The uppermost portion of the piliferous cell is pigmented and thick-walled where it gives rise to the hairs, giving the base of the hairs a distinctly flared appearance. Such bases might easily be misinterpreted as being furcate, especially when the thin-walled, hyaline, lower portion of the piliferous cell is collapsed. In *R. neotropica* the piliferous cell is usually much more swollen than in *R. jugispora,* allowing one to determine the origin much more easily. Such hairs may not correctly be called "rooting," because of their different ontogeny and consequent lack of a divided base. They may best be termed "superficial," because they arise from the outermost tissue layer. It should perhaps be noted that in *Rhizoblepharia,* because the ectal excipulum is so reduced that the hairs actually arise at the junction of the two excipula, such hairs might be more closely related to the rooting hairs of *Scutellinia* and *Cheilymenia* than to the superficial hairs of *Trichophaea* and *Humaria.*

*STELLATE HAIRS:*

Stellate hairs in the Pezizineae differ from rooting hairs in being borne superficially and in lacking a furcate base. They are composed of several (2-5) diverging branches which arise from a usually swollen basal cell. Stellate hairs may be interspersed among rooting hairs as in *Cheilymenia stercorea* (Pers. per Fr.) Boud. and *C. cruciplia* (Cke. & Phill. in Cke.) Le Gal, but are easily distinguished by their characteristic stellate or cruciate appearance (Boudier, *1905-10:* pl. 384; Denison, *1964*).

In *Rhizoblepharia neotropica* a somewhat different type of stellate hair has been noted. The swollen, piliferous cell gives rise to one major seta, usually pointing upwards, and one to several, very reduced, widely diverging minor branches (FIGS. 5, 6).

*Trichophaea bicuspis* (Boud.) Boud. has yet another type of branched hair which might possibly be termed stellate, but which arises inconspicuously from a single superficial hyaline cell or a row of 2 or 3 cells (Kanouse, *1958*). The hairs are usually two-pronged, with the major branch diverging widely from and often forming in a direct line with the smaller branch or spur, thus giving the appearance of a single straight or slightly bent hair with two pointed ends. However, not infrequently, interspersed among the more numerous branched hairs are undivided ones. Such unbranched hairs could scarcely be called stellate, though they are doubtless a variation of the more frequent, two-pronged condition. Two, exceptional, three-pronged hairs were illustrated by Boudier (*1905-10:* pl. 366).

*PROLIFERATING HAIRS:*

Internal proliferation, or growth of a smaller, but apparently otherwise normal, seta enclosed completely within a larger seta has been described as occurring in various species of *Scutellinia* (Denison, *1961*). During the course of this study internal proliferation was observed in the setae of *Rhizoblepharia neotropica* (FIG. 7) and *Trichophaea bicuspis*, but was not observed in *R. jugispora*. The cause and function of internal proliferating hairs is not known, but Denison suggests that it might be "associated with damage of the larger enclosing hair."

ASCOSPORES

The uniqueness of the ascospore markings in *Rhizobelpharia* is easily attested to by the fact that it is the only genus in the suborder Pezizineae characterized by transversely wrinkled ascospores. One apparently undescribed species of *Pyronema* (Korf, *pers. comm.*), not at all closely related to *Rhizoblepharia*, also has transversely wrinkled ascospores. In both of the species of *Rhizoblepharia* the wrinkling, which is much more delicate in *R. neotropica* (FIG. 2) than in *R. jugispora* (FIG. 1), may even give the appearance of a poorly defined reticulum. In addition, the ascospores of both species are fusoidal, nonguttulate, hyaline to subhyaline, and the wrinkled inner wall and smooth outer wall are cyanophobic in Poirrier's Blue (cotton blue) dye. The ascospores of *R. jugispora* are slightly larger, and bear germpore-like marks near the ends of some ascospores as illustrated by Rifai. While the nuclear condition of the ascospores is unknown for *R. jugispora*, material of *R. neotropica* preserved in FAA in the field at the time of the original collection shows the uninucleate condition of the ascospores even in cotton blue or in Melzer's Reagent.

ECTAL EXCIPULUM

In attempting to use features of the excipulum in determining affinities, the characteristics of the ectal excipulum proved to be more important than those of the medullary excipulum. The ectal excipulum is reduced to a one-cell-thick layer or "skin" in *R. neotropica*. Though individual cells vary widely in shape in this species, from horizontally elongated at the margin to vertically elongated in the stipe, rows of cells in a more or less vertical orientation can always be distinguished. This corresponds very closely to the condition in *Trichophaea bicuspis* in which the ectal cells again form a one-cell-thick "skin," but are more uniform in size and shape, and are more tightly compacted into more strictly vertical rows. The term "skin" is used in describing the ectal excipulum of these two species because the tissue is only one cell thick and the cells tend to cohere in large, relatively intact fragments when making a crush mount of an apothecium. The ectal excipulum of *R. jugispora* approaches the extremely reduced condition of *R. neotropica* and *T. bicuspis*, but may be several cells thick and the cells seem to lack obvious vertical orientation. Because the material was scanty, only one apothecium of the type collection was sectioned, and the ectal excipulum was not observed clearly in face view. It may be more comparable to that of the other two species than appears in sectional view.

THE QUESTION OF CAROTENOIDS

Rifai's presumption that *Rhizoblepharia* has rooting hairs was undoubtedly the basis for his decision to place it near *Scutellinia* and *Cheilymenia* in the Ciliarieae. Up until then, however, all species described with rooting hairs had, in addition, yellowish to reddish carotenoid pigments in the hymenium. The carotenoids are generally concentrated in the paraphyses and tend to become faded or leached out entirely in dried specimens. Since present-day classification schemes for Operculate Discomycetes (Arpin, *1968;* Dennis, *1968;* Eckblad, *1968;* Korf, *1972*) continue to attach a high significance to the presence or absence of carotenoids in the hymenium, the question of whether or not a fungus might have had them in the fresh state is vital. Rifai opted for the presence of carotenoids in *Rhizoblepharia* although he had at his disposal only dried specimens which showed no evidence of their presence.

The discovery of a second species of the genus which totally lacks any hymenial pigments leads me to the opposite conclusion with regard to Rifai's type species, *R. jugispora*. I would therefore consider the genus *Rhizoblepharia* to lack carotenoids, and emend the generic diagnosis accordingly.

*RELATIONSHIP TO TRICHOPHAEA BICUSPIS*

In the course of examining several genera for possible close relationships to *Rhizoblepharia*, I examined the genus *Trichophaea* rather closely. One species, *T. bicuspis*, long considered by Korf to be an anomalous member of that genus, showed characteristics in common with *Rhizoblepharia*, and with *R. neotropica* in particular. The species seems more closely related to *Rhizoblepharia* than to any species of *Trichophaea*, and in another paper (Korf and Erb, *1972*) a new genus, *Trichophaeopsis*, is being proposed to accommodate *Trichophaea bicuspis*.

## *RELATIONSHIP TO THE TRIBE PSEUDOMBROPHILEAE*

At one time almost all hairy Operculate Discomycetes were placed in the genus *Lachnea (= Patella)*. The genus has since been divided, with species being distributed among genera such as *Scutellinia*, *Cheilymenia*, *Trichophaea*, *Humaria*, *Tricharina*, etc. *Rhizoblepharia* must be transferred from the Scutellinieae (= Ciliarieae) because of its lack of carotenoid pigments. The possibility of placing the genus near *Humaria* and *Trichophaea* in the Mycolachneeae is also rejected on the basis that the ascospores lack oil guttules. Instead it is proposed to transfer *Rhizoblepharia* to the tribe Pseudombrophileae as erected by Korf *(1972)*, within the family Pyronemataceae, subfamily Ascophanoideae. This tribe contains genera which lack carotenoid pigments and have shallow-cupulate to discoid apothecia beset with brown hyphae or brown setae, and ascospores devoid of oil guttules. The genus seems most closely related to *Trichophaeopsis*, and possibly to *Tricharina*.

## *TAXONOMY OF RHIZOBLEPHARIA*

### EMENDATION OF THE GENUS

R H I Z O B L E P H A R I A Rifai emend. Erb

= *Rhizoblepharia* Rifai *in* Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect., *57(3):* 104. 1968.

TYPE SPECIES: *R. jugispora* Rifai, *Ibid.*, 105. 1968. (monotype)

Apothecia gregarious, minute, stipitate to substipitate. Disc shallowly concave or flat. Receptacle saucer-shaped, beset with numerous dark brown, septate, acuminate, thick-walled setae, at the margin arising directly upon a swollen, globose piliferous cell, elsewhere piliferous cells enlarged or not, often becoming collapsed and indistinct. Hyaline superficial hairs sometimes also present. Ectal excipulum of large, isodiametric or elongated, polygonal, subglobose or rectangular cells, of textura angularis primarily, becoming more vertically elongated and tending toward textura prismatica in the stipe. Medullary excipulum scant to well-differentiated, of compact, coarse, short-celled, constricted hyphae forming a textura intricata. Asci cylindrical, 8-spored, unitunicate, apex not blued in Melzer's Reagent, operculate, narrowed basally to a crozier or not. Ascospores uniseriate or biseriate, fusoidal to elliptic-fusoid, non-guttulate, hyaline to pale yellow, ornamented with delicate transverse and sometimes anastomosing cyanophobic wrinkles or ridges on the inner wall which may form a germpore-like mark at the ends of the ascospores, the outer wall smooth and cyanophobic. Paraphyses slender, septate, apex not or slightly enlarged, straight, branched apically or not. Habitat: soil.

## DIAGNOSIS OF THE NEW SPECIES

Rhizoblepharia **neotropica** Erb & Korf, sp. nov.

*Apothecia minuta, stipitata, gregaria vel caespitosa. Discus pallidus vel albidus, planus vel concavus, 0.6-0.9 mm diam. Stipes cylindricus, 0.4 mm longus × 0.08 mm diam. Receptaculum et stipes concolores, pallidi vel albidi cum desiccati sunt, setis crassitunicatis, fuscis, usque ad 650 µm longis × 6-18 µm diam. induti, his setis vel singulatim vel in fasciculis setae unius majoris cum setis singulis pluribusve divergentibus minoribus ex cellulis globosis subglobosisve piliferis 20-55 µm diam. orientibus. Excipulum ectale cellulam unam crassitudine aequans, ex textura angulari formatum, cellulis 2-30 × 6-25 µm, stipite ex textura prismatica formato, cellulis 12-60 × 5-25 µm. Excipulum medullare exiguum, ex textura intricata formatum, hyphis 2-5 µm diam. Hymenium usque ad 165 µm crassum. Asci octospori, clavati, 125-175 × 15-20 µm, ad basin in crocam angustati, ad apicem operculati, (J —). Ascosporae hyalinae, uninucleatae, 30-35 × 9-11 µm, biseriatae, elliptico-fusoideae, eguttulatae, pariete exteriore laevi, cyanophobico, interiore transversaliter corrugato, cyanophobico. Paraphyses septatae, ramosae, apicibus 1-1.5 µm diam.*

*Habitat in solo, Jamaica, B. W. I.*

Apothecia minute, short-stipitate, gregarious to caespitose (FIG. 4). Disc flat to somewhat concave (inrolled at the margin when dried), 0.6-0.9 mm in diam. Stipe distinct, cylindrical, up to 0.4 mm long and 0.08 mm in diam. Stipe, receptacle and disc concolorous, pallid to white when dried, more or less colorless and translucent when fresh. Receptacle and stipe beset with stiff, dark brown, thick-walled setae 150-650 × 6-18 µm in diam, which form a fringe at and extend beyond the margin. Hairs arising from piliferous cells of the ectal excipulum, acuminate, with up to 15 dark brown, thick-walled, transverse septa, some hairs (broken?) proliferating internally, especially near the apex (FIG. 7). Piliferous cells globose to subglobose, 20-55 µm in diam, bearing one major hair, and often one to several widely diverging hairs, hyaline below, becoming dark brown and thick-walled at and between the bases of hairs (FIGS. 5, 6).

Ectal excipulum of a single layer of cells forming a "skin" of textura angularis, arranged in loosely organized vertical rows. Marginal cells horizontally elongated, 2-20 × 6-25 µm, those farther down on the flanks becoming isodiametric to more vertically elongated, 12-30 × 6-18 µm, cells at the base of the receptacle and composing the stipe vertically elongated, 12-60 × 5-25 µm, tending toward textura prismatica. Medullary excipulum scant, of textura intricata, cells 2-5 µm in diam, not distinguishable from the subhymenium; hymenium up to 165 µm thick.

Asci 8-spored, clavate, 125-175 × 15-20 µm, narrowed basally to a crozier, the terminal cell usually not re-fusing with the antepenultimate cell, apex not blueing in Melzer's Reagent (J —). Ascospores biseriate, elliptic-fusoid, nonguttulate, hyaline, uninucleate, 30-35 × 9-11 μm, with a double wall; the outer wall smooth and cyanophobic, the inner wall delicately transversely wrinkled at maturity and cyanophobic (FIG. 2).

Paraphyses branched, sparingly near the base, becoming very branched and entangled apically, septate, apices rounded but not enlarged, 1-1.5 μm in diam.

Habitat and Distribution: on soil, Jamaica, B. W. I.

HOLOTYPE: CUP-MJ *174*. On soil, along Lady's Mile Trail south of Woodcutter's Gap, vicinity of Newcastle, border of St. Andrew and Portland parishes. 9. I. 1971. *R. P. Korf, J. R. Dixon, K. P. Dumont, R. W. Erb, D. H. Pfister, D. R. Reynolds, A. Y. Rossman, & G. L. Samuels.*

PARATYPE: CUP-MJ *255*. On soil, vicinity of Dick's Pond, west of Hardwar Gap, near Holywell Recreation Area and Wag Water River, St. Andrew Parish, elev. 2800-3000 ft. 10. I. 1971. *R. P. Korf, et al.*

ACKNOWLEDGMENTS

The author expresses his appreciation to the Director and staff of the Herbarium of the Royal Botanic Gardens, Kew, England, for loan of the holotype specimen of *Rhizoblepharia jugispora* Rifai; to Dr. William J. Dress, Bailey Hortorium, Cornell University for correcting the Latin diagnosis; and to Mr. H. H. Lyon, Department of Plant Pathology, Cornell University for assistance with some of the photographs.

SUMMARY

A new species, *Rhizoblepharia neotropica* Erb & Korf, is described from Jamaica, B.W.I. It has setae arising usually in widely diverging groups from a swollen piliferous cell (new term) on a distinctly stipitate apothecium. A reinvestigation of the type species of the genus, *R. jugispora* Rifai, demonstrated that in that species, too, the setae arise from piliferous cells, and are not "rooting" as originally described; the apothecia are substipitate rather than "broadly sessile" as given in the original diagnosis. No hymenial pigments occur in the neotropical species, and though carotenoid pigments were presumed to be present in the type species by Rifai, the genus is now emended to indicate that such pigments are lacking, as well as to incorporate the characters of the neotropical species and to correct observations on the type species. The genus is now to be assigned to the tribe Pseudombrophileae (Pyronemataceae, Ascophanoideae).

*LITERATURE CITED*

ARPIN, N. 1968. Les caroténoïdes des discomycètes: essai chimiotaxinomique. 170 p. Université de Lyon, Villeurbanne; *reissued* 1969, Bull. Mens. Soc. Linn. Lyon *38 (Suppl.):* 1-169.

BOUDIER, E. 1905-10. Icones Mycologicae. 4 vols. Klincksieck, Paris.

BOUDIER, E. 1907. Histoire et classification des discomycètes d'Europe. 221 p. Klincksieck, Paris.

DANGEARD, P. A. 1894. La reproduction sexuelle des Ascomycètes. Botaniste *4:* 21-58.

DENISON, W. C. 1961 [1959]. Some species of the genus *Scutellinia.* Mycologia *51:* 605-635.

DENISON, W. C. 1964. The genus *Cheilymenia* in North America. Mycologia *56:* 718-737.

DENNIS, R. W. G. British Ascomycetes. 455 p. Cramer, Lehre.

ECKBLAD, F.-E. 1968. The genera of operculate discomycetes. A re-evaluation of their taxonomy, phylogeny and nomenclature. Nytt Mag. Bot. *15:* 1-191.

GWYNNE-VAUGHAN, H. C. I., and H. S. WILLIAMSON. 1933. The asci of *Lachnea scutellata.* Ann. Bot. (London) *47:* 375-383. Pl. XVI, XVII.

KANOUSE, B. B. 1958. Some species of the genus *Trichophaea.* Mycologia *50:* 121-140.

KORF, R. P. 1972. Synoptic key to the genera of the Pezizales. Mycologia *64(5):* (in press.)

KORF, R. P., and R. W. ERB. 1972. The genus *Trichophaeopsis.* Phytologia 24: 15-19.

LE GAL, M. 1947. Recherches sur les ornementations sporales des discomycètes operculés. Ann. Sci. Nat., Bot. xi *8:* 73-297.

LE GAL, M. 1953. Les discomycètes de Madagascar. Prodrome Flore Mycol. Madagascar *4:* 1-465.

MASSEE, G. 1897. A monograph of the Geoglosseae. Ann. Bot. (London) *11:* 225-306. Pl. XII, XIII.

RIFAI, M. A. 1968. The Australasian Pezizales in the herbarium of the Royal Botanic Gardens Kew. Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. *57(3):* 1-295.

# THE GENUS TRICHOPHAEOPSIS[1]

RICHARD P. KORF

and

ROBERT W. ERB

*Plant Pathology Herbarium*
*Cornell University, Ithaca, New York*

*Trichophaea bicuspis* (Boudier) Boudier, a most unusual Operculate Discomycete with two-pronged setae, was apparently first reported for North America by the senior author in a paper read before the annual meeting of the Mycological Society of America in September, 1948. Two American collections were reported at that time, and the species has continued to intrigue him ever since, in that it differs significantly from most other species of the genus *Trichophaea* in several respects. He suggested to Mme Marcelle Le Gal while at Paris shortly thereafter that a new genus to accommodate this species would be appropriate, but deferred to her opinion that the species would be best left in *Trichophaea*, at least for the time being. He then prepared a manuscript covering his studies on the species, when a request from Dr. Bessie B. Kanouse for the loan of herbarium material of this species alerted him to the fact that she was undertaking a monographic revision of the genus. His manuscript, notes, and specimens were all turned over to Dr. Kanouse for her use, and were mentioned in her studies (Kanouse, *1958*). She, too, retained the species in *Trichophaea*, though she stressed many of the characters which now lead us to propose this species as the type of a new, monotypic genus.

The ectal excipulum of *T. bicuspis* is very characteristic, being composed of vertically oriented rows of cells, the individual cells rather short, glued together to form a one-cell-thick tissue or "skin" seen as large, plate-like structures in squash mounts. Though Kanouse noted that "Boudier did not emphasize sufficiently the peculiar exciple," a character not even mentioned in the original description (Boudier, *1896*), he did faithfully illustrate these unusual cells in his later publication (Boudier, *1905-10:* pl. 366). Such a one-cell-thick "skin" of agglutinated cells is known to us in only one other member of the Pezizales, *Rhizoblepharia neotropica* Erb & Korf in Erb (and probably also in the type species of that genus, *R. jugispora* Rifai). The studies of *R. neotropica* by the junior author (Erb, *1972*) led us to restudy *T. bicuspis*, which we are now convinced belongs to a genus close to, but distinct from, *Rhizoblepharia*, and like that genus

1. Supported in part by National Science Foundation Grant GB-8548.

referable to the Pseudombrophileae (Pyronemataceae, Ascophanoideae).

The dark brown setae of this species are diagnostic. The stiff, upward-pointing end is prolonged below into usually a short to rather long spur or branch, borne nearly in direct line with the apical part, so that at first glance the seta appears to be pointed at both ends. On rare occasions the seta may lack a basal prong, or even have two such spurs. Setae of this type are unknown elsewhere among the Discomycetes.

In addition to the setae, there are also present on the apothecial surface many other hairs apparently overlooked by all previous workers. These are of varying color from collection to collection, nearly hyaline in some specimens, but brown to almost black in others, and are much narrower than the setae, more or less flexuous, arising from a somewhat swollen basal, superficial cell, tapering slightly to a almost perfectly cylindrical tube. These hairs are (2-) 3-5 (-6) × (75-) 150-400 (-535) µm, whereas the setae have the apical portion 12-22 × 105-800 µm and the lower prong 12-22 × (0-) 43-250 (-430) µm.

*Trichophaea bicuspis* is normally considered to have biguttulate ascospores. One of its synonyms, *Lachnella setiformis* Rehm[2], was also described with biguttulate ascospores. When the senior author was unable to demonstrate guttules in the two American collections, he entered into correspondence with Mme Le Gal, who advised him *(pers. comm.)* that guttules are often absent in some collections. She communicated a specimen from the Netherlands (*Daams,* 5. XI. 1947) from her herbarium which purported to show these. Kanouse *(1958)* reported the spores as non-guttulate. Boudier *(1896)* had originally noted: "Les spores très obtuses à chaque ex[t]rémité sont ordinairement avec des granules assez gros rassemblés irrégulièrement aux deux bouts, quand elles sont encore jeunes; mûres, elles sont très réfringentes avec deux grosses sporidioles bien visibles, quoiqu'un peu effacées par suite de la réfringence même." In the explanation of the plate for his Icones Mycologicae, Boudier *(1905-10)* wrote: "Spores ... avec des granulations aux deux extremites quand elles sont jeunes, qui se reunissent en deux gouttelettes bien marquees a leur complete maturite; ..." Grelet *(1939)* likewise commented on the phenomenon of guttule appearance: "Les spores de cette espèce présentent au début, à l'intérieur, des granulations analogues à celles que l'on aperçoit dans les spores de *Trichophaea Boudieri,* mais tandis que dans

---

2. Rehm's *(1914)* statement that his *Lachnella setiformis* "... wurde bisher von mir als zugehörig zu *Lachnea livida* (Schum.) Gill. erachtet, cfr. Rehm Discom. p. 1065" is apparently in error. In examining Rehm collections at Stockholm in 1949, the senior author encountered two specimens from Wagner: (1) *Lachnea livida* (Schum.) Sacc. a. Nadelholzstock, gr. Winterberg. G. Wagner. Herbst 1885. [det. Rehm]; (2) 27. *Lachnea Rehmiana* Wagner nov. spec! a. faulenden *Ochroporus fomentarius,* gr. Winterberg. G. Wagner. V. 1894. [redet. Rehm as *Lachnea livida* (Schum.)]. These appear to be the collections mentioned by Rehm (*1895:* 1066; *1896:* 1270), but they are quite distinct from *Lachnella setiformis,* and surely not referable to either *Trichophaea* or *Trichophaeopsis*.

cette dernière espèce, les granulations ont plutôt tendence à disparaître avec l'âge, dans les spores de *Tr. bicuspis,* au contraire, les granulations ont tendence à se réunir en amas de plus en plus denses, vers les extrémités, jusqu'à ce que finalement elles se condensent en deux gouttelettes bien marquées."

Our studies have now convinced us that what was reported by Boudier and by Grelet can be found in at least some of our specimens. The youngest spores are usually without any granulations, but soon there appear irregular masses of material, either distinctly granular or of an amorphous nature, usually towards the poles. The spore matures and becomes, as Boudier correctly noted, distinctly refringent, and the contents take on a yellowish cast. The spores recall to us similarly refringent spores in the genus *Fimaria.* Some of the spores will develop one, two, or even more distinct de Bary bubbles (gas inclusions) in concentrated solutions (as also will individual cells of the setae). A single de Bary bubble frequently develops in the ascospores of species of *Trichophaea,* but the only genus known to us in which two dBb's are common is *Coprobia.* None of the previous authors mention having seen dBb's in this species, but we do not believe their reports of biguttulate spores are based on these inclusions. In mature spores one can also make out two, sometimes four, more rarely three or many, fairly distinct globules of the size illustrated by these authors. That these globules or droplets are not the typical oil guttules associated with species of *Trichophaea* is clear from the fact that they fail to absorb Sudan IV dye. We are thus far unable to determine the chemical nature of the globules. Since the ascospores are in fact devoid of oil guttules, the assignment of this species to *Trichophaea,* a genus characterized by the possession of such oil guttules, is open to further question.

The resinous yellow contents of the spores recall only one group of the Pezizineae, the tribe Pseudombrophileae (Korf, *1972*). The setae resemble in some respects the genus *Rhizoblepharia,* being exceptionally thick-walled as in that genus, whereas the hairs and setae of the other genera assigned to the tribe Pseudombrophileae *(Pseudombrophila, Fimaria, Selenaspora, Tricharina)* all tend to be much thinner-walled and, except in *Tricharina,* not acuminate. *Trichophaea bicuspis* occupies an isolated position among the Operculate Discomycetes, and appears to be worthy of a genus of its own. We assume that its closest relative is the genus *Rhizoblepharia.* Since Dr. Kanouse did not utilize the information on additional synonyms of this species uncovered by the senior author in his herbarium studies, a complete synonymy of the species is also provided here, together with a listing of the known published exsiccati.

The apothecia of this species were originally described from soil, but most of the collections are either on decaying leaves or on decorticated wood, or twigs or branches, predominantly of various species of *Populus.* The apothecia open wide when fresh to expose the white hymenium, but on drying close up so that the long bristles usually completely obscure the hymenium, and the apothecium becomes turbinate or even conical. The peculiar excipulum doubtless contributes to this phenomenon.

TRICHOPHAEOPSIS Korf & Erb, gen. nov.

*Receptaculum setis crassitunicatis, fuscis, bicuspidatis et pilis tenuitunicatis, flexuosis, hyalinis vel fuscis indutum. Excipulum ectale cellulam unam crassitudine aequans, ex textura prismatica formatum. Asci ad apicem operculati, ad basin in crocam angustati. Ascosporae hyalinae, laeves, juventute materiam granulosam vel amorphosam, maturitate materiam resinaceam luteolam et 2 vel 4 guttulas non oleosas continentes. Holotypus:* Ciliaria bicuspis *Boudier.*

Trichophaeopsis bicuspis (Boudier) comb. nov.

≡ *Ciliaria (Trichophaea) bicuspis* Boud., Bull. Soc. Mycol. France *12:* 11. 1896.
 ≡ *Lachnea bicuspis* (Boud.) Sacc. & Syd. *in* Sacc., Syll. Fung. *14:* 757. 1899.
 ≡ *Trichophaea bicuspis* (Boud.) Boud., Icones Mycol. Expl. Planches sér. *3:* 2. 1906.
 ≡ [*Tricharia bicuspis* Boud. in herb.; Kanouse, Mycologia *50:* 138. 1958.]
= *Lachnea eichlerii* Bres. (as *"Eichlerii"*), Ann. Mycol. *1:* 119. 1903.
 ≡ *Tricharia eichlerii* (Bres.) Boud. (as *"Echlerii"*), Hist. Classif. Discom. d'Eur. 57. 1907.
= *Lachnella setiformis* Rehm, Ann. Mycol. *12:* 174. 1914.

PUBLISHED EXSICCATAE: *Jaap,* Fungi sel. exs. *455* (as *Lachnea livida*); *Jaap,* Fungi sel. exs. *876* (as *Lachnella setiformis*); *Rehm,* Asc. *1225* (as *Lachnella setiformis,* ISOTYPE of that name in S-R examined).

OTHER TYPE SPECIMENS EXAMINED: [*Boudier*], ad terram, Montm[orency], 7br 1895, PC-B, LECTOTYPE of *Ciliaria bicuspis,* designated by Korf in Kanouse (*1958:* 138); *Eichler,* ad folia et caules herbarum, [Poland], no number, no date, S-B, HOLOTYPE of *Lachnea eichlerii.*

*ACKNOWLEDGMENTS*

For many favors the senior author expresses his gratitude to the late Dr. Bessie B. Kanouse and to Dr. Marcelle Le Gal. For facilities provided and permission to examine type and authentic specimens, he is indebted to Prof. Roger Heim of the Muséum National d'Histoire Naturelle, Paris, and to Dr. G. Haglund of the Stockholm Naturhistoriska Riksmuseet.

*LITERATURE CITED*

BOUDIER, E. 1896. Description de quelques nouvelles espèces de Discomycètes de France. Bull. Soc. Mycol. France *12:* 11-17.

BOUDIER, E. 1905-10. Icones Mycologicae. 4 vols. Klincksieck, Paris.

ERB, R. W. 1972. A new species of the genus *Rhizoblepharia* from the neotropics, and a redisposition of the genus in the Pyronemataceae, Pseudombrophileae. Phytologia 24: 5-14.

GRELET, L.-J. 1939. Les Discomycètes de France d'après la classification de Boudier (Huitième fascicule). Bull. Soc. Bot. Centre-Ouest

*1939:* 19-37. (Reprint repaged 1-18.)
KANOUSE, B. B. 1958. Some species of the genus *Trichophaea.* Mycologia *50:* 121-140.
KORF, R. P. 1972. Synoptic key to the genera of the Pezizales. Mycologia *64(5):* (in press.)
REHM, H. 1895. Ascomyceten: Hysteriaceen und Discomyceten. *In* Dr. L. Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz, Zweite Auflage (G. Winter and H. Rehm, eds.). *1(3)* [Lief. 44]: 1041-1104.
REHM, H. 1896. *Ibid.,* [Lief. 55]: 1233-1275.
REHM, H. 1914. Rehm: Ascomycetes exs. Fasc. 55. Ann. Mycol. *12:* 170-175.

- - - - - - - - - - - - - - - -

## TWO NEW PIPEWORTS FROM BRAZIL

Harold N. Moldenke

PAEPALANTHUS ARGILLICOLA var. PILOSUS Moldenke, var. nov.

Haec varietas a forma typica speciei recedit foliis pilosis (pilis sparsis elongatis albis), pedunculis glabris, et vaginis densiter longiterque pilosis, pilis elongatis albis.

This variety differs from the typical form of the species chiefly in having at least some of its leaves sparsely scattered-pilose, the peduncles glabrous, and the sheaths densely long-pilose, the hairs on both the leaves and the sheaths weak, ascending, and white.

The type of this variety was collected by H. Strang and A. Castellanos (no. 26305) "na rodov. BR-6", at Restinga de Sernambetibam near Pedra Itaúna, Guanabara, Brazil, on March 12, 1967, and is deposited in my personal herbarium at Plainfield, New Jersey.

SYNGONANTHUS AQUATICUS var. CAESPITOSUS Moldenke, var. nov.

Haec varietas a forma typica speciei recedit caulibus usque ad 6 cm. elongatis, ramis 3—4 cm. longis, et pedunculis 9—18 congregatis 3.5—9.5 cm. longis glabris.

This variety differs from the typical form of the species in having its very leafy stem to 6 cm. long, the branches only 3—4 cm. long and apparently always solitary, and the peduncles 9—18 per cluster, 3.5—9.5 cm. long, and completely glabrous.

The type of the variety was collected by G. T. Prance, P. J. M. Maas, A. A. Atchley, W. C. Steward, D. B. Woolcott, D. F. Coêlho, O. P. Monteiro, W. S. Pinheiro, and J. F. Ramos (no. 13778), forming dense tufts 20 cm. tall, on the Fortaleza Savanna, Rio Puciari tributary of the Rio Ituxi, Amazônas, Brazil, on June 29, 1971, and is deposited in my personal herbarium at Plainfield, New Jersey.

ADDITIONAL NOTES ON THE GENUS VERBENA. XV

Harold N. Moldenke

VERBENA [Dorst.] L.

Additional & emended bibliography: Rivin., Introd. Gen. Rem Herb. Ord. Pl. Irreg. Monop. [24], pl. [56] & [57]. 1690; P. M. Rodríguez, Pl. Medic. Parag. 109--111. 1915; R. W. Br., Compos. Scient. Words 460, 832, & 833. 1954; Humbert, Fl. Sahara Sept. & Cent. 405--407, fig. 149. 1958; H. H. Iltis, Prelim. Check List Ferns Seed Pl. Upham Woods, ed. 1, 12. 1960; Quezel & Santa, Nouv. Fl. Alg. 2: 779 & 780. 1963: H. H. Iltis, Prelim. Check List Ferns Seed Pl. Upham Woods, ed. 2, 12. 1968; Beebe & Hoffm., Am. Midl. Nat. 80: 96, 99, 101, & 103. 1968; J. E. Weaver, Prairie Pl. 204, 206, & 275. 1968; Burbidge & Gray, Fl. Austr. Cap. Terr. 310, 313, & 445, fig. 312. 1970; McMinn, Allan Cunningh. 9. 1970; Mahler, Key Vasc. Pl. Black Gap, ed. 3, 69--71, 104, & 109. 1971; Thetford, Pieper, & Nels., Journn. Range Manag. 24: 425--431. 1971; Anon., Biol. Abstr. 53 (7): B.A.S.I.C. S.270. 1972; A. H. D., Biol. Abstr. 53: 3496. 1972; Moldenke, Phytologia 23: 366--389, 413--473, 505--507, 509, & 512. 1972; Cody, Ind. Sem. 1972: 25. 1972; W. A. Weber, Rocky Mtn. Fl. 305--306 & 437. 1972.

The Rivinius work (1690), cited in the above bibliography, is sometimes cited as "Rivin., Ord. Pl. Irreg. Monop. 81, t. 56". The New York Botanical Garden Library's copy of this work has the plates unnumbered, but the one depicting Verbena is actually the 56th in sequence. The page of text on which the name occurs is also unnumbered, but is the 24th in the series which begins with numbered pages. Possibly in some other extant copies of this work the pages are in a different sequence and it is the 81st. The work is dated "1691--1717" by some bibliographers.

R. W. Brown (1954) reminds us that the Latin word "lustrago, -inis, f." refers to "a kind of vervain, just as the Greek word "hierobotane, f." is also the name for a vervain known to the ancients [actually, Verbena officinalis L.].

Thetford, Pieper, & Nelson (1971) report that species of this genus constitute important forbs in sheep diets.

Leverett (1852) misspells the common name for members of this genus as "vervaing".

VERBENA AMBROSIFOLIA Rydb.

Additional bibliography: Mahler, Keys Vasc. Pl. Black Gap, ed. 3, 70. 1971; Moldenke, Phytologia 23: 367, 426, & 431. 1972; W. A. Weber, Rocky Mtn. Fl. 305. 1972.

VERBENA BONARIENSIS L.

Additional bibliography: Burbidge & Gray, Fl. Austr. Cap. Terr. 310, 313, & 445, fig. 312. 1970; Moldenke, Phytologia 23: 367, 418, & 419. 1972.

Additional illustrations: Burbidge & Gray, Fl. Austr. Cap.

Terr. 313, fig. 312. 1970.

Burbidge & Gray (1970) comment that this species is "Of South American origin but naturalised in New South Wales, Victoria, and South Australia; a roadside weed in the A. C. T. [=Australian Capital Territory] where it flowers in summer" and is called "purple-top".

VERBENA BRACTEATA Lag. & Rodr.

Additional bibliography: Moldenke, Phytologia 23: 367, 374, 413, 414, 419, & 426. 1972; W. A. Weber, Rocky Mtn. Fl. 306. 1972.

VERBENA BRASILIENSIS Vell.

Additional bibliography: Moldenke, Phytologia 23: 259, 265, 291--293, 371, 413, 414, & 435. 1972.

It should be noted here that the I. S. Gottsberger 143 [4], cited in a previous installment of these notes as being deposited in the herbarium of the Fairchild Tropical Garden is actually in that of the Texas Research Foundation at Renner, Texas, instead.

In June, 1972, my wife, my son, and I observed this species growing abundantly along moist roadsides in Stanislaus County, California.

VERBENA CANESCENS H.B.K.

Additional bibliography: Mahler, Keys Vasc. Pl. Black Gap, ed. 3, 70. 1971; Moldenke, Phytologia 23: 219--220 & 373--375. 1972.

VERBENA CANESCENS var. ROEMERIANA (Scheele) Perry

Additional bibliography: Mahler, Keys Vasc. Pl. Black Gap, ed. 3, 70. 1971; Moldenke, Phytologia 23: 219--220, 374, & 375. 1972.

Mahler (1971) calls this the "Roemer verbena".

VERBENA CILIATA Benth.

Additional bibliography: Mahler, Keys Vasc. Pl. Black Gap, ed. 3, 70. 1971; Moldenke, Phytologia 23: 220, 237, 302, & 370. 1972.

xVERBENA COVASII Moldenke

Additional bibliography: Moldenke, Phytologia 23: 194--195. 1972.

Emended illustrations: Schnack & Covas, Darwiniana 7: 78, fig. 2B, pl. 1 D, & pl. 5 A--G. 1945.

VERBENA CRITHMIFOLIA Gill. & Hook.

Additional bibliography: Moldenke, Phytologia 23: 368 & 426. 1972.

The Zöllner 5417, distributed as V. crithmifolia, is actually V. parodii (Covas & Schnack) Moldenke.

VERBENA HASTATA L.

Additional bibliography: Rivin., Introd. Gen. Rem Herb. Ord. Pl. Irreg. Monop. [24], pl. [57]. 1690; R. W. Br., Compos. Scient. Words 833. 1954; Moldenke, Phytologia 23: 368, 413, 414, & 435--

437. 1972; Cody, Ind. Sem. 1972: 25. 1972; W. A. Weber, Rocky Mtn. Fl. 306. 1972.

Schuett & Roe collected this plant on a sandy shore with Cyperus and Scirpus and thought that it might represent a hybrid, but their specimen seems to be typical dwarfed V. hastata.

Additional citations: NORTH CAROLINA: Avery Co.: Leonard & Russ 2634 (N). WISCONSIN: Marquette Co.: Schuett & Roe 92 (Ws).

xVERBENA HYBRIDA Voss

Additional bibliography: McMinn, Allan Cunningh. 9. 1970; Burbidge & Gray, Fl. Austr. Cap. Terr. 11, 92, 93, & 431. 1970; Moldenke, Phytologia 23: 368--369, 417, 426, & 436. 1972.

McMinn (1970) asserts that Allan Cunningham and James Bowie "are generally credited with having introduced to England from Brazil the Verbena, which was later to develop under hybridization into one of the most popular of ornamentals".

VERBENA LACINIATA (L.) Briq.

Additional & emended bibliography: Schnack & Covas, Darwiniana 7: [71]--75 & 77--79, pl. 1 D--F, 3 A, & 5 A--G. 1945; Schnack & Solbrig, Revist. Fac. Agron. La Plata 29: [255]--266, fig. 1--4. 1953; Moldenke, Phytologia 23: 369, 377, 430, & 435. 1972.

Emended illustrations: Schnack & Covas, Darwiniana 7: pl. 1 E & F, 3 A, & 5 B. 1945; Schnack & Solbrig, Revist. Fac. Agron. La Plata 29: 257, 261, & 263, fig. 1 A & B, 3 A & B, & 4 A & G. 1953.

The Herrera 3450, originally distributed as V. laciniata, is actually V. microphylla H.B.K.

VERBENA OFFICINALIS L.

Additional & emended synonymy: Verbena communis coeruleo flore C. Bauh. ex Tourn., Compl. Herb. 357. 1719. Verbena mas seu recta & vulgaris Parkinson ex Tourn., Compl. Herb. 357, in syn. 1719.

Additional & emended bibliography: Rivin., Introd. Gen. Rem Herb. Ord. Pl. Irreg. Monop. [24], pl. [56]. 1690; P. M. Rodríguez, Pl. Medic. Parag. 109--111. 1915; Quezel & Santa, Nouv. Fl. Alg. 2: 780. 1963; Moldenke, Phytologia 23: 377--389, 414, 419, 421--423, 435--437, 460--473, & 511. 1972.

Emended illustrations: Rivin., Introd. Gen. Rem Herb. Ord. Pl. Irreg. Monop. pl. [56]. 1690.

The Rivinius work (1690), cited above, is sometimes cited as "Rivin., Ord. Pl. Irreg. Monop. 81, t. 56". The copy of this work in the library of the New York Botanical Garden has the plates unnumbered, but the one depicting this species is 56th in the series -- perhaps in some extant copies of the work the plates have been numbered by hand. Also the page on which the text explaining the illustration appears is 24th in the series of pages following the numbered ones -- perhaps in other copies of the work the pages are bound differently and it is there the 81st. The work is cited as "1691--1717" by some bibliographers.

Tournefort (1719) records the common name "common vervain with a blue flower" for this species. Rodríguez (1915) adds "colombaria", "hierba buena", "hierba culumbina", "hierba cruz", "hierba de Santiago", "hierba sagrada", "hierba turca", "verbena común", and "yerba de todos los males". He also notes that in Paraguay V. officinalis "existe en abundancia en nuestro pais". If this is true, then it does seem passing strange that in my 45 years of work on this group I have not as yet seen a single specimen of the species from Paraguay! He seems most probable to me that the various medicinal uses which he gives for this plant have been taken wholly from European literature. In fact, he notes that "Algunos autores, dicen que apenas tiene uso actualmente. Sin embargo, babia yo notado desde hace años la verdadera insistencia y fé con que empleaban nuestras gentes de campaña. Y hasta en ocasiones soureía. La práctica, esa madre de la ciencia ha venido sin embargo á corroborar sa empleo. Es pues mi objeto levantar un milímetro más, el nivel que ocupa actualmente nuestra humilde verbena, dando á conocer el veredicto de competentes en la materia. De paso anotaremos que Plinio, Virgilio y Propercio afirmaban que era empleada la verbena en ciertas ceremonias entre los druidos y los celtas; entre los romanos para purificar los altares y quitarles el polvo; en los filtros amorosos como afrodisiacos, las pitonisas se adornaban la frente con ella para sus predicciones; y finalmente, era la yerba sagrada de los heraldos pues proclamaban la guerra, teniendo á su lado un hombre con un ramito de verbena en la mano."

He then quotes Mathioli: "Mathiolo, botánico sienes fué quien asignó á la verbena propiedades febrifugas, ratificando á su vez la creencia de que los ramos del primer nudo son útiles en las fiebres diarias, las terceras en las tercianas etc. Considero util y de peso cientifico, copiar sus palabras: 'Las hojas, dice, tomadas con vino así como la raiz, sirve aplicada en forma de emplastro sobre la mordedura de víbora; bebida en cantidad de una dracma (3 grs. 88 centgs.) en un cortadillo de vino añejo, con tres ovulos de incienso por cuarenta dias y en ayunas es util en los derrames de bilis; mitiga bajo la forma de emplasto las postemas crónicas y la inflamación y modifica las úlceras sórdidas. El cocimiento de toda la planta en gargarismos corrige las anginas y cierra las úlceras corrocivas de la boca. Dícese que rociando con su cocimiento á las comensales en los banquetes les alegra. Las hojas, desde el tercer nudo, á contar desde el suelo, se usan contra las tercianas y al partir del cuarto, en las cuartanas.'

"El Dr. Ricci refiere: quen en un viaje realizado á la provincia del Siena y especialmente en Val de Orcia donde reinaba la fiebre malaria, pudo observar los buenos resultados que se obtenía para cortar la calentura, con un cocimiento de hojas de verbena. Dicha preparación tenía la ventaja sobre la quinina, do no producir recedivas, en tanto que la acción de este alcaloide, vuelven por cualquier exeso en las comidas ó por exponerse al fresco de la madrugada ó anochecer.

"Se administraba en la siguiente forma: 5 gramos de hoja en medio litro de agua hirbiendo. Se apuraba el cocimiento hasta roducirlo por la mitad. Colado, tomaban todas las mañanas en ayunas durante varios dias.

"Setiembre era cuando más usaban porque afirmaban que en ese mes y en todo el Otoño, la quinina producia muy poco efecto.

"Ensayado luego por el misme médico en elganos casos de intermitentes, en lo que varios fueron rebeldes á la quinina, pudo comprobar sus buenos resultados y le impulsaron á proseguir.

"Estos buenos resultados se manifestaron segun la gravedad y el tiempo que venian padeciéndose, ya á los ochos días y hasta á los quince; en un solo caso me vi precisado á continuar su uso por viente dias, para que no volviese á aparecer la fiebre.

"Sin tener en cuenta á que nudo pertenecian las hojas arrancadas ni el tipo de la intermitente preparaba un cocimiento y administraba, no de una sola vez sino 2 ó 3 veces diarios después de desaparecer la calentura.

"Y finalmente concluia: 'No dispuse á enfermo alguno, prescripciones especiales, como la dieta, resguardarse del relente de la madrugada y de la noche, todo con objeto de comprobar la verdad de lo que venia asegurándose sobre la acción benéfica de esta planta en las intermitentes, independiente de toda precaución.

"'Me prometo ante de nuevos experimentos, conocer analiticamente la Verbena officinalis, para poderme explicar á que principio ó por que mecanismo dinamico puede actuar sobre el proceso febril.'.....

"Un anciano me decía hace poco: 'Nunca se olvide que en ciertos dias, el cuerpo fatigado, el estómago é intestino se transtornan á consecuencia de la mala calidad de nuestra alimentación, sobreviniendo efectos que se producen por una fiebre de origen gastrico, poca gana de tomar alimentación dolores en el bajo vientre y languidez. En esos casos, rinde muy buen resultado un decocto de verbena con un pocde azucar tomado en ayunas. Con ello, el apetito vuelo ve y la fiebre desaparece."

Quezel & Santa (1963) state that V. officinalis is found wild "dans toute l'Algérie". Panigrahi & Saran (1967) cite their 1516 & 10627 from Tehrighat, India; Esfandiari (1967) cites Behboud s.n. [29.7.49], Bogomolov s.n. [1947], Mir-kamali s.n. [2.9.65], and Scharif s.n. [28.5.49] from Iran.

Pampanini (1930) cites Giannattasio s.n. [Cirene, 1926], Petrovich s.n. [Benghasi, 1880-1884], Ruhmer s.n. [Bengasi, 1883], and Vaccari s.n. [Derna, 1912] from Cyrenaica. Druce (1897) cites from England the following collections: Batson s.n. [Wickham], Bellamy s.n. [Ilsley], F. W. Bennett s.n. [Wittenham], Bunny s.n. [near Bucklebury Parsonage] & s.n. [Itchenswell], J. Frances s.n. [between Didcot and Upton], Lousley s.n. [Blewbury] & s.n. [Hampstead Norris], M. Niven s.n. [Carswell], Pamplin s.n. [Streatley], Penny s.n. [Wellington College], W. M. Rogers s.n. [Chieveley], S. Rudge s.n. [Sonning, 1800], Stanton s.n. [Wargrave], Tafnail s.n. [Shinfield], and Walker s.n. [Mareham].

Patzak & Rechinger (1967) reduce V. tenuispicata Stapf to synonymy under V. officinalis and cite: IRAQ: Barkley 9071, Guest 2994 & 3044, Rechinger 11517. IRAN: Behboudi 1266, Bornmüller 5127, Buhse s.n., Bunge s.n., Furse 2841, Gauba 903, Grant 16057 & 16081, Knapp s.n., Koeie 770 & s.n., Koelz 15757, 16144, 16839, & 18192, Lindsay 375 & 1026, Manucheri s.n., Martinez de la Escalera s.n., Rechinger 1083, 1805, & 5255, Sab. s.n., Sintenis 1328, Stapf s.n., Starmühlner 1071, Str. s.n. U.S.S.R.: Turkmanskaya: Lipsky s.n. AFGHANISTAN: Amsel s.n., Chaworth-Musters s.n., Edelberg 1110 & 1788, Hedge & Wendelbro 3770 & 4327, Koeie 3151, Koelz 11593, 11785, 13246, & 13501, Lindberg 557, Neubauer 1950/737, Rechinger 17061 & 19229, Volk K.134. PAKISTAN: Blatter, Hallberg, & McCann 225 & 346, Rechinger 30231 & 30270, Stewart s.n. Kapoor (1968) cites Srivastava & Party 29701 from Kashmir.

Priszter (1971) offers seeds of Verbena officinalis under his seed packets no. 1670 and 2645.

Additional citations: DELAWARE: New Castle Co.: Canby s.n. [July] (Pa). DISTRICT OF COLUMBIA: Sudworth s.n. [8 June 1890]. NORTH CAROLINA: Catawba Co.: Small & Heller s.n. [June 25-26, 1891] (Lk). SOUTH CAROLINA: Aiken Co.: Canby s.n. [May 1858] (Pa). CALIFORNIA: San Diego Co.: Edw. Palmer 304 (Pa). NORWAY: Ellingsen s.n. [Aug. 1879] (Go), s.n. [14/8/1889] (Go). SWEDEN: Blom s.n. [7/7/1948] (Go), s.n. [23/XI/1951] (Go), s.n. [12/10/1952] (Go), s.n. [18/9/1955] (Go), s.n. [17/8/1956] (Go), s.n. [16/8/1957] (Go); Brandt s.n. [15/8/1952] (Go), s.n. [24/7/1953] (Go); H. Fries s.n. [12/9/1947] (Go). DENMARK: A. Hensen s.n. [31/8/1898] (Go). FRANCE: Herb. Mus. Paris. s.n. (N). PORTUGAL: F. Lemos 157 (N). SWITZERLAND: Bernet s.n. [Genève] (Se--158842); G. Kohler 114 (Se--227366). GREECE: Ferguson & Natzio 827 (W--2437950). ITALY: Kuntze s.n. [Genua, 18/V/67] (W--2505561). ETHIOPIA: C. C. Albers 62132 (Au--223637). ZAMBIA: E. A. Robinson 5596 (N). IRAN: Koelz 15757 (W--2188876), 16144 (W--2189170), 16839 (W--2189631). PAKISTAN: Karachi: Quaiseo 259. NEPAL: Banerjee & Shakya 5596 (W--2581495). INDIA: East Punjab: R. E. Cooper 5045 (Mi). CHINA: Szechuan: Farges 832 bis (W--2496749). THAILAND: Larsen, Santisuk, & Warncke 2937 (Ac). JAPAN: Honshu: Murata 27359 (W--2409960). RYUKYU ISLAND ARCHIPELAGO: Amamioshima: Hosoyamada s.n. [July 23, 1927] (W--2071188). Ishigaki: F. R. Fosberg 37244 (Rf); Masamune & Mori s.n. [July 31, 1934] (Tw); A. Smith 50 (W--2156896), 211 (W--2156952). Kurema: Okuhara & Sunagawa 22 (Rf). Okinawa: Beauchamp 1178 (W--2620617); Field & Loew 21t (W--1942622), 96e (W--1942760); R. Moran 5066 (W--2186564); A. R. Phillips 46 (W--2187038), 105 (W--2245938); E. H. Walker 7557 (W--2129627), 8101 (Ac, W--2619389). Island undetermined: C. Wright s.n. [Loo-choo Islands] (W--73001). FORMOSA: Chuang & Kao 4544 (N). NEW ZEALAND: North: H. H. Allan s.n. (Nz--1164). South: Healy 59/408 (Nz--118197); Kilworth s.n. [1/2/1961; Herb. Bot. Div. D. S. I. R. 118429] (Nz--118429, Rf). LOCALITY OF COLLECTION UNDETERMINED: Collector undesignated s.n. [Tzschetzschnow, Juli 1933] (Pa); Herb. A. Brown s.n. (N).

VERBENA OFFICINALIS var. ALBIFLORA Strobl

Additional synonymy: Verbena communis floribus albidis Tourn. ex Manetti, Virid. Florent. 98. 1751. Verbena communis, floribus albidis Seguier ex Bertol., Fl. Ital. 6: 260, in syn. 1844.

Additional bibliography: Tourn., Compl. Herb. 357. 1719; Manetti, Virid. Florent. 98. 1751; Gussone, Fl. Sic. Prodr. 2: 145. 1828; Bertol., Fl. Ital. 6: 260. 1844; Moldenke, Phytologia 11: 475. 1965; Gilkey & Dennis, Handb. NW. Pl. 353. 1967; Moldenke, Fifth Summ. 1: 207 (1971) and 2: 604, 668, 686, & 917. 1971; Moldenke, Phytologia 23: 414. 1972.

Gussone (1828) does not name this variety, but describes it as "Floribus albis variat, quae rarior, sed magis obvia cum floribus coeruleis. In icone Sabbat. flores duplo majores". Tournefort (1719) calls it the "common vervain with white flowers". Gilkey & Dennis (1967) assert that about Portland, Oregon, this white-flowered variety is more common than the normal purplish-flowered form.

VERBENA OFFICINALIS var. ANARRHINOIDES Murr

Additional bibliography: Moldenke, Phytologia 10: 278--279. 1964; Moldenke, Fifth Summ. 1: 205 (1971) and 2: 917. 1971.

VERBENA OFFICINALIS var. BRACHYANTHA Murr

Additional bibliography: Moldenke, Phytologia 10: 279. 1964; Moldenke, Fifth Summ. 1: 206 (1971) and 2: 917. 1971.

VERBENA OFFICINALIS var. GAUDICHAUDII Briq.

Additional bibliography: Moldenke, Phytologia 11: 475. 1965; Moldenke, Fifth Summ. 1: 349 & 371 (1971) and 2: 687 & 917. 1971.

VERBENA OFFICINALIS var. GRACILIS G. Cta.

Additional bibliography: Moldenke, Phytologia 10: 280. 1964; Moldenke, Fifth Summ. 1: 203 (1971) and 2: 917. 1971.

VERBENA OFFICINALIS var. GRANDIFLORA Hausskn.

Additional bibliography: Moldenke, Phytologia 11: 475. 1965; Moldenke, Résumé Suppl. 17: 7. 1968; Moldenke, Fifth Summ. 1: 206 & 350 (1971) and 2: 917. 1971.

Hodgkins says that "Round Auckland [New Zealand] in waste places & roadsides, uncommon, also seen at Great Barrier Island and at Okovoine in the Waikato; usually squamose or ascending or rarely erect 1--2 ft. high, fls. nearly double the diameter of Verbena officinalis. It is very scarce in all the localities seen."

Citations: NEW ZEALAND: North: Hodgkins 5 (Nz--2052).

VERBENA OFFICINALIS var. LATILOBA Sennen

Bibliography: Moldenke, Fifth Summ. 1: 205 (1971) and 2: 917. 1971.

The collection cited below is probably the type collection of this variety. It bears the following description, apparently by Sennen: "feuilles supérieures entières à limbe large, ainsi que ses lobes des feuilles caulinaires; longe épis". It is possible that this may be the variety described by Haller (1768) as having "Foliis vix dissectis" and by Bertolini (1844) as "foliis non, vel parum dissectis".

Citations: SPAIN: Gonzalo s.n. [Sennen 4845] (N--isotype).

VERBENA OFFICINALIS var. MACROSTACHYA Benth.

Additional bibliography: Moldenke, Phytologia 11: 475. 1965; Moldenke, Fifth Summ. 1: 208, 349, & 371 (1971) and 2: 682, 687, & 918. 1971.

VERBENA OFFICINALIS f. MONTANA Goiran

Additional bibliography: Moldenke, Phytologia 10: 281. 1964; Moldenke, Fifth Summ. 1: 206 (1971) and 2: 918. 1971.

VERBENA OFFICINALIS var. PROSTRATA Gren. & Godr.

Synonymy: Verbena officinalis var. prsotrata Gren. & Godr. ex Moldenke, Résumé Suppl. 17: 7, sphalm. 1968.

Additional bibliography: Moldenke, Phytologia 11: 475. 1965; Moldenke, Résumé Suppl. 17: 7. 1968; Moldenke, Fifth Summ. 1: 205, 206, 211, 213, & 350 (1971) and 2: 687 & 918. 1971.

This plant has been collected in flower and fruit in January. It is said to be "abundant throughout" North Island, New Zealand, where Healy describes it as "anomalous plants: stalks closely appressed to ground."

Additional citations: ERITREA: Pappi 4331 (W--2483955). NEW ZEALAND: North: Healy 50/64 (Nz--70249a); "L. B. M." s.n. [Te Kaha, 1.3.41] (Nz--34326).

VERBENA OFFICINALIS var. RESEDIFOLIA Murr

Additional bibliography: Moldenke, Phytologia 10: 282. 1964; Moldenke, Fifth Summ. 1: 206 & 208 (1971) and 2: 918. 1971.

xVERBENA OKLAHOMENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 16: 191. 1968; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1317 & 1324. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke, Fifth Summ. 1: 47, 53, & 59 (1971) and 2: 654, 658, & 918. 1971; Moldenke, Phytologia 22: 471. 1972.

Unfortunately, this binomial was inadvertently written as that of a true species in the Correll & Johnston work (1970) cited above.

VERBENA ORCUTTIANA Perry

Additional bibliography: Moldenke, Phytologia 16: 191. 1968; Moldenke, Fifth Summ. 1: 76 (1971) and 2: 918. 1971.

Moran found this plant to be "locally common" in dry meadows and occasional in open grass areas in pine forests and "occasional in Jeffrey pine forest" in Baja California. The corollas are said to have been "blue" on R. V. Moran 13604 and "blue-violet" on R. V. Moran 13476.

Additional citations: MEXICO: Baja California: R. V. Moran 13476 (Sd--63645), 13596 (Sd--63433), 13604 (Mi, N, Sd--63504, W--2553382).

VERBENA ORIGENES R. A. Phil.

Additional & emended bibliography: R. A. Phil., Viage Des. Atac. 214. 1860; Sanzin, Anal. Soc. Cient. Argent. 88: 98, 127--129, & 134, fig. 32. 1919; I. M. Johnst., Rev. Soc. Aegent. Cienc. Nat. 9: 317. 1929; J. A. Clark, Card Ind. Gen. Sp. Var. issue 183. 1944; Moldenke, Phytologia 16: 191. 1968; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 521, 665, 688, & 918. 1971; Moldenke, Phytologia 23: 426. 1972.

Emended illustrations: Sanzin, Anal. Soc. Cient. Argent. 88: 128, fig. 32. 1919.

Johnston (1929) says "I refer here collections from talus at ca. 3300 m. alt. in the gorge above Baños de San Críspin (J. 6102) and from a dry gravelly bench at ca. 2900 m. alt. in Queb. del Cadillo (J. 6154). The coarse simple or subsimple stems are erect or somewhat decumbent at the base. They spring from a low woody caudex and form a plant usually 3--6 dm. tall. The corollas are pale bluish. My collections are obviously conspecific with those illustrated and treated as V. origenes Ph. by Sanzin.........The type of V. origenes Ph., Linnaea, XXIX, 20 (1857), is a poor specimen lacking corollas. It came from the high cordilleras of Coquimbo and, as far as comparisons can be made, is indistinguishable from the type of V. palmata Reiche, Fl. Chile, V, 287 (1910), which also came from the same general region and perhaps even from the same territory in the vicinity of Baños del Toro. Reiche's V. palmata is distinguished from the plant he called V. origenes by the smaller anthers and lack of stiped protruding staminal appendages. As the plant which lacks appendages ranges from the cordilleras southeast of Copiapó to east of Coquimbo and appears to be the only one with its characteristic habit in the area, I feel confident that V. origenes Ph. is the same species as V. palmata Reiche and that Philippi's name should be applied to the concept which Reiche described as V. palmata. The plants with well developed, salient staminal appendages which grow in the cordilleras of Aconcagua, Mendoza and San Juan, are indistinguishable from V. deserticola Ph., of the mountains east of Copiapó, except that their leaves are somewhat more abundantly lobed, the lobes somewhat more obtuse and the plants as a whole a trifle more stiff and scabrid. These differences, however, seem minor ones and I am treating my collections as referable to that species, although realizing that they might be treated as varietally distinct."

Additional citations: CHILE: Coquimbo: J. L. Morrison 17271 (Se—120439); Zöllner 4087 (Go).

VERBENA ORIGENES var. GLABRIFLORA Moldenke

Additional bibliography: Moldenke, Phytologia 16: 191. 1968; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 918. 1971.

VERBENA ORIGENES var. SEMPERI Moldenke

Additional bibliography: Moldenke, Phytologia 10: 288. 1964; Moldenke, Fifth Summ. 1: 202 (1971) and 2: 918. 1971.

xVERBENA OSTENI Moldenke

Additional bibliography: Moldenke, Phytologia 11: 475. 1965; Moldenke, Fifth Summ. 1: 178 & 190 (1971) and 2: 683, 689, 690, 702, & 918. 1971.

Additional citations: BRAZIL: Rio Grande do Sul: Palacios & Cuezzo 340 (N).

VERBENA OVATA Cham.

Additional & emended bibliography: Noack, Biol. Zentralbl. 57: 384--386, fig. 13. 1937; Darlington & Wylie, Chrom. Atl., pr. 1, 323. 1956; Moldenke, Phytologia 16: 191. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Moldenke, Fifth Summ. 1: 178, 188, 202, & 371 (1971) and 2: 655 & 918. 1971; Moldenke, Phytologia 22: 478 (1972) and 23: 419. 1972.

Illustrations: Noack, Biol. Zentralbl. 57: 386, fig. 13. 1937.

Krapovickas and his associates found this plant growing "en vega, borde de arroyo", fruiting in December. The Cowgill 903, cited below, was grown from seeds collected in Paraguay by Archer. The corollas as said to have been "blue" on Krapovickas, Cristóbal, Arbo, Maruñak, Maruñak, & Irigoyen 17069 and on A. G. Schulz 6986 and "mauve" on Woolston 916.

Material of this species has been misidentified and distributed in some herbaria as V. bonariensis L.

Additional citations: PARAGUAY: Woolston 916 (N). ARGENTINA: Corrientes: Krapovickas, Cristóbal, Arbo, Maruñak, Maruñak, & Irigoyen 17069 (Rf). Misiones: A. G. Schulz 6986 (N). CULTIVATED: Maryland: Cowgill 903 [Pl. Introd. 121505] (Mi).

VERBENA PARAGUARIENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 11: 476. 1965; Moldenke, Fifth Summ. 1: 188 (1971) and 2: 918. 1971.

Additional citations: PARAGUAY: T. Rojas s.n. [Hassler 9751] (Ca—950435—isotype).

VERBENA PARANENSIS Moldenke

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 572. 1965; Moldenke, Phytologia 14: 292. 1967; Moldenke, Fifth Summ. 1: 178 (1971) and 2: 918. 1971.

VERBENA PARODII (Covas & Schnack) Moldenke

Additional & emended bibliography: Schnack & Covas, Darwiniana 7: [71], 72, 74, & 75, pl. 2 A & D. 1945; J. A. Clark, Card Ind. Gen. Sp. Var. issue 191. 1945; Darlington & Wylie, Chrom. Atl., pr. 1, 323. 1956; Troncoso in Cabrera, Fl. Proc. Buenos Aires 5: 134 & 139--140. 1965; Moldenke, Phytologia 16: 191. 1968; Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1238. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715. 1969; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 207. 1970; Moldenke, Fifth Summ. 1: 202 (1971) and 2: 522, 683, 688, & 918. 1971; Moldenke, Phytologia 23: 419 & 426. 1972.

Schnack & Rubens (1970) record this species from La Pampa, Argentina. Troncoso (1965) gives its distribution as "Región andina. Extremo sur de la Provincia (partidos de Patagones y Villarino)" of Buenos Aires. She cites J. H. Hunziker 384 & 4584 and Krapovickas 1990, the two former deposited in the San Isidro herbarium, the latter being sheet number 47896 in the Buenos Aires herbarium. She comments that "Los ejemplares bonaerenses difieren de la forma típica de Mendoza, en las brácteas menores (no alcanzan a veces la mitad del cáliz), tubo corolar glabro o subglabro y borde de las hojas a veces subrevoluto".

Material of this species has been misidentified and distributed in some herbaria as V. crithmifolia Gill. & Hook.

Additional citations: ARGENTINA: Mendoza: Krapovickas & Cristobal 14581 (Rf); Zöllner 5417 (Rf).

VERBENA PARVULA Hayek

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 615 & 627--628. 1960; Moldenke, Résumé Suppl. 17: 3. 1968; Moldenke, Phytologia 16: 192. 1968; Moldenke, Fifth Summ. 1: 87, 137, 144, & 184 (1971) and 2: 674 & 918. 1971; Moldenke, Phytologia 23: 222, 233, 293, 417, & 418. 1972.

Recent collectors have encountered this plant on dry or xerophytic slopes, flowering in June, fruiting in January and September. Edwin & Schuncke call it a "common roadside weed....also growing on gentler slopes", but describe it as a "shrub to 4 ft. tall", which is obviously an error in observation or transcription. The corollas are said to have been "pale-blue" on Asplund 17804 and "blue-purple" on Edwin & Schuncke V.3746. Herbarium material of V. parvula has been misidentified and distributed in some herbaria under the name V. littoralis H.B.K., while the Rose, Pachano, & Rose 22939, cited below, was previously erroneously cited by me as V. glabrata H.B.K.

Macbride (1960) comments: "A small delicate plant with the habit of a dwarf V. officinalis L. but with completely different leaves" and cites Balls B.6784 from Cuzco, Peru. Actually, V. parvula has hardly any resemblance to V. officinalis, but does have a very close affinity with V. litoralis.

Additional citations: VENEZUELA: Mérida: López-Palacios 2552 (Ft). ECUADOR: Azuay: Asplund 17804 (N); Rose, Pachano, & Rose 22939 (N). Carchi: Sparre 14290 (S). Chimborazo: Asplund 20443 (N). Imbabura: Sparre 13582 (S). Pichincha: Sparre 13285 (S). PERU: Apurimac: Iltis & Ugent 699 (W—2558167). Arequipa: Vargas Calderón 18160 (Ac). Cajamarca: López Guillén & Chumpitáz 3393 (Rf). Lima: Riccio & Chumpitáz 3711 (Rf). Loreto: Sagástegui, Fukushima, & Vásquez 6463 (Ac). Piura: Edwin & Schuncke V. 3746 (S).

VERBENA PARVULA var. GIGAS Moldenke

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 628. 1960; Moldenke, Phytologia 13: 214. 1966; Moldenke, Fifth Summ. 1: 144 (1971) and 2: 918. 1971; Moldenke, Phytologia 23: 222 & 233. 1972.

Vargas Calderón collected this variety at 3450 m. altitude, fruiting in April. Macbride (1960) cites only the original type collection. The Field Museum photographic negative which he cites represents typical V. parvula Hayek. Vargas Calderón 19493 is a mixture with xV. dermeni Moldenke.

Additional citations: PERU: Arequipa: Vargas Calderón 19493, in part (Ac).

VERBENA PARY-CARY Fr. Allem.

Bibliography: T. Peckolt, Bericht. Deutsch. Pharm. Gesell. 14: 466. 1904; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 267. 1969; Moldenke, Fifth Summ. 2: 918 & 968. 1971.

Nothing is known to me of this plant except what is stated about it by Peckolt (1904), who says "Verbena pary-cary Fr. Allem. In den Nordstaaten vom Äquator bis zum 10.° südl. Br. vorkommend. Indianerbenennung: Boia-caa — Schlangenkraut, vom Volke in Pary-cary korrumpiert; hat noch folgende Benennungen: Herva S. Pedro — Heiliges S. Peterskraut, Menstrato — Minze, Hortelaã brava — wilde Minze. Dr. Castro in Pará berichtete über die arzneiliche Wirksamkeit dieser Pflanze, auch als Antidot des Schlangengebisses, zu welchem Zwecke sie vom Volke und Indianern benutzt wird. Im Archiv der Pharmacie von Dr. L. Brey, 1859, S. 42, publizierte ich den Bericht des Arztes."

The geographic limits given by Peckolt for this species would imply that it is native only to the northernmost states of Brazil, such as Amazônas, Pará, Maranhão, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Espirito Santo, Piauí, Alagôas, Bahia, and Goiás, but there is no species of this genus known to me with such a distribution. Possibly the plant is not even verbenaceous.

VERBENA PAULENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 10: 297--298. 1964; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 840 & xix, map 1395. 1970; Moldenke, Fifth Summ. 1: 178 (1971) and 2: 918. 1971.

VERBENA PAULSENI R. A. Phil.

Additional bibliography: Cabrera, Bol. Soc. Argent. Bot. 5: 96. 1953; Moldenke, Phytologia 16: 192. 1968; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 691 & 918. 1971.

Zöllner collected this species at 800--1000 m. altitude. The corollas on Zöllner 4398 are said to have been "violet" in color when fresh.

Additional citations: CHILE: Aconcagua: Zöllner 4398 (Ac, Rf).

VERBENA PERAKII (Covas & Schnack) Moldenke

Additional & emended bibliography: Schnack & Covas, Darwiniana 7: [71], 72, 74, & 75, pl. 1 C & 2 B. 1945; J. A. Clark, Card Ind. Gen. Sp. Var. issue 191. 1945; Covas & Schnack, Revist. Argent. Agron. 14: 229 & 231, fig. 32. 1947; Darlington & Wylie, Chrom. Atl., pr. 1, 323. 1956; Rattenbury, Madroño 15: 50. 1959; Moldenke, Phytologia 16: 192. 1968; Moldenke, Résumé Suppl. 16: 22. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715 & 717. 1969; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 206. 1970; Moldenke, Fifth Summ. 1: 202 & 371 (1971) and 2: 522, 666, 667, 688, 689, 694, 700, & 918. 1971; Moldenke, Phytologia 23: 419 & 426. 1972.

Additional illustrations: Covas & Schnack, Revist. Argent. Agron. 14: 231, fig. 32. 1947.

Schnack & Rubens (1970) record this species from Catamarca and Córdoba, Argentina. Semper collected it at 700 m. altitude. The corollas on Semper 58 are said to have been "purple".

Additional citations: ARGENTINA: Mendoza: Semper 58 (N).

VERBENA PERENNIS Wooton

Additional synonymy: Verbena perenais Wooton ex Moldenke, Fifth Summ. 2: 689, in syn. 1971.

Additional & emended bibliography: Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 726 & 728. 1960; Lewis & Oliv., Am. Journ. Bot. 48: [639]—641, fig. 19. 1961; Rattenbury, Madroño 16: 267. 1962; Hocking, Excerpt. Bot. A.6: 91. 1963; Moldenke, Phytologia 16: 192. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Rickett, Wild Fls. U. S. 3 (2): 365 (1969) and 4 (3): 540 & 799. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1314 & 1321. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke, Fifth Summ. 1: 59, 62, 63, 76, & 400 (1971) and 2: 689 & 918. 1971; Mahler, Key Vasc. Pl. Black Gap, ed. 3, 70. 1971; Moldenke, Phytologia 23: 242 & 374. 1972.

Emended illustrations: Lewis & Oliv., Am. Journ. Bot. 48: 640, fig. 19. 1961.

Recent collectors refer to this plant as globose, 25 cm. tall, from a thick, woody, perennial taproot, with showy very odoriferous flowers, the lower lip of the corolla being undulate-margined. The corollas are described as "bright blue-violet" on Solbrig 3186, "purple" on Latorre s.n., "blue-lavender" on Whitehouse 17019, "lavender" on D. S. Correll 34066, and "blue to purple" on C. H. Muller 8214. In addition to the months previously reported, this plant has been collected in fruit in September. It has been found growing among rocky ledges of pinyon pine-juniper associations, while Correll encountered it "on hills formed by tilted shales" and describes it as a "sprawling shrub to 1 foot tall".

Mahler (1971) records the common names "perennial verbena" and "pinleaf vervain".

The haploid chromosome number for the species is confirmed as 7 by Rattenbury (1962), based on Solbrig 3186 from Pecos County, Texas. Howell & McClintock (1960) cite only M. E. Jones 24994.

Additional citations: TEXAS: Brewster Co.: D. S. Correll 34066 (Ld); Warnock 21827 (Se--159659). Culberson Co.: Mahler 838 (Au--248888); Matthews & Matthews 310 (Au--259930); Whitehouse 17019 (N). Hudspeth Co.: C. H. Muller 8214 (Mi). Pecos Co.: C. M. Rowell 11147 (Lk); Solbrig 3186 (W--2607469). NEW MEXICO: Lincoln Co.: E. L. Reed 3655 (Lk, Lk, Lk). MEXICO: Coahuila: Latorre s.n. [12 May 1968] (Au--265091); E. G. Marsh 859 (Au--212686).

VERBENA PERENNIS var. JOHNSTONI Moldenke

Additional bibliography: Moldenke, Phytologia 16: 192. 1968; Moldenke, Fifth Summ. 1: 76 (1971) and 2: 695 & 918. 1971.

The variety has been collected in flower and fruit in May (in addition to the months previously reported by me).

Additional citations: MEXICO: Nuevo León: H. Hernández s.n. [18/V/1965] (Z).

xVERBENA PERPLEXA Moldenke

Additional bibliography: Moldenke, Phytologia 10: 306--307. 1964; G. Taylor, Ind. Kew. Suppl. 14: 142. 1970; Moldenke, Fifth Summ. 1: 63 (1971) and 2: 654, 671, & 918. 1971; Moldenke, Phytologia 22: 471. 1972.

xVERBENA PERRIANA Moldenke

Additional bibliography: Moldenke, Phytologia 16: 192. 1968; Moldenke, Résumé Suppl. 16: 2 (1968) and 17: [1]. 1968; Moldenke, Fifth Summ. 1: 15, 27, 32, 35--38, 41, 44, 45, 47, 52, 53, & 64 (1971) and 2: 525, 656, 657, 672, 678, 686, 698, 704, 705, & 918. 1971; Moldenke, Phytologia 23: 222, 223, & 265. 1972.

Material of this hybrid has been misidentified and distributed in some herbaria as V. urticifolia L.

Additional citations: ILLINOIS: Cass Co.: Geyer s.n. [Beardstown, July 1842] (Ws--cotype). Henderson Co.: H. N. Patterson s. n. [Oquawka, July] (Pa). Peoria Co.: J. T. Stewart 13861 (Ws). Winnebago Co.: M. S. Bebb s.n. [Fountaindale, 1871] (Pa). WISCONSIN: Sauk Co.: T. J. Hale s.n. [Baraboo, 1861] (Pa, W--2606306). MISSOURI: Saint Louis: Eggert s.n. [Prairies, 11 August 1891] (Pa); Engelmann s.n. [St. Louis, July 1842] (Ws--cotype). NEBRASKA: Kearney Co.: Hapeman s.n. [Minden, Aug. 23, 1939] (Se--170256).

xVERBENA PERTURBATA Moldenke

Additional bibliography: Moldenke, Phytologia 16: 193. 1968; G. Taylor, Ind. Kew. Suppl. 14: 142. 1970; Moldenke, Fifth Summ. 1: 202 (1971) and 2: 522, 683, 688, & 918. 1971.

VERBENA PERUVIANA (L.) Britton

Additional synonymy: Glandularia peruviana Small apud J. A. Clark, Card Ind. Gen. Sp. Var. issue 141. 1933. Erimus peruvianus L. apud Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 840, in syn. 1970. Verbena peruviana Moldenke ex Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 840, sphalm. 1970. Glandularia peruviana (L.) Britton ex Moldenke, Fifth Summ. 2: 522, in syn. 1971.

Additional & emended bibliography: Pers., Sp. Pl. 3: 346--347. 1819; Steud., Nom. Bot. Phan., ed. 1, 873. 1821; Voigt, Hort. Suburb. Calc. 472. 1845; E. Twining, Ill. Nat. Ord. Pl. 2: 104, fig. 2. 1855; A. Wood, Class-book, [ed. 42], pr. 1, 538. 1861; A. Gray, Man. Bot., ed. 3, lxvi (1862) and ed. 4, pr. 1, lxvi. 1863; A. Wood, Class-book, [ed. 42], pr. 2, 538. 1863; A. Gray, Man. Bot., ed. 4, pr. 2, lxvi. 1864; A. Wood, Class-book, [ed. 42], pr. 3, 538 (1865), [ed. 42], pr. 4, 538 (1867), and [ed. 42], pr. 5, 538. 1868; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 1, 242 (1868) and ed. 1, pr. 2, 242. 1869; A. Wood, Class-book, [ed. 42], pr. 6, 538 (1869) and [ed. 42], pr. 7, 538. 1870; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1, 236 (1870), ed. 1, pr. 2, 236 (1871), and ed. 1, pr. 3, 236. 1872; A. Wood, Class-book, [ed. 42], pr. 8, 538. 1872; A. Wood, Am. Bot. & Flor., ed. 1, pr. 4, 236 (1873), ed. 1, pr. 5, 236 (1874), and ed. 1, pr. 6, 236. 1875; A. Wood, Class-book, [ed. 42], pr. 9, 538. 1876; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 3, 242. 1880; A. Wood, Class-book, [ed. 42], pr. 10, 538. 1881; Vesque, Ann. Sci. Nat. Paris., sér. 7, 1: 339. 1885; O. R. Willis in A. Wood, Am. Bot. & Flor., ed. 2, 236. 1889; L. H. Bailey in A. Gray, Field For. & Gard. Bot., ed. 2, 341. 1895; Sanders, Encycl. Gard., ed. 2, 409. 1897; T. Peckolt, Bericht. Deutsch. Pharm. Gesel. 14: 465. 1904; Baez, Anal. Asoc. Estud. Mus. Pop. Paraná 1920: 37. 1920; Lázaro e Ibiza, Comp. Fl. Españ., ed. 3, 3: 297. 1921; Macself in Sanders, Encycl. Gard., ed. 21, pr. 1, 457. 1931; J. A. Clark, Card Ind. Gen. Sp. Var. issue 141. 1933; Macself in Sanders, Encycl. Gard., ed. 21, pr. 2, 457. 1934; Navarro de Haydon, Flor. Comun. Puerto Rico [16]. 1936; Baez, Mus. Entre Ríos Cart. Herb. Paran. 43. 1938; Macself in Sanders, Encycl. Gard., ed. 21, pr. 3, 457 (1938), ed. 21, pr. 4, 457 (1942), and ed. 21, pr. 5, 457. 1945; Schnack & Covas, Darwiniana 7: [71]--75, pl. 3 B, C, & F & 4 A. 1945; Schnack & Covas, Revist. Argent. Agron. 12: 224--228, fig. 1 A, 2 A--C, 3 A--C, & pl. 11 & 12 B, C, & F. 1945; Macself in Sanders, Encycl. Gard., ed. 21, pr. 6, 457. 1946; E. L. Palmer, Fieldbook Nat. Hist., ed. 1, pr. 3, 297 & 663. 1949; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 1, 457 (1950) and ed. 22, pr. 2, 507. 1952; Cabrera, Man. Fl. Alred. Buenos Aires 397. 1953; Schnack & Solbrig, Revist. Fac. Agr. La Plata 29: [255]--266, fig. 1 C--E, 3 A & B, & 4 C & H. 1953; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 3, 507. 1956; Schnack, Fehleisen, & Cocucci, Revist. Argent. Agron. 24: 129 & 132--135, pl. 1 C, D, & G. 1957; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 614. 1960; Balakrishnan, Bull. Bot. Surv. India 6: 87. 1964; Martínez-Crovetto, Bonplandia 1: 287, 299, 301, & 314. 1964; Melchior in Engl., Syllab. Pflanzenfam., ed. 12, 2: 436, fig. 184 F & L. 1964; Angely, Fl. Anal. Paran., ed. 1, 572. 1965; Hocking, Excerpt. Bot. A.9: 365 & 366. 1965; Martínez-Crovetto, Bonplandia 2: 6 & 19. 1965; Troncoso in Cabrera, Fl. Prov. Buenos Aires 133. 1965; Yotaro, Gard. Pl. World 1: 131, pl. 66, fig. 2. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 2: 2266. 1966; Greensill, Trop. Gardening 79. 1966; Hirata, Host Range & Geogr. Distrib. Powd. Mild. 276. 1966; G. Abraham, Green Thumb Book 188. 1967; D'Arcy, Rhodora 69: 439. 1967; Zukowski in Pawlowskiego, Fl. Polsk. 11: 65. 1967; Moldenke, Phytologia 16: 193--194 & 212. 1968; Moldenke, Résumé Suppl. 16: 7, 13, 22, & 28 (1968) and 17: 7. 1968; Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1235--1239. 1968; Stucchi, Fiori 11: 136. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715--717. 1969; R. F. V. Cooper in Pastore, Bol. Soc. Argent. Hort. 157: 125. 1969; Hay & Synge, Dict. Gard. Pl. 177 & 369, pl. 1411. 1969; Raman, Curr. Sci. 38: [579]. 1969; Solbrig, Passani, & Glass, Biol. Abstr. 50: 4151. 1969; Swink, Pl. Chicago Reg. 428. 1969; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 840 & xix. 1970; Graf, Exot. Pl. Man., ed. 1, 410. 1970; Moldenke in Menninger, Flow. Vines 338--339. 1970; Montgomery & Cheo, Lasca Leaves 20 (3): 58. 1970; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 205 & 208. 1970; Solbrig, Princ. & Meth. Pl. Biosystem. 75, 76, 148, 150, 157, & 158, fig. 5-1 & 9-5. 1970; Moldenke, Phytologia 22: 471 (1972) and 23: 193, 194, 226, 227, 273, 278, 279, 426, 427, 430, 431, & 436. 1972; A. L. Moldenke, Phytologia 23: 318, 372, & 373. 1972.

Additional & emended illustrations: Schnack & Covas, Darwiniana 7: pl. 3 B, C, & F & 4 A. 1945; Schnack & Covas, Revist. Argent. Agron. 12: 225, fig. 1 A, 226, fig. 2 A--C, 227, fig. A--C, & pl. 11 & 12 B, C, & F. 1945; Schnack & Solbrig, Revist. Fac. Agr. La Plata 29: 257, 261, & 263, fig. 1 C--E, 3 A & B, & 4 C & H. 1953; Schnack, Fehleisen, & Cocucci, Revist. Argent. Agron. 24: 133, pl. 1 C, D, & G. 1957; Melchior in Engl., Syllab. Pflanzenfam., ed. 12, 2: 436, fig. 184 F & L. 1964; Yotaro, Gard. Pl. World 1: pl. 66, fig. 2 [in color]. 1965; Hay & Synge, Dict. Gard. Pl. 177, pl. 1411 [in color]. 1969; Solbrig, Princ. & Meth. Biosystem. 76, fig. 5-1. 1970.

Recent collectors have found this plant growing on campos. The corollas are described as having been "red" on Abbiatti 4027, Cabrera & Fabris 14743, Job 2949, Ruíz Huidobro 1225 & 1538, and Varela 614, "scarlet" on W. R. Sykes 1044/64, and "bright scarlet" by Hay & Synge (1969). The last-mentioned authors describe the leaves as oblong, gray-green and the flowers borne in dense clusters, 4--6 inches long. They recommend V. peruviana for "well-drained soil and a sheltered sunny corner. Not reliably hardy and best raised from cuttings each year in 8--9 [=August-September] of the current growth and inserted in sandy soil. Over-winter in a frost-free greenhouse and plant out in 5--6 [=May-June]." Greensill (1966) points out that it has "daintier foliage than the annual plant" [by which he presumably means xV. hybrida Voss].

Vernacular names in addition to those reported previously by me include "jurujúba", "melindres colorado", "pampas", "Peruvian vervain", "rojo-punzé", and "verbena melindres".

Abraham (1967)asserts that V. peruviana is good for use in hanging baskets, but its leaves will turn brown if the soil becomes dry. Martínez-Crovetto (1964, 1965) records the Chaco Amerind names "bashé umpatpát (=pegado a la tierra)", "adagn(a)rát l(o)kó", "aragn(a)rát l(o)ko (comido de víbora)", "pôkō (brasa, carbōn encendido)", and "tok lauró" (flor roja)" — "pôkō" being also applied to Urtica urens by them and "tok lauró" to Dolichandra cynanchoides and Portulaca grandiflora. He tells us that they use the plant "para el 'dolor de vista' y contra los dolores de barriga".

Bolkhovskikh and his associates (1969) point out that the haploid number of chromosomes for V. peruviana was given by Junell (1934), Beale (1940), Schnack & Covas (1945), and Schnack & Solbrig as 10, but as 15 by Schnack, Fehleisen, & Cocucci (1957). Possibly some misidentifications of the material examined are involved here, since the name, V. peruviana, has often been applied haphazardly to any red-flowered species.

Solbrig and his associates (1968) report a hybrid between V. peruviana and V. elegans H.B.K., but fail to describe or name it or to cite any substantiating specimens from which its morphological characters could be obtained. Likewise, Solbrig (1970) refers to a hybrid with V. moricolor Moldenke and another with what he calls V. pulchella Sweet, but which probably is not V. pulchella in the sense that this binomial is interpreted by me.

Swink (1969) makes the claim that "According to Moldenke (Phytologia 10: 406, 1964), the legitimate name of this plant may well be Verbena chamaedryfolia". This is hardly true because Feuillée's original specimen, on which Erinus peruvianus L. is based, is also the basis of Jussieu's Verbena chamaedryfolia. Feuillée's plant may very possibly be some other species than the one now passing as V. peruviana. However, Macbride (1960) maintains that Feuillée's type came from Paraguay and this seems to be correct: "Type from Paraguay!; based on a plant of Abbé Feuillé, Per. 3: 36, pl. 25. 1725, as noted by Briquet, Ann. Cons. Jard. Bot. Genève 7: 290. 1904; as he pointed out, Britton's transfer (now acceptable) was prompted on the basis of a misdetermination and the plant of Jussieu, as that of Linnaeus, is unknown in Peru unless in cultivation. Flowers brilliant scarlet."

Lázaro e Ibiza (1921) describes the plant as "Tallo erizado; hojas ovales, con pecíolo corto, festonado-dentadas o hendidas, ásperas; espigas solitarias; brácteas lanceolado-alesnadas, mitad que el cáliz; corola grande y roja. Fl. verano". Peckolt (1904) says of the distribution of the species in Brazil: "In den Südstaaten heimisch; wird zufolge ihrer scharlachroten Blüten in allen Gärten kultiviert". Balakrishnan (1964) records it as cultivated in India. Stucchi (1968) avers that it was introduced into Italy between 1829 and 1839. Montgomery & Cheo (1970) report drought tolerance very good for V. peruviana, that it is hardy to cold below 20° F., shows good erosion control at 9--30° grade, and has medium-low maintenance requirements.

It should be noted here that the figure given by Melchior (1964) is erroneously referred to as "E" in the legend instead of "F"; the illustration given by Graf (1970) as "Verbena peruviana 'Chiquita'" is actually V. tenera var. maonetti Regel! The Aguilar 55, Fabris 4958, Rocha 3683, and Woolston 731 & 1353, distributed as V. peruviana, are all actually V. incisa Hook., while Venturi 378b is Phyla nodiflora var. reptans (Spreng.) Moldenke.

Troncoso (1965) cites Abbiatti 4057, Rentzell s.n., and Valencia s.n. from Buenos Aires, Argentina.

Additional citations: BRAZIL: Rio Grande do Sul: Palacios & Cuezzo 1763 (N), 2080 (N). PARAGUAY: Lourteig 2030 (S). URUGUAY: Rosengurtt & Gallinal 5694 (Se--126901). ARGENTINA: Buenos Aires: Abbiatti 4027 (N); Cabrera & Fabris 14743 (N); Fabris & Cullen 2506 (Ip); Ruíz Huidobro 1225 (N), 1307 (N), 1358 (N), 1538 (N). Catamarca: O'Donell & Meyer 5247 (N); Pierotti 11526 [Herb. Inst. Miguel Lillo 28352] (N). Córdoba: Ledingham 4469 (Sk); Nicora 873 (W--2567985). Corrientes: G. J. Schwarz 182 (N). Entre Ríos: Job s.n. [Yuquerí chico, 3/XI/1949] (N). Jujuy: Garolera & Romero s.n. [11-I-1947] (N). La Pampa: Fortuna 12 (N). La Rioja: Job 2949 (N). Misiones: Ibarrola 1120 (N); G. J. Schwarz 4735 (N). San Luis: Varela 614 (N). Santiago del Estero: P. Garcia 892 (N). Tucumán: M. R. Malvarez 69 (N). CULTIVATED: New Zealand: W. R. Sykes 1044/64 [Herb. Bot. Div. D. S. I. R. 153296] (Rf).

VERBENA PERUVIANA (L.) Britton x V. ELEGANS H.B.K.

Bibliography: Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1236--1238. 1968; Solbrig, Passani, & Glass, Biol. Abstr. 50: 4151. 1969; Solbrig, Princ. & Meth. Biosystem. 148. 1970; Moldenke, Fifth Summ. 370, 914, & 970. 1971; Moldenke, Phytologia 23:

227, 426, & 431. 1972.

Solbrig and his associates (1968, 1969, 1970) speak of the crosses which they have made between these two species, producing a tetraploid hybrid which showed less than 5 percent fertility and a segmental allooctoploid hybrid which showed over 70 percent fertility. A binomial designation has not yet been proposed for these hybrids because the accuracy of identification of the purported parents has not been verified.

VERBENA PERUVIANA (L.) Britton x V. MORICOLOR Moldenke, Fifth Summ. 2: 918 & 970. 1971.

Bibliography: Solbrig, Princ. & Meth. Pl. Biosystem. 76. 1970; Moldenke, Fifth Summ. 2: 918 & 970. 1971; Moldenke, Phytologia 23: 427. 1972.

See under V. moricolor x peruviana in this series of notes for Solbrig's discussion of this hybrid.

VERBENA PERUVIANA (L.) Britton x V. PULCHELLA Sweet ex Moldenke, Fifth Summ. 2: 918 & 970. 1971.

Synonymy: Glandularia pulchella x peruviana Solbrig, Princ. & Meth. Pl. Biosystem. 148. 1970.

Bibliography: Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1238. 1968; Solbrig, Princ. & Meth. Pl. Biosystem. 75 & 148. 1970; Moldenke, Fifth Summ. 2: 918 & 970. 1971; Moldenke, Phytologia 23: 427 & 431. 1972.

Solbrig (1970) asserts that this is a natural hybrid, but rarely seen in the field. He has produced it artificially and describes its chromosomal picture: "When they were obtained artificially in the experimental garden they were approximately 40—50 % pollen fertile, and only about 1 % of the flowers set seed". The hybrid plant itself is not described nor are any collections cited. I am not sure that his interpretation of one or even both of the supposed parental species is the same as mine, and so I am not assigning a hybrid name as yet. Examination of herbarium vouchers, if any, of the parental species and of the hybrid is much to be desired.

VERBENA PERUVIANA f. ALBA Moldenke

Additional bibliography: Moldenke, Phytologia 14: 293. 1967; Moldenke, Fifth Summ. 1: 178 (1971) and 2: 918. 1971.

VERBENA PERUVIANA var. GLABRIUSCULA Kuntze

Additional bibliography: Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 134. 1965; Moldenke, Phytologia 14: 293. 1967; Moldenke, Fifth Summ. 1: 190, 202, & 371 (1971) and 2: 918. 1971.

Troncoso (1965) reduces this variety to synonymy under typical V. peruviana (L.) Britton, but its almost smooth leaves distinguish it quite well, at least in my estimation.

VERBENA PERUVIANA f. ROSEA Moldenke

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 628. 1960; Moldenke, Phytologia 10: 491—492. 1964; Moldenke, Fifth Summ. 1: 178, 190, & 372 (1971) and 2: 662, 689, & 918. 1971.

Macbride (1960) implies that this form is to be expected in Peru, but presumably only in cultivation, since he states that the typical form of the species occurs there only in that state. No supporting specimens are cited for either taxon.

VERBENA PHLOGIFLORA Cham.

Additional & emended synonymy: Glandularia phlogiflora (Cham.) Schnack & Covas apud J. A. Clark, Card Ind. Gen. Sp. Var. issue 183. 1944. Verbena phlogiflora Cham. emend. Mold. apud Troncoso, Darwiniana 1: 616, in syn. 1971. Verbena megapotamica var. phlogiflora Cham. apud Troncoso, Darwiniana 1: 616, in syn. 1971.

Additional & emended bibliography: A. Gray, Man. Bot., ed. 3, lxvi (1862), ed. 4, pr. 1, lxvi (1863), and ed. 4, pr. 2, lxvi. 1864; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 1, 242 (1868) and ed. 1, pr. 2, 242. 1869; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1, 236 (1870), ed. 1, pr. 2, 236 (1871), ed. 1, pr. 3, 236 (1872), ed. 1, pr. 4, 236 (1873), ed. 1, pr. 5, 236 (1874), and ed. 1, pr. 6, 236. 1875; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 3, 242. 1880; O. R. Willis in A. Wood, Am. Bot. & Flor., ed. 2, 236. 1889; L. H. Bailey in A. Gray, Field For. & Gard. Bot., ed. 2, 341. 1895; Sanders, Encycl. Gard., ed. 2, 409. 1897; Schnack & Covas, Darwiniana 7: [71]—75, pl. 3 E & 4 D. 1945; Darlington & Wylie, Chrom. Atl., pr. 1, 323. 1956; Angely, Fl. Anal. Paran., ed. 1, 573. 1965; Yotaro, Gard. Pl. World 1: 131. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 2: 2266. 1966; Moldenke, Phytologia 16: 194—196. 1968; Moldenke, Résumé Suppl. 16: 13 & 28. 1968; Stucchi, Fiori 11: 131. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715 & 717. 1969; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 840 & xiv, map 1395. 1970; Moldenke in Menninger, Flow. Vines 339. 1970; Troncoso, Darwiniana 16: [613], 614, 616—618, & 621, fig. 2. 1971; Moldenke, Fifth Summ. 1: 98, 178, 188, 190, 202, & 372 (1971) and 2: 521, 522, 657, 665, 683, 685, 689, 690, 700, 703, 709, 783, & 918. 1971; Moldenke, Phytologia 23: 193, 194, 239, 300, 427, & 436. 1972.

Additional & emended illustrations: Schnack & Covas, Darwiniana 7: pl. 4 D. 1945; Troncoso, Darwiniana 16: 617, fig. 2. 1971.

The corollas of this species are described as having been "lilac" on Hatschbach 14967 and Rodriguez V. 566, "violet" on Hatschbach 15522, and "clear violet" on Hatschbach 15008. The chromosome number is given as 2n = 10 by Junell (1934) and by Schnack & Covas (1945). Stucchi (1968) tells us that it was introduced into Italy between 1827 and 1837. Sasaki (1928) lists it as cultivated on Formosa and cites the vernacular names "bizo-zakura", "hana-gasa", and "siki-zakura", but it seems most probable that the plant to which he refers is xV. hybrida Voss. Troncoso (1971) gives the overall distribution of V. phlogiflora as "Sur del Brasil y NE argentino, en Misiones. Ruderal, en matorrales y capueras". She comments that "Chamisso al describir su var. β señala que las espigas son algo alargadas después de la antesis. Este carácter no se ha podido confirmar, por el contrario en todos los ejemplares fructificados revisados, las inflorescencias son globosas y no se alargan......El área más austral de G. phlogiflora es la provincia de Misiones y muy probable la de Corrientes, en la Argentina. Las citas de Moldenke......para la provincia de Buenos Aires, deben referirse a G. megapotamica."

The Foust s.n. [10/25/1937], distributed as V. phlogiflora, is actually V. canadensis (L.) Britton, while H. Evans s.n. [Santa Monica] and Kansiro 5828 are V. rigida Spreng.

An unnamed hybrid between V. phlogiflora and V. santiaguensis (Covas & Schnack) Moldenke is referred to by Schnack & Covas in Darwiniana 7: 73 & 75 (1945).

Troncoso (1971) cites the following: BRAZIL: Paraná: Hatschbach 15041, 15522, & 22637. Santa Catarina: Klein 4406 & 4881; Reitz 3404; Smith & Klein 13223. State undetermined: Sellow s.n. ARGENTINA: Misiones: Martínez Crovetto G. 361; Schnack s.n. [Herb. San Isidro 26407].

Additional citations: BRAZIL: Paraná: Hatschbach 14967 (W--2563949), 15008 (W--2564698), 15522 (W--2564731); Hatschbach, Lindeman, & Haas 13747 (Ac); Reitz & Klein 17786 (N, W--2548335). Santa Catarina: Smith & Klein 13223 (N). ARGENTINA: Buenos Aires: Rodriguez V. 566 (N). Corrientes: Ruiz Huidobro 4408 (Se--130306). Misiones: Pierotti 6599 (N); G. J. Schwarz 610 (N), 4772 (N).

VERBENA PHLOGIFLORA f. ALBA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 216. 1966; Moldenke, Fifth Summ. 1: 178 (1971) and 2: 918. 1971.

VERBENA PINETORUM Moldenke

Additional bibliography: Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 726 & 728. 1960; Rickett, Wild Fls. U. S. 4 (3): 540 & 799. 1970; Moldenke, Fifth Summ. 1: 63 & 76 (1971) and 2: 918. 1971; Moldenke, Phytologia 22: 499 (1972) and 23: 184, 302, & 374. 1972.

Pennington reports that in Sonora a medicinal tea is made by boiling the entire plant of this species and that it is taken against fevers. Howell & McClintock (1960) cite Berry s.n. [Santa Rita Mtns., 1904]. Pennington 215 is a mixture with V. carolina L., while Pennington 43, 66, & 98, distributed as V. pinetorum, are apparently V. menthaefolia Benth.

Additional citations: MEXICO: México: Paxson & Barkley 16M839 (Au--121975). Sonora: Pennington 74 (Au--264095), 215, in part (Au--264202).

VERBENA PINNATILOBA (Kuntze) Moldenke

Additional synonymy: Glandularia pinnatiloba Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 205. 1970.

Additional bibliography: Moldenke, Phytologia 11: 477. 1965; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 205. 1970; Moldenke, Fifth Summ. 1: 188, 190, & 202 (1971) and 2: 683 & 918. 1971; Moldenke, Phytologia 23: 431. 1972.

Burkart refers to this species as abundant in abandoned campos bordering quebrachal. Krapovickas and his associates found it growing along roadsides. It has been collected in anthesis and fruit in October and November (in addition to the months previously reported by me). The corollas on Burkart 19550 and on Krapovickas, Cristóbal, Arbo, Maruñak, Maruñak, & Irigoyen 16725 are said to have been "violet", on R. M. Aguilar 1070 they were "red", and on Krapovickas & Cristóbal 16373 they were "lilac".

Additional citations: ARGENTINA: Chaco: R. M. Aguilar 1070 (N). Corrientes: Burkart 19550 (W--2567975); Krapovickas & Cristóbal 16373 (Z); Krapovickas, Cristóbal, Arbo, Maruñak, Maruñak, & Irigoyen 16725 (Rf). Misiones: G. J. Schwarz 4847 (N).

VERBENA PLATENSIS Spreng.

Additional & emended bibliography: A. Gray, Man. Bot., ed. 3, lxvi (1862), ed. 4, pr. 1, lxvi (1863), and ed. 4, pr. 2, lxvi. 1864; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 1, 242 (1868) and ed. 1, pr. 2, 242. 1869; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1, 236 (1870), ed. 1, pr. 2, 236 (1871), ed. 1, pr. 3, 236 (1872), ed. 1, pr. 4, 236 (1873), ed. 1, pr. 5, 236 (1874), and ed. 1, pr. 6, 236. 1875; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 3, 242. 1880; O. R. Willis in A. Wood, Am. Bot. & Flor., ed. 2, 236. 1889; L. H. Bailey in A. Gray, Field For. & Gard. Bot., ed. 2, 341. 1895; Sanders, Encycl. Gard., ed. 2, 409. 1897; Reiche & Phil., Fl. Chil. 5: 295. 1910; Baez, Anal. Asoc. Estud. Mus. Pop. Paraná 1920: 37. 1920; Sanders, Encycl. Gard., ed. 19, 447. 1930; Macself in Sanders, Encycl. Gard., ed. 21, pr. 1, 456 (1931) and ed. 21, pr. 2, 456. 1934; Cheymol, Bull. Soc. Chim. Biol. 19: 1647--1653. 1937; Noack, Biol. Zentralbl. 57: [383], 384, & 387, fig. 16. 1937; Anon., Chem. Abstr. 32: 2977. 1938; Baez, Mus. Entre Rios Cart. Herb. Paran. 43. 1938; Macself in Sanders, Encycl. Gard., ed. 21, pr. 3, 456. 1938; L. V. Barton, Contrib. Boyce Thomp. Inst. 10: 399, 401, 410, 411, 425, & 525. 1939; Macself in Sanders, Encycl. Gard., ed. 21, pr. 4, 456. 1942; J. A. Clark, Card Ind. Gen. Sp. Var. issue 183. 1944; Schnack & Covas, Darwiniana 7: [71] & 72. 1945; Macself in Sanders, Encycl. Gard., ed. 21, pr. 5, 456 (1945) and ed. 21, pr. 6, 456. 1946; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 1, 456 (1950) and ed. 22, pr. 2, 506 & 507. 1952; L. V. Barton, Contrib. Boyce Thomp. Inst. 17: 87. 1953; Cabrera, Man. Fl. Alred. Buenos Aires 397 & 398. 1953; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 3, 506 & 507. 1956; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 133, 135, & 136, fig. 46 E--G. 1965; Altman & Dittmer, Environ. Biol. 55, 624, & 641. 1966; Burkill, Dict. Econ. Prod. Malay Penins. 2: 2266. 1966; Hirata, Host Range & Geogr. Distrib.

Powd. Mild. 277. 1966; Thornberry, U. S. Dept. Agr. Agric. Handb. 165: 479. 1966; Moldenke, Phytologia 16: 195. 1968; Moldenke, Résumé Suppl. 16: 13 & 28. 1968; Stucchi, Fiori 11: 131. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715 & 717. 1969; Coats, Pl. Hunters 359. 1969; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 267. 1969; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Gibson, Fieldiana Bot. 24 (9): 230. 1970; Moldenke in Menninger, Flow. Vines 339. 1970; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 207. 1970; Moldenke, Fifth Summ. 1: 178, 188, 190, 193, 202, 203, & 372 (1971) and 2: 522, 659, 662, 685, 688—691, 693, 695, 699, 700, 702, 783, 789, & 918. 1971; Moldenke, Phytologia 22: 471 (1972) and 23: 278 & 427. 1972.

Additional illustrations: Noack, Biol. Zentralbl. 57: 387, fig. 16. 1937; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 136, fig. 46 E—G. 1965.

Recent collectors have found this species in fruit from November to January. The corollas are described as having been "white" on Cabrera, Arambarri, Cabrera, & Malcalza 17276 and on Ruiz Huidobro 1175, 1281, 1575, & 1699. The leaves are rather narrow on Golbach 120. The chromosome number for the species is given as 2n = 10 by Dermen (1936), Noack (1937), and Schnack & Covas (1945). Verbenaloside is reported as present in this species by Cheymol (1937).

Troncoso (1965) gives the overall geographic distribution of V. platensis as "Sur del Brasil, Paraguay, Uruguay y Argentina. Habita en la estepa virgen y en las lomas pedregosas de las sierras del sur do la Provincia [Buenos Aires], poco cumún en las barrancas del Paraná y del Plata". She cites from Buenos Aires only Burkart 4797, Cabrera 6570, and Hicken s.n. [San Isidro herb. no. 3440]. Schnack & Rubens (1970) record it from La Pampa. Gibson (1970) says that it is cultivated in Guatemala, but this report may be based on a misidentification of a white race of xV. hybrida Voss.

Coats (1969) notes that "Tweedie in 1837 at Sierra de Tandil, about 300 miles inland from Buenos Aires, collected seeds of Verbena platensis (=teucrioides)" in a very barren area. This probably represented the original source of its introduction into cultivation and subsequent use in the hybridization leading to xV. hybrida Voss. Stucchi (1968) bears this out by his assertion that V. platensis was introduced into Italy between 1829 and 1839. Hirata (1966) records the fungus, Oidium verbenae, as attacking this species in Russian gardens.

The Molina R. 14708, distributed as V. platensis, is actually xV. hybrida Voss.

Additional citations: ARGENTINA: Buenos Aires: Burkart 25641 (W—2567994); Fabris & Schwabe 4717 (N); Guitman s.n. [Pan de Azúcar, 4-X-1956] (N); Ruiz Huidobro 1175 (N), 1281 (N), 1575 (N), 1699 (N, N). Catamarca: Cristóbal 462 (Ca—1181621). Jujuy: Cabrera, Arambarri, Cabrera, & Malacalza 17276 (Ip). La Pampa:

Troncoso s.n. [Herb. Inst. Bot. Farw. 20587] (W--2567988). San Luis: Varela 651 (N). Tucumán: Golbach 120 (N).

VERBENA PLATENSIS var. STENODES Briq.

Additional bibliography: Moldenke, Phytologia 16: 195. 1968; Moldenke, Fifth Summ. 1: 188 & 202 (1971) and 2: 662 & 918. 1971.

Additional citations: ARGENTINA: Salta: Garolera & Romero s.n. [16-I-1947] (Se--129883).

VERBENA PLATENSIS f. VIOLACEA Moldenke

Additional bibliography: Moldenke, Phytologia 11: 477. 1965; Moldenke, Fifth Summ. 1: 190 (1971) and 2: 918. 1971.

VERBENA PLICATA Greene

Additional synonymy: Verbena plecata Greene ex Moldenke, Fifth Summ. 2: 690, in syn. 1971. Verbena plicata stricta Rowell ex Moldenke, Fifth Summ. 2: 690, in syn. 1971. Verbena plicata var. plicata Devor ex Moldenke, Phytologia 23: 436, in syn. 1972.

Additional & emended bibliography: Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 726 & 728. 1960; Lewis & Oliv., Am. Journ. Bot. 48: [639]--641, fig. 20. 1961; Rattenbury, Madroño 16: 267. 1962; Hocking, Excerpt. Bot. A.6: 91 (1963) and A.9: 365 & 366. 1965; Moldenke, Phytologia 16: 195--196. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Rickett, Wild Fls. U. S. 3 (2): 365 (1969) and 4 (3): 540 & 799. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1315, 1316, & 1320--1321. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Mahler, Key Vasc. Pl. Black Gap, ed. 3, 70. 1971; Moldenke, Fifth Summ. 1: 53, 59, 62, 63, & 76 (1971) and 2: 663, 690, & 918. 1971; Moldenke, Phytologia 22: 499 (1972) and 23: 192, 217, 242, 376, 414, & 436. 1972.

Recent collectors describe this plant as an erect perennial herb from a woody root, branched at the base, or an annual with fibrous roots, about 20 cm. tall, the stems erect or spreading, branching outward in age, the branches upright, stiff, and hairy or spreading, the bark green, the leaves spatulate, canescent, lobed and incised, the flowers not very showy, the corolla fairly small, and the fruit "a small capsule [it is actually a schizocarp]. Weaver notes that "the small flowers fall off easily on being collected". The corollas are described as having been "purple" on B. Hutchins 1051, L. Mitchell 130, D. W. Patterson s. n. [9 May 1966], and R. M. Stewart 1180, "pale to deep purple" on C. M. Rowell 5679, "pale-purple" on C. M. Rowell 8039, "pale blue-purple" on C. M. Rowell 5420, "purple or blue" on A. D. Wood 692, "pale-blue" on C. M. Rowell 8303, "bluish" on D. Hawkins 17 & 62, "light-blue" on B. Hutchins 351 & 361, "blue" on Boke & Massey 139, L. Galloway 35, Gipson 46, McCampbell 30, Pilcher 41 & 205, R. Runyon 2560, H. Thompson 62, Whitley 18, and J. M. Williams 77, "lavender-blue" on Meek 109, "violet-blue" on Forman 6 and McCracken 101, "bright violet-blue" on R. V. Moran 11476, "bluish-violet" on Whitehouse 15341, and "pale blue-violet" on Rowell, Crum, & Cornett 8236 & 8242. Hutchins 351 & 361 are accompanied by photographs.

The chromosome number for V. plicata is given as 2n = 14 by Lewis & Oliver (1961), Rattenbury (1962), and Bolkhovskikh and his associates (1969); the haploid number is reported as 7 by Solbrig, based on Solbrig 3179 from Reeves County, Texas. In addition to the months previously reported by me in this series of notes, the species has been collected in flower in January. Howell & McClintock (1960) state that in Arizona it blossoms from March to September. Rickett (1969) avers that in Texas it flowers from "February to September" and gives its distribution as "in open ground through much of Texas and westward to Arizona; and in Mexico". He adds that "'Plicate' refers to the lengthwise folding or grooving of the leaves" in this species and notes that "The flowers vary from blue to lavender and purple, about 1/4 inch across, the corolla not much longer than the calyx. V. cloveri has hairy stems, and corollas which greatly exceed the calyx."

Recent collectors have found V. plicata growing in sandy loam of mesquite grasslands and roadsides, alluvium along creek-beds, sandy soil or fine sandy silt, sandy loam limestone "derived along roadsides" in mesquite grasslands, in calcareous clay of barditch highways, limestone and gypsum gravels, the sandy soil of open fields and roadsides, the sandy or red sandy loam of canyon breaks, caliche soil, canyons, loose soil of sand mixed with clay, in the deep sandy loam of mesquite and oak shinneries, in deep sand at the edge of woods along rivers, in hard sandy silt-marl, the sandy silt of open chaparral pastures, the loose or even deep sand of moving dunes, in red sandy loam of open grasslands, in shallow soils with rock and gravel, in open areas, and in limestone soil of Prosopis-Rhus-Quercus communities, on calcareous hillsides, sandy breaks, and sandstone ledges, at water's edge, among limestone and gypsum rocks, and along roadsides with Festuca, Lesquerella, and Plantago.

In Texas it is described by Weaver as "frequent in flat low areas among sand hills" and by Rowell as "occasional in tight sandy loam of mesquite pastures", "occasional among limestone rocks on the caprock and in adjacent rocky breaks with indicator species of the Chihuahuan Desert frequent", "locally frequent in red sandy loam", and "occasional in tight sandy loam of mesquite-juniper associations", while Rowell, Crum, & Cornett refer to it as "occasional herb along roadsides and in adjacent pastures" and "occasional among limestone rocks and in sandy loam". In Ward County it was found by Cory to be "frequent on roadsides", in Childress County by Meek as "occasional along roadsides", and in Garza County by McCracken as "infrequent in tight sandy rocky soil", by Rowell as "occasional in tight sandy loam along roadsides", and by McCampbell as "frequent in pastures", while Foreman says of it "found occasionally with other species of Verbena". Runyon found it to be "scarce" or "occasional on reseca banks" in Cameron County.

In Mexico it is said by Moran to be "occasional in arroyos" in Baja California and in Coahuila Stewart found it "fairly common on gravelly flats", while Boke & Massey say it is "infrequent along roadsides and in arroyos". The type of V. plicata stricta appears to be Canales 11 from Andrews County, Texas.

Common names recorded for the species are "fanleaf vervain" and "whitevein verbena".

Material of V. plicata has been misidentified and distributed in some herbaria as V. gooddingii Briq. or V. neomexicana var. xylopoda Perry. R. Runyon 4869 is a mixture with V. cloverae Moldenke. On the other hand, the B. E. Holland 21, Reséndez 55, and Rollins & Tryon 5841, distributed as V. plicata, are actually V. canescens var. roemeriana (Scheele) Perry, while Ramos & Murillo 52 is V. cloverae Moldenke.

Additional citations: TEXAS: Andrews Co.: Canales 11 (Lk); T. Collins 227 (Lk). Armstrong Co.: L. C. Higgins 4418 (N). Baylor Co.: D. W. Patterson s.n. [9 May 1966] (Lk). Brown Co.: Fryar 28 (Au--247719). Callahan Co.: N. C. Henderson 63-198 (Au--223174). Cameron Co.: Fleetwood 8142 (Au--243038); R. Runyon 2463 (Au--265971), 4874 (Au--266160), 4888 (Au--266148). Childress Co.: Meek 109 (Lk). Cottle Co.: C. M. Rowell 5420 (Lk), 8605 (Lk). Crosby Co.: L. Galloway 35 (Lk); L. Mitchell 130 (Lk); Studhalter & Kendrick 1179 (Lk), 3324 (Lk). Culberson Co.: Matthews & Matthews 309 (Au--259932). Dawson Co.: Hargrove & Tilton HT.500690 (Lk). Dickens Co.: C. M. Rowell 10289 (Lk); N. L. Weaver 10 (Lk). Duval Co.: Silva & Gonzales 43 (Au--245143). Ector Co.: T. Collins 69 (Lk); Reed & Studhalter 1922 (Lk). Gaines Co.: Hargrove & Tilton HT.500678 (Lk); Rowell, Crum, & Cornett 8236 (Lk), 8242 (Lk). Garza Co.: Foreman 6 (Lk); Funsron 28 (Lk); B. Hutchins 351 (Lk), 361 (Lk), 1051 (Lk), 1107 (Lk); McCampbell 25 (Lk), 30 (Lk); McCracken 101 (Lk); Nickell 62 (Lk); C. M. Rowell 5679 (Lk, Lk), 8039 (Lk), 10180 (Lk, Lk), 11590 (Lk); H. Thompson 62 (Lk); Vlaming 73 (Lk). Hidalgo Co.: R. Runyon 2560 (Au--268712), 4869, in part (Au--269729). Howard Co.: Whitley 18 (Lk). Jim Hogg Co.: Botello & Ayala 12 (Ip); Ramos & Murillo 57 (Au--245125). Loving Co.: D. Hawkins 17 (Lk). Lubbock Co.: Demaree 7539 (Lk); Everett & Graham EG.500321 (Lk); D. Hawkins 62 (Lk); E. L. Reed 3375 (Lk), 3391 (Lg); C. M. Rowell 8549 (Lk); J. M. Williams 77 (Lk). Mason Co.: Gipson 46 (Lk). Mitchell Co.: Pilcher 41 (Lk). Motley Co.: Hargrove & Tilton HT.500630 (Lk). Starr Co.: Luz Campos 78 (Lk); Pilcher 205 (Lk); A. D. Wood 692 (Au--247063, Au--262608). Taylor Co.: N. C. Henderson 61-944 (Go), 63-153 (Au--225839); Mahler 3514 (Au--248881). Ward Co.: Cory 51970 (Mi, N). Webb Co.: Dickey 118 (Lk); Gonzalez-Arroyo

68 (Lk). Winkler Co.: C. M. Rowell 8303 (Lk, Lk). Young Co.: Whitehouse 15341 (N). Zapata Co.: L. R. Cuesta 61 (Au--244898, Ip); Guerra, Garcia, Garcia, & Salazar 607 (Au--244972, Ip); J. O. Perez 44 (Au--244835). MEXICO: Baja California: R. V. Moran 11476 (Sd--59702). Coahuila: Boke & Massey 139 (Mi); R. M. Stewart 1180 (Au--301986). Tamaulipas: Dominguez M. & McCart 8183 (Au--222205), 8225 (Au--222241); Escalante 37 (Au--222239).

VERBENA PLICATA var. DEGENERI Moldenke

Synonymy: Verbena plicata degeneri Moldenke ex Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970.

Additional bibliography: Moldenke, Phytologia 11: 477. 1965; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1316 & 1321. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke, Fifth Summ. 1: 59 (1971) and 2: 690 & 918. 1971.

VERBENA POGOSTOMA Klotzsch

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (15): 614 & 628--629. 1960; Hocking, Pharmaceut. Abstr. 9 (3): item 1068. 1968; Moldenke, Phytologia 16: 196. 1968; Moldenke, Résumé Suppl. 16: 7. 1968; Moldenke, Fifth Summ. 1: 202 & 372 (1971) and 2: 690 & 918. 1971.

Pierotti collected this plant in anthesis and fruit in March. Macbride (1960) says "Type from garden material of Berlin-Dahlem, origin uncertain; seems, with V. Matthewsii, to be a part of V. laciniata". He cites Weberbauer 2723 from Ancash, Peru, and Weberbauer 5333 from Lima, the latter said to have been so determined at Dahlem, but the former said to have been identified as V. trifida by Hayek. Macbride suggests that the species may also occur in Paraguay. It would seem, therefore, that his interpretation of V. pogostoma differs considerably from mine. He also adopts the Schauerian modified spelling of the specific name, rather than the original.

Additional citations: ARGENTINA: Córdoba: Villafañe 549 (N). Santiago del Estero: Pierotti 53 (N).

VERBENA PORRIGENS R. A. Phil.

Additional bibliography: Reiche & Phil., Fl. Chil. 5: 289 & 291. 1910; Cabrera, Bol. Soc. Argent. Bot. 5: 96. 1953; Moldenke, Phytologia 13: 254. 1966; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 691 & 918. 1971.

xVERBENA PROSTIBULA Moldenke

Additional bibliography: Moldenke, Phytologia 11: 21. 1964; Moldenke, Fifth Summ. 1: 372 (1971) and 2: 674, 695, & 919. 1971.

VERBENA PULCHELLA Sweet

Additional synonymy: Glandularia pulchella Sweet ex Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1235. 1968.

Additional & emended bibliography: A. Gray, Field For. & Gard. Bot., ed. 1, pr. 1, 242 (1868), ed. 1, pr. 2, 242 (1869), and ed. 1, pr. 3, 242. 1880; L. H. Bailey in A. Gray, Field For. & Gard. Bot., ed. 2, 341. 1895; E. L. D. Seymour, New Gard. Encycl., ed. 3, 1279 (1944), ed. 4, 1279 (1946), and ed. 5, 1279. 1951; Kuck & Tongg, Mod. Trop. Gard. 213. 1955; E. L. D. Seymour, New [Wise] Gard. Encycl., ed. 6, 1279 (1963) and ed. 7, 1279. 1964; J. A. Clark, Card Ind. Gen. Sp. Var. issue 248. 1964; Solbrig, Castanea 30: 173--174. 1965; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 134, 136, 137, & 139, fig. 46 C & D. 1965; Hocking, Excerpt. Bot. A.11: 123--124. 1967; Moldenke, Phytologia 16: 196--197. 1968; Moldenke, Résumé Suppl. 16: 22. 1968; Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1235--1239. 1968; R. F. V. Cooper in Pastore, Bol. Soc. Argent. Hort. 157: 125. 1969; Solbrig, Passani, & Glass, Biol. Abstr. 50: 4151. 1969; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 840 & xix. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1323. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 206 & 207. 1970; E. L. D. Seymour, New [Wise] Gard. Encycl., ed. 8, 1279. 1970; G. Taylor, Ind. Kew. Suppl. 14: 63. 1970; Solbrig, Princ. & Meth. Pl. Biosystem. 75, 76, 148, 150, 157, & 158, fig. 5-1. 1970; Moldenke, Fifth Summ. 1: 178, 190, 193, 202, & 372 (1971) and 2: 522, 619, 621, 678, 691, & 919. 1971; Moldenke, Phytologia 23: 226, 227, 427, & 431. 1972.

Additional illustrations: Solbrig, Princ. & Meth. Pl. Biosystem. 76, fig. 5-1. 1970.

Schnack & Rubens (1970) record this species from Buenos Aires, Córdoba, Santa Fé, and La Pampa, Argentina, but I am not at all certain that the interpretation of V. pulchella held by these authors and certain other Argentinian botanists and cytologists coincides with mine. Troncoso (1965) gives the distribution of what she regards as the typical form of this species as "Sur del Brasil, Uruguay, centro y litoral argentino. Común en las barrancas del Paraná y en las sierras del sur de la Provincia [Buenos Aires]", and cites only Cabrera 7195 and Burkart 8490.

The corollas are said to have been "blue" on T. Meyer 6990. The Troncoso 353, distributed as V. pulchella, is actually what I regard as V. santiaguensis (Covas & Schnack) Moldenke.

Additional citations: URUGUAY: Herter 1805 (W--2563042). ARGENTINA: Buenos Aires: T. Meyer 6990 (N).

VERBENA PULCHELLA Sweet x V. ELEGANS H.B.K. ex Moldenke, Fifth Summ. 2: 919 & 970. 1971.

Bibliography: Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1236--1238. 1968; Solbrig, Passani, & Glass, Biol. Abstr. 50: 4151. 1969; Solbrig, Princ. & Meth. Pl. Biosystem. 148. 1970; Moldenke, Fifth Summ. 1: 370 (1971) and 2: 914, 919, & 970. 1971; Moldenke, Phytologia 23: 227 & 431. 1972.

Solbrig (1970) refers to a "Glandularia elegans x pulchella" hybrid having a fertility rate of less than 10 percent, whereas in what he regards as the true V. pulchella Sweet the fertility rate is 99 percent, as it is also in the true V. elegans H.B.K. Since one of the putative parental species is South American and the other is Mexican, this hybrid cannot be expected in the wild. However, if it proves to have acceptable horticultural merit it is possible that it may at some time be propagated horticulturally. as yet it has not been assigned a hybrid binomial name since I am in doubt as to the true identity of one of the parents. Examination of the material originally used in making the cross is urgently required and points up again the prime importance of herbarium vouchers being kept by all geneticists and cytologists engaged in plant breeding.

VERBENA PULCHELLA Sweet x V. PERUVIANA (L.) Britton ex Moldenke, Fifth Summ. 2: 919 & 970. 1971.

Synonymy: Glandularia pulchella x peruviana Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1238. 1968.

Bibliography: Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1238. 1968; Solbrig, Princ. & Meth. Pl. Biosystem. 148 & 158. 1970; Moldenke, Fifth Summ. 2: 918, 919, & 970. 1971; Moldenke, Phytologia 23: 427 & 431. 1972.

Solbrig (1970) describes a segmental allotetraploid hybrid between these two species as having over 70 percent fertility, while the diploid hybrid between the same two species has only less than 30 percent fertility. He states that natural hybrids between these two species are "occasionally seen in the field, but they are rare". He further states that "The cross between G. peruviana and G. pulchella......was 42 percent pollen fertile, but in spite of this showed almost normal meiotic pairing. The differences are almost entirely due to small cryptic aberrations, as shown by the fact that the artificial allopolyploid had a pollen fertility of over 70 percent."

This hybrid has not yet been given an official hybrid binomial designation because of the doubt in my mind as to the true identity of the parent referred to as V. pulchella. Examination of the herbarium vouchers, if any were made, would be required to settle this point.

VERBENA PULCHELLA Sweet x V. SANTIAGUENSIS (Covas & Schnack) Moldenke, Fifth Summ. 2: 919 & 970. 1971.

Bibliography: Solbrig, Princ. & Meth. Pl. Biosystem. 518. 1970; Moldenke, Fifth Summ. 2: 919 & 970. 1971.

Solbrig (1970) refers to a hybrid between these two species: "Hybrids between G. santiaguensis and G. peruviana are 50 % pollen sterile (Solbrig, 1968). The reduced sterility is due to at least one translocation and probably also to small cryptic aberrations, because the chiasma frequency of the hybrid is lower than that of the parent, leading to the formation of approximately 4 % of univalents (although the reduced chiasma frequency could, of course, also be due just to the effect of the translocation or to some specific mutation). Very similar cytological behavior was found by Schnack and Covas (1945) in a hybrid between G. santiaguensis and G. pulchella......On morphological grounds, G. santiaguensis and G. pulchella are more related to each other than to G. peruviana; chromosomally, however, G. pulchella and G. peruviana appear to be closer, although the genetic isolating barrier between all three species is about the same. It is evident that in this case morphological differentiation (and the genetic system underlying it) has developed at different rates in the three species than have the genetic and cytological factors producing reduced fertility in the hybrid."

VERBENA PULCHELLA var. CLAVELLATA (Troncoso) Shinners

Additional bibliography: J. A. Clark, Card Ind. Gen. Sp. Var. issue 248 (1964) and 251. 1965; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 139. 1965; Hocking, Excerpt. Bot. A.11: 124. 1967; Moldenke, Phytologia 16: 196. 1968; Moldenke, Fifth Summ. 2: 522, 919, & 968. 1971.

VERBENA PULCHELLA f. LATILOBATA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 256. 1966; Moldenke, Fifth Summ. 1: 190 (1971) and 2: 919. 1971.

VERBENA PULCHRA Moldenke

Synonymy: Glandularia pulchra Moldenke, Phytologia 23: 431, in syn. 1972.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 573. 1965; Moldenke, Phytologia 16: 196. 1968; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 840 & xix, map 1395. 1970; Moldenke, Fifth Summ. 1: 178, 190, & 202 (1971) and 2: 919. 1971; Moldenke, Phytologia 23: 419 & 431. 1972.

Krapovickas and his associates found this plant growing "en pedregal al borde de un isleta, en selva, mata de ca. 80 cm. alt., flores rosadas".

Additional citations: ARGENTINA: Corrientes: Krapovickas, Cristóbal, Arbo, Maruñak, Maruñak, & Irigoyen 17226 (Rf).

VERBENA PULCHRA var. PALUDICOLA Moldenke

Additional bibliography: Moldenke, Phytologia 11: 27--28. 1964; Moldenke, Fifth Summ. 1: 190 (1971) and 2: 683 & 919. 1971.

VERBENA PUMILA Rydb.

Additional & emended bibliography: Lewis & Oliv., Am. Journ. Bot. 48: [639]--641, fig. 2. 1961; Hocking, Excerpt. Bot. A.6: 91 (1963) and A.7: 455. 1964; Moldenke, Phytologia 16: 196. 1968; Moldenke, Résumé Suppl. 16: 2. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Rickett, Wild Fls. U. S. 3 (2): 364. 1969; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1318 & 1326. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found.

Bot. 6:] 1877. 1970; Mahler, Keys Vasc. Pl. Black Gap, ed. 3, 70. 1971; Moldenke, Fifth Summ. 1: 47, 53, 59, 60, 62, & 76 (1971) and 2: 657, 677, 689--691, & 919. 1971; Moldenke, Phytologia 22: 485 (1972) and 23: 188, 190, & 265. 1972.

Recent collectors describe this species as a low, spreading, herbaceous annual clinging to the ground or as a perennial spreading from a taproot, the stems partly decumbent and becoming widely branched. The corollas are described as "purple" on D. Hawkins 64, B. Hutchins 459 & 1020, L. McCracken 19, and D. W. Patterson s.n. [9 May 1960], "light-purple" on Perino & Pierson 209 and Youngblood 2, "purple-rose" on Shinners 26092, "pale blue-purple" on Rowell, Giddens, & Griggs 8085, "pale-purple" on C. M. Rowell 8038, "rose-purple" on Meek 56, "reddish-violet" on L. Mitchell 28, "rosy-lavender" on Foreman 5, "lavender" on Gipson 45, "light-red" on Pilcher 79, "rosy-pink" on D. Griffith 163, "pink" on Whitten 44, "pale-pink" on C. M. Rowell 5645, and "very pale-blue" on C. M. Rowell 5258. Lewis & Oliver (1961) and Bolkhovskikh and his associates (1969) report the chromosome number as 2n= 20.

The plant has been found growing in light or red sandy loam or black rocky soil, shallow alkaline soil, loose sand, shallow soils with rock and gravel, disturbed rocky soils, rocky limestone soil or very rocky calcareous soil, in calcareous clay loam of eroded pastures and barditch highways, in cultivated areas by roadsides and disturbed areas in general, in cultivated grassland pastures, moist grassy depressions on open rocky slopes, in sandy loam grasslands with Artemisia filifolia and mesquite thickets, in juniper openings on rocky limestone slopes, among sandstone rubble and lava boulders, and on dry slopes and sand dunes.

Perino & Pierson refer to the species as "common" in Rogers County, Oklahoma. In Texas Nixon found it "in soils derived from granite, open areas in hilly terrain" (Gillespie County), Mc Cracken reports it as "infrequent in ungrazed pastures and roadsides" (Ector County), Whitten calls it only "occasional on roadsides" (Childress County), Rowell, Giddens, & Griggs found it only "occasional on red sand and gravel hillsides" (Cottle County), Foreman reports it "locally very abundant in picnic areas" (Mitley County), Hawkins says "found frequently off caprock in sandy loam" (Lubbock County), and Pilcher & Williams found it "in red sandy loam of flat open mesquite grasslands" (Burnet County). In San Patricio County it is said by Rowell to be "an occasional herb in deep sands" and "locally frequent but not in large numbers in deep loose sand". Meek reports it very common along roadsides in red loamy soil. In Garza County Youngblood reports it "frequent along roadsides in red sandy loam", while Rowell says "locally frequent in red sandy loam" and "occasional in red sandy loam below caprock". In New Mexico it is said by Griffin to be "locally frequent on gravel-sandy roadsides".

The label accompanying Parks 51 is inscribed "very common in disturbed soil; bracts two to four times as long as the calyx", but the latter statement is not true of the two specimens mounted on the sheet. Perhaps this is another case of mixed labels. T. Collins 91 is a mixture with V. wrightii A. Gray. A photograph accompanies B. Hutchins 459.

In the Hocking (1965) reference cited in the bibliography a typographic error has caused the binomial name of this species in abbreviated form to appear as "C. pumila".

Verbena pumila, in addition to the months previously reported by me, has also been found in fruit in October. Material has also been misidentified and distributed in some herbaria under the names V. bipinnatifida Engl. & Gray, V. bracteata Lag. & Rodr., V. bracteata Log. & Rode, V. ciliata var. pubera (Greene) Perry, and V. hastata L. On the other hand, the Bolen 81 and C. Drake 22, distributed as V. pumila, are actually V. bipinnatifida Nutt., Whitehouse 9513 is V. ciliata var. longidentata Perry, R. Runyon 2499 is the type collection of V. pumila f. albida Moldenke, K. Peterson 64 is V. quadrangulata Heller, and W. P. Taylor s.n. [3-31-44] is V. racemosa Eggert.

Additional citations: OKLAHOMA: Comanche Co.: Hopkins, Nelson, & Nelson 199 (Se--107249), 970 (Se--136589). Johnston Co.: G. T. Robbins 3256 (N). Murray Co.: Hopkins, Nelson, & Nelson 159 (Se--103965, Ws), 905 (Se--119710, Ws); G. T. Robbins 2449 (N, Se--153535). Rogers Co.: Perino & Pierson 209 (Au--302833). TEXAS: Armstrong Co.: C. M. Rowell 10766 (Lk). Atascosa Co.: E. J. Palmer 11231 (Au--122567). Bailey Co.: Rosson 505 (Lk). Baylor Co.: D. W. Patterson s.n. [9 May 1966] (Lk). Bexar Co.: Parks & Pladeck s.n. [April 7, 1940] (Ws). Brazos Co.: H. B. Parks 253 (Au--122493), s.n. [December 28, 1946] (Au--122494). Brewster Co.: Cory 28681 (Se--171757). Brown Co.: Faubion 6 (Au--247719); Geeslin 93 (Lk). Burnet Co.: Pilcher & Williams s.n. [Pilcher 117] (Lk). Callahan Co.: N. C. Henderson 63-28 (Au--222980). Cameron Co.: H. C. Hanson s.n. [Brownsville, January 30, 1919] (Ws); H. Parks Jr. 93/2816 (Ws). Childress Co.: Iltis, Moore, & Barkley 733 (Ws); Meek 55 (Lk); Whitten 44 (Lk). Clay Co.: Shinners 26092 (Ws). Coke Co.: Swift s.n. [Ft. Chadbourne, 1856] (W--2606303). Coleman Co.: Pruitt 210 (Au--122472). Cottle Co.: Rowell, Giddens, & Griggs 8085 (Lk). Ector Co.: T. Collins 91, in part (Lk); L. McCracken 19 (Lk); L. Mitchell 28 (Lk). Edwards Co.: Cory 53678 (Mi). Foard Co.: C. Turner 14 (Au--247714). Garza Co.: B. Hutchins 459 (Lk), 1020 (Lk); C. M. Rowell 5672 (Lk), 8038 (Lk); Youngblood 2 (Lk). Gillespie Co.: Nixon G.43 (Au--253192). Gonzales Co.: Johnston & McCart 5226 (Ws). Hill Co.: Pilcher 79 (Lk). Jim Hogg Co.: I. Moran 10 (Lk). Kerr Co.: Gould 8455 (Lk). Llano Co.: Ohlenbush 40 (Au--219536). Lubbock Co.: Bolen 59 (Lk); D. Hawkins 64 (Lk); F. Parks 51 (Lk); E. L. Reed 1637 (Lk); Studhalter 1118 (Lk, Lk). Mason Co.: Gipson 45

(Lk). McCullough Co.: Studhalter & Camp 1109 (Lk). Motley Co.: Foreman 5 (Lk). San Patricio Co.: C. M. Rowell 5258 (Lk), 5645 (Lk). San Saba Co.: Calhoun 9 (Au--248067). Scurry Co.: M. Winter 61 (Lk). Tarrant Co.: A. Ruth 110 (Ws). Taylor Co.: N. C. Henderson 62-50 (W--2604067), 63-21 (Au--222982). Throckmorton Co.: Gould 9083 (Lk). Travis Co.: E. Hall 431 (Pa); B. C. Tharp 49-1118 (Au--122469). Uvalde Co.: E. J. Palmer 13562 (Ws). Wichita Co.: Whitehouse 9664 (N). County undetermined: Cory 27905 [Phantom Lake] (Se--113331). NEW MEXICO: Lea Co.: D. Griffin 163 (Lk). MEXICO: Nuevo León: Canedo, Garza, Gonzales, & McCart 9053 (Lk). Sonora: H. D. Ripley 14281 (N).

VERBENA PUMILA f. ALBIDA Moldenke

Synonymy: Verbena pumila albida Moldenke ex Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970.

Additional bibliography: Moldenke, Phytologia 14: 294. 1967; Rickett, Wild Fls. U. S. 3 (2): 364. 1969; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1318 & 1326. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke, Fifth Summ. 1: 60 (1971) and 2: 691 & 919. 1971.

Runyon reports that this form is "frequent throughout Cameron County" [Texas] and "it is frequent but not common", flowering from January to April. He describes it as "prostrate or ascending herb, in sand, alt. 10 m.; flowers white, in terminal panicles, no odor; leaves deltoid to ovate, short petioles; fruit a small nutlet; bark green; roots fibrous" and notes that "in the sandy region this plant roots freely at the nodes, in open ground, fields, etc." It has been misidentified and distributed in some herbaria as typical V. pumila Rydb.

Additional citations: TEXAS: Cameron Co.: R. Runyon 2366 (Au--268733). Kenedy Co.: R. Runyon 2359 (Au--268732), 2499 (Au--268821--isotype).

VERBENA QUADRANGULATA Heller

Additional synonymy: Verbina quadrangulata Heller ex Moldenke, Fifth Summ. 2: 708, in syn. 1971.

Additional & emended bibliography: Parks, Tex. Agr. Exp. Sta. Bull. 155: 112--113. 1937; Lewis & Oliv., Am. Journ. Bot. 48: [639]--641, fig. 3. 1961; Hocking, Excerpt. Bot. A.6: 91. 1963; Moldenke, Phytologia 16: 196--197. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Rickett, Wild Fls. U. S. 3 (2): 364. 1969; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1316 & 1322. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke, Fifth Summ. 1: 60 & 76 (1971) and 2: 527, 672, 691, 692, 708, & 919. 1971; Moldenke, Phytologia 23: 367. 1972.

Runyon describes this plant as an "annual, low prostrate or ascending herb, bark green or pale-green, roots fibrous, leaves oval in outline, dissected and lobed or deeply lobed, bright-green, flowers small, in rather compact spikes; fruit a conical-cylindrical capsule....widespread in dry soil....the plant is frequent or very abundant throughout this region [Cameron County, Texas], sometimes it covers small areas of ground....frequent on clay slopes and hilltops in Hidalgo and Starr Counties". The specific epithet is sometimes written with an uppercase initial letter for no good reason. The corollas are described as "blue" on Rollins & Tryon 5895 and as "white" on R. Runyon 1780, 3496, 2561, & 4876. Lewis & Oliver (1961) and Bolkhovskikh and his associates (1969) report the chromosome number as 2n = 20.

The plant has been collected at altitudes of 30 to 3000 feet, growing in sandy loam, black clay, brick-red loose sand, sandy silt, gravel, black or red soil, sandy well-drained soil, on gravel outwashes, in sandy or fine sandy soil, in open chaparral pasturage, and at water's edge. Material has been misidentified and distributed in some herbaria as V. plicata Greene.

Parks (1937) calls V. quadrangulata "A small-flowered pink verbena native to the Gulf Coast where it takes the place of V. bipinnatifida. Because of the differences in shade of color, this plant should be introduced into yard and park work to get a variation in color. It is easily grown from seed but can be purchased or collected anywhere along the Gulf Coast."

The Canedo, Garza, Gonzales, & McCart 9053, I.Moran 10, and C. M. Rowell 5258, distributed as V. quadrangulata, are actually V. pumila Rydb., R. Runyon 2359 & 2366 are V. pumila f. albida Moldenke, and E. Rodriguez 57 is not verbenaceous.

Additional citations: TEXAS: Cameron Co.: R. Runyon 1780 (Au—269675), 2496 (Au—268739), 4876 (Au—269676). Hidalgo Co.: R. Runyon 2561 (Au—268735). Kleberg Co.: Ramirez & Cardenas 78 (Au—245203); R. Runyon 4284 (Au—269672). LaSalle Co.: Cory 28549 (Se—113348). Starr Co.: Luz Campos 79 (Lk). Webb Co.: Barrera & Laurel 61 (Lk); D. Cardenas 57 (Lk); B. Gutierrez 50 (Lk). Zapata Co.: M. Gonzalez 2 (Ip). MEXICO: Nuevo León: Rollins & Tryon 5895 (Au—300175). Tamaulipas: Dominguez & McCart 8182 (Au—222247); Escalante 36 (Au—222215); M. Garza 36 (Au—222271); Ibarra 107 (Au—235237); K. Peterson 64 (Au—230288).

VERBENA RACEMOSA Eggert

Additional bibliography: Hocking, Excerpt. Bot. A.1: 430 (1959) and A.6: 91. 1963; Moldenke, Phytologia 16: 197. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Rickett, Wild Fls. U. S. 3 (2): 364. 1969; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1317 & 1325. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Mahler, Keys Vasc. Pl. Black Gap, ed. 3, 70. 1971; Moldenke, Fifth Summ. 1: 60, 62, & 76 (1971) and 2: 658, 691, 692, 700, & 919. 1971; Moldenke, Phytologia 22: 499 (1972) and 23: 374. 1972.

Rickett (1969) describes this species as having "several more or less erect, downy stems, sometimes blooming when only an inch tall. The leaves are small, variously cleft several times into narrow lobes. The bracts are shorter than the calyx and fringed with hairs. The corolla is white, less than 1/2 inch long, and not more than 1/4 inch across." He avers that it blooms in Texas from January to June, "in deserts and on hills in central and western Texas".

The plant has been found by recent collectors in rocky limestone loam, on the Chihuahuan desert, and in sotol-lechuguilla associations, fruiting from March to May, at 2000 feet altitude. Cory describes it as having "stems branched at base, the branches procumbent, to 2 dm. long or more.....frequent on highway or road shoulders" in Brewster County, Texas. The corolla is described as "white" on Cory 53209, Devor 261, Leverich 41, Meebold 26296, and C. M. Rowell 11228. Material has been misidentified and distributed in some herbaria under the names V. canescens H.B.K., V. neomexicana (A. Gray) Small, V. plicata var. plicata Devor, and Verbina ciliata Benth. On the other hand, the Cory 28550, distributed as V. racemosa, is actually V. ambrosifolia Rydb.

Additional citations: TEXAS: Brewster Co.: Cory 53209 (Mi, N); Devor 261 (Lk); Leverich 41 (Lk); C. M. Rowell 11228 (Lk); W. P. Taylor s.n. [3-31-44] (Au--122471). Pecos Co.: Cory 53500 (Mi), 53501 (Mi), 53502 (Mi); Tharp & Havard 49359 (N). Reeves Co.: Moore & Moore 4 (Se--119543); Nelson & Nelson 4985 (Se--118707). NEW MEXICO: Dona Ana Co.: Meebold 26696 (N).

VERBENA RADICATA Moldenke

Additional & emended bibliography: Reiche & Phil., Fl. Chil. 5: 295. 1910; J. A. Clark, Card Ind. Gen. Sp. Var. issue 183. 1944; Schnack & Covas, Darwiniana 7: [71], 72, 74, & 75, pl. 4 B. 1945; Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22 (1): 109. 1963; Moldenke, Phytologia 14: 295. 1967; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715 & 717. 1969; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 206. 1970; G. Taylor, Ind. Kew. Suppl. 14: 142. 1970; Moldenke, Fifth Summ. 1: 193, 202, & 372 (1971) and 2: 522, 692, & 919. 1971; Moldenke, Phytologia 22: 466 (1972) and 23: 419 & 427. 1972.

Beale (1940), Schnack & Covas (1945), and Bolkhovskikh and his associates (1969) all record the chromosome number of this species as 2n= 10.

VERBENA RADICATA var. GLABRA (Hicken) Moldenke

Additional bibliography: Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22 (1): 109. 1963; Moldenke, Phytologia 13: 258. 1966; Moldenke, Fifth Summ. 1: 202 (1971) and 2: 692 & 919. 1971; Moldenke, Phytologia 23: 419. 1972.

[to be continued]

## BOOK REVIEWS

Alma L. Moldenke

"HAWAII" by Hans W. Hannau, 62 pp., illus., Panorama Books, Doubleday & Company, Garden City, New York 11530. 1968. $3.25.

This is one of over one hundred attractive, casual, little books, each with thirty lavish color plates and other illustrations and with short, interesting, pertinent text. They make delightful souvenirs of where you or friends have been or hope to go. Naturally some plant life is depicted along with the typical "touristy" photographs.

"KEYS TO THE VASCULAR PLANTS OF THE BLACK GAP WILDLIFE MANAGEMENT AREA, BREWSTER COUNTY, TEXAS" by William F. Mahler, 3rd edition, iv & 109 pp., privately published by the author and available from him, Southern Methodist Book Store, Dallas, Texas 75222 or the Dallas Museum of Natural History, Dallas, Texas. 1971. Paper-bound.

Over 400 species are simply and accurately keyed to families, then to genera, and finally to species for this area of over 100,000 acres just east of the Big Bend National Park. The author's main objective (which it meets fully) has been to provide university students with an efficient guide to plant identification. The introduction briefly describes the area geographically and vegetatively in terms of major plant associations. Appended are literature citations without mention of the "Flora of Texas", a glossary with line-drawn illustrations, and indexes of generic, family, and common names.

"THE BIOLOGY OF THE CELL CYCLE" by J. M. Mitchison, v & 313 pp., illus., Cambridge University Press, American Branch, New York, N. Y. 10022. 1971 on the title-page, actually 1972. $14.50 cloth-bound, $4.95 paper-bound.

This valuable book is the outgrowth of a graduate course on this topic by the author when he was a visiting professor at the University of California at Berkeley in 1969. Much valuable material is organized about this topic for the first time. It is richly documented with a bibliography of over a thousand items, also so organized for the first time.

"The cell cycle of a growing cell is the period between the formation of the cell by the division of its mother cell and the time when the cell itself divides to form two daughters. It is a fundamental unit of time at the cellular level since it defines the life cycle of a cell." This study excludes mitosis and cleavage so thoroughly covered by Mazia (to whom this book is dedicated), but includes single cell measurement methods, synchronous cultures, DNA synthesis in eukaryotic and prokaryotic cells, RNA synthesis, protein synthesis during cell growth, enzyme synthesis, organelles, respiration, and experimental control of division by heat shock, radiation, etc.

There is a postscript arranged by chapter headings revealing most recent addenda. There is a subject index. There is little reference to plant cells; mainly it is to ciliate and mammalian cells. The print is easily legible and neat, but why uppercase font was used on p. 202 for Ciliate Protozoan is not clear.

"CHEMISTRY OF FUNGICIDAL ACTION" by Raymond J. Lukens, xiii & 138 pp., illus., Molecular Biology, Biochemistry and Biophysics 10. Springer Verlag, Heidelberg, Berlin & New York, N. Y. 10010. 1971. $12.60.

"Fungicides play an essential role in the production of agricultural crops, in industrial production, and in prolonging the utility of manufactured products. It has been estimated that fungicides are employed in the growing of one-half of the world's crops.

"Of the 1,000,000 or so known fungi, fewer than 200 are considered plant pathogens and fewer than a dozen of these cause serious loss.....When systemically acting fungicides become available, these losses could be reduced by half.

"The health hazards of pesticide usage were dramatized by the publication of 'Silent Spring' by Rachel Carson. The prerequisites of high fungitoxicity and low mammalian toxicity, especially of materials applied to edible crops, have been paramount in the development of fungicides.

"In the present monograph, data are based upon literature of plant pathology, pharmacology, and industrial preservatives. Fungitoxic chemistry is presented from a mechanistic viewpoint. Activity is described in terms of the physical and chemical properties of the compounds in relation to recent concepts of cellular biology. The principles developed may be applicable to an understanding of the actions of fungicides in the control of diseases of plants, animals, and man, as well as the action of fungicides in preventing deterioration of material."

Succinctly and clearly the chapters develop the following topics: (1) chemical control of deterioration of fungi, (2) measurement of fungitoxicity, (3) fungitoxic barriers, (4) migration of fungicide to sites of action, (5) sites of action, (6) reactions to fungicides with cellular constituents, (7) effects of fungicides on enzymes, (8) structure-activity relationships, and (9) action of fungus on fungicides. A helpful appendix describes and diagrams the structure of some fungicides. Literature references from a wide range of sources are given. The whole work is carefully indexed.

# PHYTOLOGIA

*Designed to expedite botanical publication*

Vol. 24 September, 1972 No. 2

CONTENTS



Published by Harold N. Moldenke and Alma L. Moldenke

303 Parkside Road
Plainfield, New Jersey 07060
U.S.A.

Price of this number, $2; per volume, $8 in advance.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE) LXXVI.

## ADDITIONS TO THE GENUS *KYRSTENIOPSIS*

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

When the genus *Kyrsteniopsis* was originally described (King & Robinson, 1971) some variation was noted in the material but we had too few specimens to allow proper evaluation. The arrival of a new collection from Mexico and the loans kindly provided by the University of Michigan, the University of Texas, and the Gray Herbarium, show certain features to be consistent. On this basis we expand the genus to include four species, two species described as new in this paper, and one species previously placed in the genus *Brickellia*.

Key to species of *Kyrsteniopsis*

1a. Achenes with few or no glands, with ca. 25-30 pappus setae ... 2

1b. Achenes with numerous prominent glands, with ca. 35-45 pappus setae. ... 3

2a. Inflorescence very dense with short lateral branches; carpopodium sclerotized throughout ... *K. congesta*

2b. Inflorescence rather lax with elongate lateral branches, carpopodium sclerotized only in lower part ... *K. nelsonii*

3a. Herbaceous 3-4 dm tall; branches of the inflorescence with 3-5 long-pedicellate heads; anther collars sclerotized throughout ... *K. cymulifera*

3b. Shrub ca. 1 m tall; branches of the inflorescence with many densely clustered heads; anther collars with median unsclerotized portion ... *K. dibollii*

*Kyrsteniopsis congesta* R.M.King & H.Robinson, sp. nov. Plantae subarborescentes usque ad 3 m altae. Caules teretes atrorubescentes albo-puberuli. Folia opposita longe petiolata, petiolis 2-6 cm longis; lamina ovato-lanceolata usque ad 12 cm longa et 6.5 cm lata, anguste acuminata basi late cordata valde trinervata margine denticulata in dimidio superiore integra, subtus glandulifera in nervis et nervulis breviter tomentosa. Inflorescentiae thyrsiformes anguste ovoideae, pedicellis brevibus dense tomentosis. Capitula congesta subglomerata, ca. 6 mm alta; flores 9-12 in capitulo; involucri squamae ca. 25 subimbricatae valde inaequilongae tri-quadri-seriatae anguste oblongae obtusae extus glabrae; receptacula convexa glabra; corollae anguste tubulares ca. 3.5 mm longae extus in lobis et in dimidio inferiore granduliferae; filamenta antherarum in parte superiore ubique indurata; achaenia in costis dense setifera non glandulifera; carpopodia cylindrica ubique indurata, cellulis parvis multiseriatis rotundatis collenchymatosis; pappi setae ca.23-27. Grana pollinis 18-20μ diam.

MEXICO: Guerrero: 2 km al S de Taxco, sobre la carretera a Iguala. Arbusto de 3 m. de alto; ramas del estilo amarillentas. February 14, 1970. 1800 m J. Rzedowski 27070 (Holotype US! Isotype MICH!).

The species is most distinct in the compact form of the inflorescence. The carpopodium and outer wall of the achene are also unique in the genus by being sclerotized throughout.

*Kyrsteniopsis cymulifera* (B.L.Robinson) R.M.King & H. Robinson, comb. nov. *Brickellia cymulifera* B.L. Robinson, Proc. Amer. Acad. 51: 538. 1916. MEXICO: San Luis Potosi: C.A.Purpus 4802 (Isotype US!)

*Kyrsteniopsis dibollii* R.M.King & H.Robinson, sp. nov. Plantae frutescentes ca. 1 m altae. Caules teretes fusci breviter puberuli. Folia opposita tenuiter petiolata, petiolis usque ad 2 cm longis vel longioribus; lamina late ovata breviter acuminata usque ad 5.5 cm longa et 4 cm lata basi truncata vel cordata trinervata margine subintegra, subtus glandulifera in nervis et nervulis breviter tomentosa. Inflorescentiae paniculatae, ramulis brevibus corymbosis, pedicellis 1-4 mm longis puberulis. Capitula ca. 6 mm alta; flores ca. 13 incapitulo; involucri squamae ca. 25 imbricatae valde inaequilongae tri-quadriseriatae oblongae obtusae extus glabrae; receptacula convexa glabra; corollae anguste tubulares 4.0-4.5 mm longae extus in lobis et in dimidio inferiore granduliferae; filamenta antherarum in parte superiore interrupta; achaenia setifera et glandulifera; carpopodia solum in parte inferiore rotundata indurata, cellulis parvis multiseriatis rotundatis valde collenchymatosis; pappi setae ca. 35. Grana pollinis 18-20$\mu$ diam.

MEXICO: Veracruz: Along route 150, ca. 20 miles north of Tehuacan. Occasional; a shrub about 1 meter tall; open sun; flowers yellow? January 26, 1960. Robert Merrill King 2329 (Holotype MICH! Isotype US!).

The new species is like *K. cymulifera* (B.L.Robinson) R.M.King & H.Robinson in the numerous glands on the achene and in the greater number of pappus setae. Differences from *K. cymulifera* include the much more robust habit and the partially unsclerotized anther collars.

The new species is named for Dr. Alfred George Diboll whose aid and enthusiasm during the 1960 collecting season was greatly appreciated by the senior author.

*Kyrsteniopsis nelsonii* (B.L.Robinson) R.M.King & H. Robinson, Phytologia 22:146. 1971. MEXICO: Guerrero: E.W.Nelson 2144 (Lectotype US! Isolectotype GH!); Michoacan: McVaugh 22,651 (MICH!); Anderson & Anderson 5889 (MICH!); Oaxaca: Seler 1447 (GH!).

Reference

King, R.M. & H.Robinson 1971. Studies in the Eupatorieae (Asteraceae). LXIII. A new genus, *Krysteniopsis*. Phytologia 22: 145-146.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 to the senior author.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXXVII.

ADDITIONS TO THE GENUS STEVIOPSIS.

R. M. King and H. Robinson
Smithsonian Institition, Washington, D.C. 20560.

Almost simultaneously with the description of Steviopsis, the publication by McVaugh (1972) transferred the type species, Stevia rapunculoides DC, from Eupatorium to Brickellia. The placement by McVaugh was based on a number of characters including the number of ribs on the achenes which is usually more than 5, the style branches which are broad and smooth, and the tubular corolla. Moreover, McVaugh called attentionto a related species, Brickellia amblyolepis B.L.Robinson. Now, after a review of these species and others in the genus Brickellia we can agree with the species relationship cited by McVaugh, but we would retain the genus Steviopsis including the species cited by McVaugh and a third species, Brickellia pulcherrima B.L.Robinson. A forth species is described here as new.

The four species of Steviopsis can be distinguished from Brickellia most easily by the lack of an expanded setiferous node at the base of the style. Additional distinguishing characters are the indistinct carpopodium and the lack of distinct fringes on the lateral surfaces of the pappus setae. Also distinctive are the elongate corolla lobes without glands. The ternate leaves originally noted in Steviopsis are characteristic of the type species only. The additional species show alternate leaves in most of the upper portions and the older parts of B. amblyolepis commonly show whorls of 4 or 5 leaves.

In spite of the differences cited, the genus Steviopsis does seem closely related to Brickellia. The genera Dyscritogyne and Kyrsteniopsis are probably in this general relationship also.

Key to the species of Steviopsis.

1. Phyllaries narrowly acute, achenes usually with 5-7 ribs. 2

1. Phyllaries short-acute to obtuse, achenes usually with 9-10 ribs. 3

2. Leaves mostly in whorls of three, narrowly lanceolate, not or scarcely trinerved at base ... *S. rapunculoides*

2. Most leaves alternate, elliptical-ovate, strongly trinervate ... *S. arsenei*

3. Leaves ovate, without glands; most lower leaves in whorls of 4 or more; outer phyllaries obtuse ... *S. amblyolepis*

3. Leaves linear-lanceolate, with glands, mostly alternate; outer phyllaries short acute ... *S. pulcherrima*

Our studies indicate that the genus contains the following four species.

*Steviopsis amblyolepis* (B.L.Robinson) R.M.King & H. Robinson, comb. nov. *Brickellia amblyolepis* B.L.Robinson, Proc. Amer. Acad. 36: 485. 1901. Mexico.

*Steviopsis arsenei* R.M.King & H.Robinson, sp. nov.

Plantae herbaceae erectae; caules breviter puberuli irregulariter maculati, maculis elongatis pubescentibus. Folia superiora alterna, petiolis ca. 0.5-1.0 cm longis, laminis 4-13 cm longis 1.5 - 4.0 cm latis elliptico-ovatis vix acuminatis distincte serratis base trinervatis supra glabra subtus in nervis breviter hirsutis. Inflorescentiae dense paniculatae pauce ramosae, pedicellis 2-7 mm longis dense puberulis. Capitula ca. 1.0 alta, floribus ca. 30-35; involucri squamae 25-35 eximbricatae 2-3-seriatae plerumque anguste lanceolatae anguste acutae; corollae anguste infundibulares ca. 6 mm longae, lobis longe triangularibus extus glabris; achaenia dense longe setifera, glandulifera; pappi setae ca. 30 argute scabrae. Grana pollinis 27-30μ diam.

MEXICO: Michoacan: Cerro San Miguel, Vicinity of Morelia, alt. 2100 meters. 15 September 1910. Bro. G. Arsene 10215 (Holotype US !).

*Steviopsis pulcherrima* (B.L.Robinson) R.M.King & H. Robinson, comb. nov. *Brickellia pulcherrima* B.L.Robinson, Contr. Gray Herb. n.s. 31: 268. 1904. Mexico.

Steviopsis rapunculoides (A.P.Decandolle) R.M.King & H.Robinson, Phytologia 22: 157. 1971. Mexico.

## Reference

McVaugh, Rogers. 1972. Compositarum Mexicanarum Pugillus. Contr. Univ. Mich. Herb. 9:(4): 359-484.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB- 20502 A #1 to the senior author.

STUDIES IN THE EUPATORIEAE (ASTERACEAE) LXXVIII.

A NEW GENUS, BRICKELLIASTRUM

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

Among the species previously included in Brickellia is B. fendleri A. Gray of the Western United States. The species has been retained in the genus in spite of the reduced number of ribs on the achene. The lack of any node or hairs at the base of the style and the presence of a more funnelform corolla are further significant distinctions on which we here base a separate new genus, Brickelliastrum.

Brickelliastrum is closest in characteristics and possibly closest in relationship to Kyrsteniopsis of Mexico. Brickelliastrum is like Kyrsteniopsis in some of its generally Brickellioid characters such as the enlarged style branches and the short corolla lobes. A more important shared character is the lack of a Brickellia-type hirsute enlargement at the base of the style. The differences from Kyrsteniopsis include 25-30 flowers per head rather than 10-16; the less tubular corolla, the more fragile pappus setae more distinctly flattened on the outer surface for the whole length, the anther collars having less distinct short cells below and having distinct transverse annular thickenings. The greatest concentration of differences is in the achene where Brickelliastrum has only short setae or is scabrous instead of having long setae, it has a strong tendency for 6 ribs rather than the regular 5, the base of the achene is very short with a very low ovule instead of attenuate, and the carpopodium is shorter and flatter instead of cylindrical with slightly more rectangular rather than oval cells.

Kyrsteniopsis is distributed from Jalisco eastward through Guerrero to Oaxaca and northward to Veracruz and San Luis Potosi. Brickelliastrum is known from New Mexico and western Texas south to the Big Bend of the Rio Grande northward to the border and possibly into southeastern Colorado, west into the south eastern corner of Arizona, and it is perhaps found in a few border areas of Mexico.

Brickelliastrum R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae suffrutescentes erectae vel decumbentes e basi multo ramosae. Folia inferne opposita superne saepe alterna distincte et interdum longe petiolata, laminis ovatis acutis basi truncatis vel subcordatis margine serratis. Inflorescentiae paniculatae saepe pauce ramosae. Involucri squamae ca. 25 subimbricatae valde inaequilongae ca. 4-seriatae oblongae; receptacula leniter convexa glabra. Flores 25-30 in capitulo; corollae anguste infundibulares 5-lobatae, lobis triangularibus vix longioribus quam latioribus laevibus extus pauce glanduliferis; filamenta antherarum in parte superiore non incrassata, cellulis plerumque oblongis vel longioribus, parietibus transverse annulate ornatis, appendicibus vix longioribus quam latioribus; styli inferne non nodulosi glabri, appendicibus longe clavatis laevibus; achaenia 5-6-costata scabra vel setifera inferne vix angustiora; carpopodia distincta breve operculiformia, cellulis oblongis, parietibus distincte incrassatis; pappus setiformis uniseriatus, setis ca. 25 extus laevibus lateraliter scabris superne non dilatatis, cellulis apicalibus argute acutis.

Species typica: Brickellia fendleri A. Gray

The genus is monotypic.

Brickelliastrum fendleri (A.Gray) R.M.King & H. Robins. comb. nov. Brickellia fendleri A. Gray, Mem. Amer. Acad. 4: 63. 1849.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB-20502 A #1 to the senior author.

STUDIES IN THE EUPATORIEAE (ASTERACEAE) LXXIX.

A NEW GENUS, ASANTHUS.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

The genus *Asanthus* described here represents three species of two rather distinctive types. A critical comparison with members of related genera is particularly instructive.

The new genus *Asanthus* seems closest to *Steviopsis* but can be distinguished by the sessile leaves, the presence of glands on the outer surface of the corolla lobes, the four or more series of phyllaries, the less distinct anther collars, the lack of glands on the achenes, the very narrow raised ribs on the achenes and the distinct carpopodia of small rather thick-walled cells. The genus also lacks the mottled reddish coloration of the stem that occurs in *Steviopsis*.

The many series of phyllaries are reminiscent of *Dyscritogyne* but the latter is distinct in its much shorter corolla lobes and the fusiform 5-ribbed achenes bearing many long-stalked glands.

The genus *Asanthus* does have a resemblance to the related genus *Brickellia*, especially comparing *A. squamulosus* (Gray) R.M.King & H.Robinson to *Brickellia spinulosa* Gray. In superficial characteristics the last two seem closely related, both having the strobilus-like clusters of reduced leaves in the leaf axils and below the involucres. In reality *A. squamulosus* is distinct by the lack of the hirsute stylar node, the more reduced carpopodium, the narrower raised costae on the sparsely setiferous achene and the great number (75-100) of much finer less scabrous pappus setae. In all these features except the pappus structure, *A. squamulosus* is like the other species of *Asanthus* and different from most *Brickellia*. The occurence of the squamulous condition in a rather unrelated species of *Brickellia* lessens the inclination to value the characteristic very highly but *A. squamulosus* is still very distinctive in the form of its pappus which is distinctly in 2-3 rows, and the species could easily be subgenerically distinct from *A. thryiflora* and *A. solidaginifolia*.

The two species *A. thrysiflora* and *A. solidaginifolia* have never been compared previously though they are obviously related. The former species known from San Luis Potosi seems to differ only by a somewhat longer involucre from the latter species of Chihuahua, Coahuila and Durango.

Asanthus R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae suffrutescentes erectae multo ramosae. Folia inferne opposita sessilia anguste lanceolata vel linearia integra, utrinque glandulifera, superne opposita vel alterna, interdum squamulosa, in glomerulis dense imbricata. Inflorescentiae paniculatae, ramis ad apicem dense corymbosae. Involucri squamae ca. 20-25 interdum in foliis squamulosis imbricatis numerosis continuae imbricatae vel subimbricatae valde inaequilongae, 4-seriatae vel plus, oblongae; receptacula plana glabra. Flores 8-14 in capitulo; corollae tubulares vel anguste infundibulares, lobis distincte longioribus quam latioribus extus pauce glanduliferis; filamenta antherarum in parte superiore non incrassata, cellulis indistinctis, parietibus transverse annulate ornatis; appendicibus 1 1/8-1 1/2 longioribus quam latioribus; styli inferne non nodulosi, glabri, appendicibus longe clavatis laevibus; achaenia longe prismatica ca. 10-costata, costis angustis parce breviter setiferis; carpopodia breviter operculiformia, cellulis parvis subquadratis vel breviter oblongis, parietibus aliquantum incrassatis; pappus setiformis 1-3-seriatus, setis 20-100, varie scabris superne non dilatatis, cellulis apicalibus argute acutis.

Species typica: Brickellia squamulosa A. Gray

Our studies of the genus indicate that it contains the following three species.

Asanthus solidaginifolius (A.Gray) R.M.King & H.Robinson, comb. nov. Brickellia solidaginifolia A. Gray, Proc. Amer. Acad. 22: 306. 1887. Mexico.

Asanthus squamulosus (A.Gray) R.M.King & H.Robinson, comb. nov. Brickellia squamulosa A.Gray, Proc. Amer. Acad. 15: 30. 1880. Mexico, Southwest United States.

Asanthus thrysiflorus (A.Gray) R.M.King & H.Robinson, comb. nov. Brickellia thrysiflora A.Gray, Proc. Amer. Acad. 15: 30. 1880. Mexico.

This study was supported in part by the National Science Foundation Grant GB 20502 A# 1 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE) LXXX.

## A NEW GENUS, FLYRIELLA.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

A new genus is established for a group of species of northern Mexico and the adjacent United States that were among the many originally placed in *Eupatorium*. The study of one of the species of the group by the late David Flyr pointed out the closer relationship to the genus *Brickellia*. We have examined the possibility of a broader genus concept of *Brickellia* as suggested by Flyr and find it untenable, but very natural generic groupings have been noted that preserve very nearly the original concept of *Brickellia*. In this treatment the species studied by Flyr falls into a new genus and it seems appropiate to name the group after him.

The genus *Flyriella* is similar to *Brickellia* and different from *Eupatorium* in the features mentioned by Flyr, the narrow corolla with short rather erect lobes and the narrow greenish phyllaries in many rows. A similarity to *Brickellia* not noted previously is the hirsute node at the base of the style which, however, differs in details of structure from that of *Brickellia*. *Flyriella* is one of the segregates of *Brickellia* that differs by having only 5 ribs on the achene. A unique feature of the new genus is the contorted carpopodium with distorted cells and only partially thickened walls. Additional distinctions of *Flyriella* are the lack of the characteristic fringed pappus setae found in all species of *Brickellia*, and the more spreading more sparse setae on the achenes.

In reviewing the species in the group we have noted that *Eupatorium chrysostyloides* B.L.Robinson is apparently the same as the earlier described *Eupatorium leonense* B.L.Robinson. We describe as new a species found named as *E. stanfordii* among the collections in the Gray Herbarium. Unfortunately, we do not know who to credit with this notation.

*Flyriella* R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae herbaceae vel suffrutescentes erectae vel decumbentes e basi multo ramosae, dense hirsutae. Folia plerumque opposita distincte petiolata, petiolis interdum alatis, laminis ovatis vel deltoideis acutis basi truncatis vel subcordatis margine serratis. Inflorescentiae laxe ramosae, ramis cymosis. Involucri squamae ca. 30 subimbricatae valde inaequilongae ca. 3-seriatae plerumque lanceolatae; receptacula plana glabra. Flores 10-30 in capitulo; corollae tubulares vel anguste infundibulares 5-lobatae, lobis brevibus vix longioribus quam latioribus vel angustioribus, laevibus, extus pauce glanduliferis interdum breviter setiferis; filamenta antherarum in parte superiore anguste, cellulis plerumque breviter oblongis, parietibus infirme transverse annulate ornatis, appendicibus parum longioribus quam latioribus; styli inferne leniter nodulosi dense hirsuti; appendicibus longe clavatis laevibus; achaenia 5-costata setifera inferne interdum glabra; carpopodia distincta asymmetrica brevia vel longe cylindrica, cellulis varie contortis, parietibus distincte aequaliter incrassatis; pappus setiformis uniseriatus, setis 20-40 scabris superne sensim angustioribus, cellulis apicalibus subacutis.

Species typica: Eupatorium parryi A. Gray

The five species of Flyriella can be distinguished by the following key.

1. Stems with short crisped pubescence; achenes with setae only in upper part ..... F. leonensis

1. Stems long hirsute; achenes with setae not restricted to upper part ..... 2

  2. Heads with ca. 11 flowers, pappus with ca. 20 setae ..... F. sphenopoda

  2. Heads with 15-25 flowers, pappus with 25-30 setae ..... 3

3. Corollas narrowly funnelform; carpopodia short-turbinate ..... F. stanfordii

3. Corollas tubular and constricted above; carpopodia elongate and contorted ..... 4

  4. Heads in lax cymes, with 15-20 flowers per head; stems short-hirsute ..... F. parryi

  4. Heads in dense cymes, with ca 30 flowers per head; stems very densely long-hirsute ..... F. chrysostyla

Our studies of the genus indicate that it contains the following five species.

Flyriella chrysostyla (B.L.Robinson) R.M.King & H. Robinson, comb. nov. Eupatorium chrysostylum B.L. Robinson, Proc. Amer. Acad. 41: 274. 1905. Northern Mexico.

Flyriella leonensis (B.L.Robinson) R.M.King & H. Robinson, comb. nov. Eupatorium leonense B.L.Robinson, Proc. Amer. Acad. 36: 479. 1901. Northern Mexico.

Flyriella parryi (A.Gray) R.M.King & H.Robinson, comb. nov. Eupatorium parryi A.Gray in Torr. Bot. Mex. Bound. 75. 1859. Southern Texas, Northern Mexico.

Flyriella sphenopoda (B.L.Robinson) R.M.King & H. Robinson, comb. nov. Eupatorium sphenopodum B.L. Robinson, Proc. Amer. Acad. 43 : 35. 1907. N. Mexico.

Flyriella stanfordii R.M.King & H.Robinson, sp. nov. Plantae herbaceae? Caules dense longe hirsuti. Folia superiora alterna, petiolis 1.5 - 4.0 cm longis anguste alatis fere ad basim, laminis late ovatis 4.0 - 12.0 longis 3.0 - 9.5 cm latis breviter acuminatis serratis utrinque parce pilosis subtus in nervis hirsutis. Infloresentiae dense cymosae, pedicellis 2 - 7 mm longis hirsutis glanduliferis. Capitula ca.8 mm alta, floribus ca. 20 - 23; involucri squamae ca. 25 ca. 3-seriatae exteriores ovatae interiores lanceolatae; corollae albae anguste infundibulares ca. 5 mm longae, lobis vix longioribus quam latioribus extus pauce glanduliferis; achaenia sparse setifera, inferne vix angustiora carpopodia brevia turbinata; pappi setae ca. 40. Grana pollinis 25μ in diam.

MEXICO: Tamaulipas: 4 kms. west of Miquihauana in canyon with luxuriant vegetation. Flowers white. August 4, 1941. L.R.Stanford, K.L.Retherford, R.D. Northcraft 675 (Holotype GH!)

## Reference

Flyr, David. 1968. New names and records in Brickellia (Compositae). Sida 3(4): 252-256.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 to the senior author.

STUDIES IN THE EUPATORIEAE (ASTERACEAE) LXXXI.

THE GENUS, PHANEROSTYLIS.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

The name Phanerostylis is raised here to generic rank from the subgeneric level. Gray in his original description emphasized the unusually broad style branches which are one of the distinctive features. Harcombe and Beaman (1967) made an exhaustive comparison of the superficial characteristics of two species of the group and found relationship to a strikingly distinctive monocephalic member of the genus Brickellia. Our own review of Brickellia and its relatives has shown a third species of the Phanerostylis group that is not monocephalic and which indicates other relationships than those suggested by Harcombe and Beaman. In addition there are many important features evident at the microscopic level all suggesting a status related to but outside of the genus Brickellia.

Distinctive features of Phanerostylis include the 5 angled achenes, the flaring corollas, the more erect spreading hairs on the stylar node and the broader style branches. The corolla lobes and the style branches both show a papillosity not seen in any other members of the Brickellia complex. It seems worth noting that the broadened condition and papillosity of the corolla lobes and style branches might be influenced by a single gene, and we have seen evidence of similar parallel development of these structures in other Eupatorieae. The similarities to Brickellia are comparatively subtile and include the habit, the structure of the carpopodia and the pappus setae and, of course, the chromosome number N = 9.

The removal of Phanerostylis glutinosus from the genus Barrotea has the additional effect of purifying the latter genus which can now be consistently recognized by the prickles on the tips of the lobes of its leaves and the 5 angled achenes.

Phanerostylis (A.Gray) R.M.King & H.Robinson, new status.

Eupatorium (Phanerostylis) A. Gray, Proc. Amer. Acad. 9: 205.1882.

Erect to decumbent many branched subshrubs. Leaves opposite, long petioled, blades ovate to ovate-lanceolate. Inflorescence scarcely branched, or monocephalous. Involucre of ca. 30-50 oblong to lanceolate phyllaries in 3-7 series. Receptacle flat or slightly convex, glabrous, 25-50 flowers per head, corollas funnelform, glabrous, 5-lobed, lobes scarcely longer than wide, papillose on both surfaces, stomates absent; anther collar short to rather elongate, lower cells subquadrate, with distinct annular thickenings. Anther appendage slightly shorter to distinctly longer than wide, composed of large thin-walled cells; stylar node distinctly enlarged, covered with rather long sinuous hairs, stylar appendage long, enlarged, densely covered with long papillae. Achenes prismatic, 4-5 ribbed, setiferous, carpopodia distinct, asymmetrical, short, composed of thick-walled cells, pappus of ca. 25 externally nearly smooth laterally densely fringed setae. Chromosome number determined as X = 9 (Turner & King, 1964).

Type species: Bulbostylis pedunculosa A. P. Decandolle.

Our studies of the genus indicate that it contains the following three species.

Phanerostylis coahuilensis (A.Gray) R.M.King & H.Robinson, comb. nov. Eupatorium coahuilensis A.Gray, Proc. Amer. Acad. 17: 205. 1882. Mexico.

Phanerostylis glutinosa (T.S.Brandegee) R.M.King & H. Robinson, comb. nov. Barroetea glutinosa T.S. Brandegee, Zoe 5: 262. 1908. Mexico.

Phanerostylis pedunculosa (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Bulbostylis pedunculosa A.P.Decandolle, Prodr. 5: 138. 1836. Mexico.

## Reference

Turner, B.L. & R.M.King. 1964. Chromosome numbers in the Compositae VIII. Mexican and Central American species. Southwest Nat. 9: 27-39.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 to the senior author.

STUDIES IN THE EUPATORIEAE (ASTERACEAE) LXXXII.

A NEW GENUS, AUSTROBRICKELLIA.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

A new genus, Austrobrickellia, is established for a group of the southern-most relatives of Brickellia including three species long misplaced in the genus, Eupatorium. Though ignored in all previous discussions of the Brickellia complex, the three species show the three primary features of that group, very slender corollas with short rather erect lobes, large clavate style branches, and an enlarged hairy node at the base of the style. The five ribbed achenes have been of primary significance in placement of the group, and this feature along with the smaller cylindrical carpopodium, the scarcely fringed pappus setae and the rigidly divergent branching continue to distinquish the group from Brickellia and other related genera.

The present concept of the species of Austrobrickellia is based partly on the study by Cabrera and Vittet (1954). In this treatment a few familiar names are relegated to synonymy, Mikania tenuiflora Griseb. was placed under Eupatorium arnottii Baker, E. patagonicum Klatt and E. vattuonei Hicken were placed under E.patens Don ex Hook. & Arn.

Austrobrickellia R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae frutescentes erectae vel decumbentes multo ramosae, raris recte patentibus. Folia plerumque opposita breviter petiolata, lamina anguste ovatis vel deltoideis integra vel dentatis. Inflorescentiae laxe, ramis ultimis dense corymbosis, pedicellis breviter gracilis. Involucri squamae 6-22 subimbricatae valde inaequilongae 3-4-seriatae oblongae vel lanceolatae acutae vel subobtusae extus tomentosa vel subglabra; receptacula plana glabra. Flores 3-12 in capitulo; corollae anguste tubulares superne constrictae; lobis brevibus leniter patentibus oblongis duplo longioribus quam latioribus extus glanduliferis; filamenta antherarum in parte superiore parum incrassata, cellulis elongatis, parietibus transverse annulate ornatis, appendicibus oblongis $1\frac{1}{4}$ longioribus quam latioribus; styli inferne nodulosi dense hirsuti, appendicibus longe incrassate clavatis laevibus; achaenia 5-costata breviter setifera plerumque glandulifera; carpopodia breviter cylindrica, cellulis parvis subquadratis parietibus vix incrassatis; pappus setiformis l-seriatus, setis ca. 30 inferne lateraliter aliquantum fimbriatis superne sensim aliquantum remote scabris, cellulis apicalibus subobtusis.

Species typica: Eupatorium patens Don ex Hook. & Arn.

Our studies of the genus indicate that it contains the following three species.

Austrobrickellia arnottii (Baker) R.M.King & H.Robinson, comb. nov. Eupatorium arnottii Baker, Mart. Fl. Bras. 6(2): 323. 1876. Argentina.

Austrobrickellia bakerianum (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium bakerianum B. L. Robinson, Contr. Gray Herb. n.s. 75: 5. 1925. Eupatorium cinereum Baker, London Journ. Bot. 20: 226. 1882. Brazil.

Austrobrickellia patens (Don ex Hook. & Arn.) R.M.King & H.Robinson, comb. nov. Eupatorium patens Don ex Hook. & Arn., Comp. Bot. Mag. 1: 242. 1835 (1836). Argentina, Bolivia, Brazil, Paraguay.

## Reference

Cabrera, A.L. & N. Vittet. 1954. Catalogo de las Eupatorieas Argentinas (Compositae). Revista del Museo de la Universidad Eva Peron n.s. 8: 179-263.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 to the senior author.

STUDIES IN THE EUPATORIEAE (ASTERACEAE) LXXXIII.

A NEW GENUS, PSEUDOBRICKELLIA.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

Three brazilian species are the basis for the new genus, Pseudobrickellia described here. All three species show a habit of closely spirally inserted narrow leaves. The habit is common in the planalto of Brazil among plants of many rather unrelated genera including some other Eupatorieae, but is unique among the relatives of Brickellia. Further important distinctions are the few flowered heads (2-4) and the corolla lobes with hairs or glands.

The genus includes species previously placed in both Eupatorium and Brickellia. Of these, Eupatorium angustissimum does show only 5 ribs on the achene while Brickellia brasiliensis has about 10, but the species were sufficiently similar to be intermixed in the folders of each species in the U.S. National Herbarium. Though similar, the two species have a number of other differences. The most significant distinction of Eupatorium angustissimum is the scarcely enlarged style base with the node marked only by the dense cluster of hairs.

The descriptions by DeCandolle (1838) and B. L. Robinson (1911) indicate Brickellia coridifolia of Brazil is a plant of similar habit. Still, descriptions indicate the latter species has 8 flowers per head and phyllaries that are glandular pubescent externally. The proper relationship remains to be determined.

Pseudobrickellia R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae suffrutescentes vel frutescentes erectae pauce vel multo ramosae. Caules puberuli. Folia arcte spiraliter inserta indistincte breviter petiolata vel sessilia anguste linearia integra. Inflorescentiae corymbosae, ramis ascendentibus. Involucri squamae plerumque 12-14 subimbricatae vel imbricatae valde inaequilongae 3-4-seriatae ovatae vel lanceolatae; extus glabrae; receptacula plana glabra. Flores 2-4 in capitulo; corollae anguste infundibulares 5-lobatae, lobis longioribus quam latioribus oblongis glabris; filamenta antherarum in parte superiore vix incrassata, cellulis oblongis vel longioribus, parietibus aliquantum transverse annulate ornatis, appendicibus late ovatis vix latioribus quam longioribus; styli inferne varie nodulosi dense hirsuti, appendicibus longe incrassato-clavatis laevibus; achaenia 5-10-costata distincte setifera; carpopodia breviter cylindrica, cellulis parvis, parietibus incrassatis; pappus setiformis 1-2-seriatus, setis ca. 35 argute scabris superne sensim parum angustioribus, cellulis apicalibus obtusis vel acutis.

Species typica: Eupatorium brasiliense Spreng.

Our studies of the genus indicate that it contains the following three species.

Pseudobrickellia angustissima (Spreng. ex Baker) R.M. King & H.Robinson, comb. nov. Eupatorium angustissimum Spreng. ex Baker, Mart. Fl. Bras. 6(2): 325. 1876. Brazil.

Pseudobrickellia brasiliensis (Spreng.) R.M.King & H. Robinson, comb. nov. Eupatorium brasiliense Spreng., Syst. 3: 417. 1826. Brazil.

Pseudobrickellia irwinii R.M.King & H.Robinson, sp. nov. Plantae ca. 60 cm altae solum ad basim ramosae. Caules sparse puberuli. Folia usque ad 1.3 cm longa 1.5 mm lata glabra. Inflorescentiae pyramidaliter corymbosae. Capitula ca. 9 mm alta, floribus 2-3; involucri squamae 12-14 usque ad 7 mm longae castaneae vel rubescentes; corollae ca. 5 mm longae, lobis duplo longioribus quam latioribus; thecae antherarum ca. 1.5 mm longae, appendicibus non latioribus quam longioribus late obtusis; styli inferne distincte nodulosi dense hirsuti, pilis valde contortis, cellulis ca. 12-15μ diam.; achaenia ca. 10-costata dense setifera, setis longis, cellulis saepe uniseriatis; carpopodia parva, cellulis vix biseriatis; pappi setae leniter patentes, cellulis apicalibus obtusis ca. 18-20μlatis. Grana pollinis ca. 25μ diam.

Brazil: Distrito Federal. Universidade de Brasilia, border of lake. Cerrado. Elevation 750 m. Subshrub ca. 60 cm. tall. Heads cream. H.S.Irwin, R. Souza, R. Reis dos Santos 7854, 24 August 1965. (Holotype US!). Paratype Brazil: Minas Gerais. Serra de Catiara, 950 m. Apparicio Pereira Duarte 2815 (US!)

References

Decandolle, A.P. 1838. Mantissa Compositarum. Prodr. Syst. Nat. 7: 263-308.

Robinson, B.L. 1911. On the classification of certain Eupatorieae. Contr. Gray Herb. n.s. 39: 191-202.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE) LXXXIV.

## A NEW GENUS, CROSSOTHAMNUS.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

A distinctive species from Peru has been placed in the genus Eupatorium but has the narrow corollas, short corolla lobes and very large style branches of the Brickellia complex. The small leaves and somewhat noding heads in paniculate terminal clusters give the plant a particularly unique appearance. We recognize the plant here as an isolated member of the Brickellia complex showing transitional features between the Brickellia and Helogyne extremes.

Crossothamnus weberbaueri is most like Brickellia in the structure of the corolla and the style branches and also shows a similarly shaped stylar node. The differences include the stylar node being essentially glabrous, the corollas and achenes being covered with glands, the carpopodia being small with small subquadrate cells, and the pappus setae lacking any distinct lateral fringe. Crossothamnus is very reminiscent of Helogyne in general aspect and in the numerous glands on the corollas and achenes. The species differs from Helogyne by the very prominent stylar node and the blunter tips on the pappus setae. The genus Helogyne has the style base unenlarged except for a slight thickening in the northern-most ranging species, H. calocephala Mattf., of costal Peru. Helogyne also differs by the narrower leaves not notably pubescent below and by the narrow pointed rather than broad tipped phyllaries.

Crossothamnus R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae frutescentes erectae tandem multo ramosae. Folia opposita vel alterna breviter petiolata, laminis parvis ovatis breviter acutis pauce crenulatis basi truncatis, supra glabris, subtus albo-tomentosis. Inflorescentiae paniculatae ramoso-corymbosae, pedicellis gracilibus, dense breviter puberulis. Capitula cernua; involucri squamae ca. 20, imbricatae, valde inaequilongae, 3-4-seriatae oblongae obtusae extus puberulae; receptacula plana glabra. Flores ca. 10 incapitulo; corollae tubulares superne vix infundibulares breviter 5-lobatae, lobis oblongis parum longioribus quam latioribus, lobis et tubis extus glanduliferis; filamenta antherarum in parte inferiore brevia, in parte superiore vix incrassata, cellulis oblongis vel longioribus, parietibus obscure transverse annulate ornatis, appendicibus oblongis $1\frac{1}{4}$ longioribus quam latioribus; styli inferne grosse nodulosi laeves vel mamillosi, appendicibus longe incrassato-clavatis, laevibus vel mamillosis; achaenia 5-7-costata dense glandulifera, setis raris; carpopodia breviter cylindrica, cellulis parvis multiseriatis, parietibus incrassatis; pappus setiformis uniseriatus, setis ca. 35 interrupte scabris, cellulis apicalibus subobtusis. Chromosome number X = 10 (Turner, Powell, & Cuatrecasas, 1967)

Species typica: Eupatorium weberbaueri Hieron.

The genus is monotypic.

Crossothamnus weberbaueri (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium weberbaueri Hieron., Engl. Jahrb. 40: 369. 1906. Peru.

## Reference

Turner, B.L., A.M.Powell and J.Cuatrecasas. 1967. Chromosome numbers in Compositae. XI. Peruvian species. Ann. Missouri Bot. Gard. 54(2): 172-177.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXXXV. ADDITIONS TO THE GENUS *AGERATINA* WITH A KEY TO THE COSTA RICAN SPECIES.

R. M. King and H.Robinson
Smithsonian Institution, Washington, D.C. 20560.

*Ageratina*, as circumscribed in our earlier work (King & Robinson, 1970) is one of the largest genera in the Eupatorieae and contains many of the most difficult species complexes in the tribe. The genus needs much work at the species level and some such efforts are recorded here. Papers dealing with members of the genus have been produced by Adams, 1971, Grashoff and Beaman, 1969, McVaugh, 1972, using the old generic concept of *Eupatorium* and new combinations are provided here. Some errors and oversights have been noted in our previous work and these are also treated here. Perhaps most important here, however, are the descriptions of a large number of new species discovered in our studies. Many of these result from a special study of the genus in Costa Rica for which we have seen almost all the revelent type material. For this group of species all previous identifications including our own have proven almost totally unreliable. A detailed key is providedfor the Costa Rican species.

The diversity in the genus *Ageratina* is only partially shown in the initial subdivision into subgenera attempted by us. A few species are difficult to assign to the proper subgenus but the situation is not as difficult as would seem from the editorial error in the original paper, where a series of species belonging to subgenus *Ageratina* were listed under *Neogreenella*, *A. isolepis*(B.L.Robinson) R.M.King & H. Robinson, *A. ixiocladon*(Benth ex Oerst.) R.M.King & H. Robinson, *A. kupperi*(Suesseng.) R.M.King & H.Robinson, *A. lasia*(B.L.Robinson) R.M.King & H.Robinson, and *A. lemmonii*(B.L.Robinson) R.M.King & H.Robinson. One of the original four subgenera has been raised to generic rank in a subsequent paper (King & Robinson, 1972). We make no attempt at this time at further refinements of the subgenera. The new species and new combinations are members of the subgenus *Ageratina* unless indicated otherwise.

The chromosome number X = 10 is most common in the Eupatorieae but the basic chromosome number X = 17 is characteristic of the genus Ageratina and X = 16 is known for the related genus Oxylobus. The closely related genera Jaliscoa, MacVaughiella and Piptothrix have not been counted yet but may be expected to show X = 17. One species in this complex, Ageratina aschenborniana(Schauer)R.M.King & H.Robinson, has been reported from Guatemala (King 3182) as N = 20 with one to several fragments (Turner, Powell, & King, 1962). Another specimen from Costa Rica (King 5377) has an uncertain count of N = 20 ± 2II. A third specimen, also from Costa Rica (King 5396) has the more likely count of N = ca. 17 II. For the present, the count of N = 20 in A. aschenborniana seems questionable.

Some information has accumulated regarding the medicinal and other chemical aspects of a few species of Ageratina. Apparently overlooked by recent workers are the comments of Weberbauer cited by B.L.Robinson (1919) regarding A. sternbergiana(A.P.Decandolle) R.M. King & H.Robinson "The species according to Dr. Weberbauer is locally called hualmi-hualmi. He also states that the fresh roots, softened in lukewarm water, are employed as an abortive, and that a tea prepared from the leaves is used for kidney and bladder troubles." Similar abortive properties have been noted more recently in another Eupatorian species, Stevia rebaudiana (Bertoni)Hemsl. of Paraguay. An additional medicinal aspect of the genus is the "milk sickness" caused by tremetol found in A. altissima(L.) R.M.King & H.Robinson as discussed by Hass (1970). In view of the known chemical peculiarities of the genus there is reason to question the nature of the oil droplets we have observed in the leaves of A. barbensis described below.

The following new combinations and new species are added to the genus Ageratina. Notes and specimen citations are given also for some species previously transferred to the genus.

Ageratina abronia(Klatt) R.M.King & H.Robinson, comb. nov. Eupatorium abronium Klatt, Ann. Naturh. Hofmus. Wien 9: 355. 1894. Mexico.

Ageratina allenii (Standl.) R.M.King & H.Robinson, comb. nov. Eupatorium allenii Standl., Publ. Field Mus. Nat. Hist. Bot. Ser. 18: 1457. 1938. Costa Rica: Alajuela. Summit of Volcan Poas. Alt. 2500-2575 meters. Dec 1, 1937-Jan. 1, 1938. Paul Allen 597 (Holotype F!).

Ageratina anchista (Grashoff & Beaman) R.M.King & H. Robinson comb. nov. Eupatorium anchistum Grashoff

& Beaman, Rhodora 71: 567. 1969. Mexico.

Ageratina anisochroma (Klatt) R.M.King & H.Robinson, Phytologia 19: 218. 1970. Costa Rica: Alajuela: Region of Zarcero. Alt. 4500 ft. Jan. 20, 1938. Austin Smith H 190(F); Sommet du Volcan de Poas. Alt. 2644 meters. Oct. 1896, Tonduz 10820 (US); Upper slopes of Volcan de Poas, Alt. 2500-2640 meters. Feb. 17,1924, Standley 34905 (US); South slopes of Volcan Poas, Elev. ca. 8300ft. 29 Jan. 1972, R.M.King 6428 (US); Viento Fresco, Alt. 1600-1900 meters, Feb. 13, 1926, Standley & Torres 47723 (US); Cartago: Cut-over cloud forest area, near La Sierra, about 25 km south of Cartago. Cordillera de Talamanca. Alt. 2000 meters. Jan. 23, 1965, Williams, Molina, Williams, Gibson 28126 (F,US); Mountains along the Interamerican Highway, 16 kms south of Cartago, 24 August 1962, R.M.King 5397 (US); Volcan de Turrialba, alt. 2900 meters, Jan. 1899, Pittier 7500 (US); Southern slope of Volcan de Turrialba, near the Finca del Volcan de Turrialba. alt. 2000-2400 meters, Feb. 22, 1924, Standley 35076 (US); Vicinity of La Congreja about 10 km south of El Tejar, Cordillera de Talamanca, alt. 1750-1850 meters, Feb.1, 1963, Williams, Jimenez, Williams 24104 (F); alt. 1800 meters, May 11, 1956, Williams 19837 (F); Volcan Irazu, March 1888, Biolley 1042 (BR); Region of La Esperanza, southern slope of Volcan de Irazu, Feb. 23, 1924, Standley 35370 (US); Cerro Doan, 3 km east of Cachi, 1450 meters, Apr. 23, 1969, Lent 1610 (F,US); Heredia: Cerro de las Lajas, north of San Isidro, alt. 2000-2400 meters, March 7, 1926, Standley 51418 (US); Vara Blanca de Sarapiqui, north slope of Central Cordillera, between Poas and Barba volcanoes, alt. 1860 meters, Jan. 1938, Skutch 3470 (US); alt. 1500-1750 meters, July-Sept. 1937, Skutch 3221 (US); San Jose: La Palma, alt. 1600 meters, Feb 3, 1924, Standley 33197 (US); La Hondura, alt. 1200-1500 meters, March 9, 1926, Standley & Valerio 51881 (US); alt. 1300-1700 meters, March 16, 1924, Standley 37587, 36554 (US); Arriba de El Empalme, alt. 2000 meters, Enero 18, 1965, Jimenez 2771 (F); Above El Empalme. Cloud forest area, Cordillera Talamanca, mountain of Cerro de La Muerte, 2000 meters, Feb. 26, 1966, Molina, Burger, and Wallenta 17915 (F); ca. 19 kms generally NW of Empalme, elev. 6200 ft. 22 Jan. 1972, King 6411 (US); In mountain forest north of San Isidro del General, Cordillera de Talamanca, alt. 1800 meters, May 12, 1956, Williams 19937 (F); alt. 1750- 2000 meters, Feb. 5, 1963, Williams, Jimenez, Williams 24338 (US); Cerro de las Vueltas, alt. 2700-3000 meters, Dec. 29, 1925-Jan.1, 1926, Standley & Valerio 43977 (US); Las Nubes, alt. 1500-1900 meters, March 20-22, 1924, Standley 38603, 38598 38430 (US); Cerro Chirripo, along the Rio Talari at the intersection of the parramo and forest, elevation 3250 meters, 5 April 1969, Davidse & Pohl 1580 (US); Cuesta de Tarrazu, IV 1893, 1900 meters, Tonduz 7797 (Type of Eupatorium polanthum Klatt, BR!). Panama: Chiriqui: West slope of El Baru between 7000-8000ft. elevation, 27 March 1970, Tyson & Loftin 5996 (US).

Ageratina aschenborniana (Schauer) R.M.King & H.Robinson, Phytologia 19: 212. 1970. Costa Rica: Alajuela: Viento Fresco, alt. 1600-1900 meters, Feb. 13, 1926, Standley & Torres 47914 (US); Region of Zarcero, alt. 6300 ft. Feb. 23, 1938, Smith H 354 (F); Cartago: Cartago, alt. 2300 meters, April 7, 1963, Jimenez 610 (US); Vicinity of Cartago, alt. 1425 meters, Feb. 1924, Standley 33357 (US); El Muneco, alt. 1400-1500 meters, March 6-7, 1926, Standley & Valerio 51153 (US); Mountain slopes south of Orosi, elevation ca. 1800 meters, Aug. 22, 1962, King 5377 (US); Orosi, March 30, 1924, Standley 39604 (US); Cerro de La Muerte, elevation ca. 3000 meters, Aug. 24, 1962, King 5396 (US); Cerro de La Carpintera, alt. 1500-1850 meters, Feb. 1924, Standley 35735 (US); Heredia: Yerba Buena northeast of San Isidro, alt. about 2000 meters, Feb. 22-28, 1926, Standley & Valerio 50078 (US); Vera Blanca de Sarapiqui, north slope of Central Cordillera, between Poas and Barba volcanoes, alt. 1710 meters, Feb. 1935, Skutch 3503 (US); San Jose: Along Rio Blanco, northeast of El Copey, alt. 1800-1900 meters, Dec. 16, 1925, Standley 41896 (US); Plantations de mais de Santa Rosa du Copey, alt. 1800 meters, Feb. 1898, Tonduz 11765 (US); Near Finca La Cima, above Los Lotes, north of El Copey, alt. 2100-2400 meters, Dec 21-22, 1925, Standley 42557 (US); San Marcos, alt. 1200 meters, March 3, 1890, Tonduz 2255 (US); Between Aserri and Tarbaca, alt. 1600-1900 meters, Feb. 12, 1924, Standley 34039 (US); about 25 km north of San Isidro de El General, alt. 3200 meters, Jan. 29, 1965, Williams, Molina, Williams, Gibson 28558 (US). Panama: Chiriqui: Pastures around El Boquete, alt. 1000-1300 meters, March 2, 1911, Pittier 2900 (US); Boquete, 6000 ft. Jan. 18, 1938, Davidson 154 (US); Cerro Punta, elev.

ca. 2150 meters, Feb.-March 1965, Tyson 1024 (US).

Ageratina badia (Klatt) R.M.King & H.Robinson, Phytologia 19: 212. 1970. Costa Rica: Clairieres le long du chemin de la Muerte a la Division, 2900-2160 meters, Jan. 1891, Pittier 3407 (Type of Eupatorium badium Klatt GH!); Clairieres entre La Division, 2100 meters et L'Alto del Palmital. Vallee du Rio General (1100 meters) 21 Jan. 1891, Tonduz 3429 (Type of Eupatorium chlorophyllum Klatt BR!).

Ageratina barbensis R.M.King & H.Robinson, sp. nov. Suffrutices erecti usque ad 1 m alti. Caules teretes parce pilosi. Folia opposita longe petiolata, petiolis 1.0-3.5 cm longis; lamina late ovata usque ad 12 cm longa, 7 cm lata, sensim acuminata serrulata vel crenata, basi late cuneata, supra in nervis hirtella, subtus pallescens in nervis et nervulis majoribus breviter pilosa, nervis secundariis ascendentibus in quadrate basilare saepe binatim fasciculatis, corporis oleosis interne praesentis. Inflorescentiae late corymbosae, pedicellis pilosis 1-6 mm longis. Capitula ca. 5 mm alta, floribus ca. 20; involucri squamae ca. 15, eximbricatae bi-triseriatae subaequilongae, anguste lanceolatae, vix attenuatae, fimbriatae 35-40 mm longae; corolla alba inferne anguste tubularis superne late infundibularis, tubis ca. 1.5 mm longis, extus plerumque setiferis, limbis 2.0-2.5 mm longis, lobis longe triangularibus extus setiferis; filamenta antherarum in parte superiore aliquantum incrassata, thecae antherarum 1.0-1.2 mm longae basi distincte breviter hastatae, appendicibus $1\frac{1}{2}$ longioribus quam latioribus; styli inferne parum nodulosi, appendicibus dense subargute papillosis; achaenia in costis setifera, setis brevibus numerosis; carpopodia breviter subcylindrica, cellulis oblongis, parietibus firmis; pappi setae ca. 25 basi subfragiles ad apicem vix dilatatae, series secundaria subnulla. Grana pollinis ca. 22-24μ diam.

Type: COSTA RICA: Heredia: Cut over forest, southern slopes of Volcan Barba, along Camino Guarano, ca. 22 kms N of Barba, El. ca. 9000ft., Jan. 21, 1972. Abundant small shrubs up to one meter tall, partial shade, flowers white. Robert Merrill King 6409 (Holotype US!); (Paratype R.M.King 6409A US!).

The new species is in the group with A. badia and A. allenii having cuneate leaf bases and short cylindrical carpopodia. The stem of A. barbensis is hirsute like A. badia but the achenes have only very short projecting setae on the costae and the phyllaries are shorter tipped with marginal hairs forming a rather dense fringe. The new species is most distinctive in the innumerable minute oil droplets in the leaves which are reminiscent of the lacticifers of Critonia but smaller. These small bodies occur in the distinct intercellular cavities in the leaf and the contents disappear over a period of hours from sections mounted in water.

Ageratina (Neogreenella) boyacensis R.M.King & H.Robinson, sp. nov. Frutices erecti usque ad 2 m alti. Caules teretes appresso-puberuli. Folia opposita breviter petiolata, petiolis 8-11 mm longis, laminis late ovatis 6.0-8.5 cm latis breviter acutis vel anguste rotundatis margine crenato-serratis basi late perbreviter cuneatis, supra et subtus minute parce pilosis, nervis secundariis pinnatis. Inflorescentiae late dense corymbosae, pedicellis 1-4 mm longis minute puberulis. Capitula 8-9 mm alta, floribus 5; involucri squamae ca. 15 subimbricatae bi-triseriatae aliquantum inaequilongae anguste oblongae vel lineares 1.5-3.0 mm longae minute apiculatae margine dense hirsutae extus parce minute puberulae; corollae 4.5-5.5 mm longae anguste infundibulares extus glanduliferae, tubis non distinctis, lobis longe triangularibus; filamenta antherarum in parte superiore ca. 450μ longa, thecae ca. 1.3 mm longae base argute hastatae, appendicibus vix longioribus quam latioribus; styli inferne non nodulosi, appendicibus dense valde papillosis; achaenia parce glandulifera non setifera; carpopodia brevia rotundata, cellulis quadratis, parietibus minute noduliferis; pappi setae ca. 30 non fragiles inferne vix scabrae superne valde scabrae interdum vix dilatatae, series secundaria indistincta parca, setis usque ad 500μ longis. Grana pollinis ca. 27μ diam.

Type: COLOMBIA: Boyaca. Alto carretera sobre Puente de Boyaca, matorral de paramo. Alt. 2800 meters. Feb. 24, 1940. Arbusto 2 metros; flor rosado claro. Arbelaez & Cuatrecasas 8085 (Holotype US!).

The species is related to A. mutiscuense (B.L.Robinson) R.M.King & H.Robinson by its broad ovate scarcely pubescent leaves and by its heads with 5 flowers. Differences of the new species include the appressed pubescent rather than hirsute stems, the sharply short apiculate tips of the phyllaries and the non setiferous achenes.

Ageratina burgeri R.M.King & H.Robinson, sp. nov.
Suffrutices erecti usque ad 0.5 m alti. Caules teretes puberuli vel glabrescentes. Folia opposita petiolata, petiolis 1.0-1.5 cm longis, laminis ellipticis usque ad 15 cm longis 5 cm latis sensim anguste acuminatis margine serratis vel serrulatis basi anguste longe cuneatis, subtus pallescentibus, supra et subtus subglabris in nervulis parce hirtellis, nervis secundariis valde ascendentibus utrinque ca. 5-6, nervis tertiariis mediis valde ascendentibus. Inflorescentiae late corymbosae, pedicellis puberulis 2-6 mm longis. Capitula ca. 5-6 mm alta, floribus ca. 23; involucri squamae ca. 15 eximbricatae bi-tri-seriatae subaequilongae anguste lanceolatae acutae ca. 4.0 mm longae; corollae albae ca. 5 mm longae inferne anguste tubulares superne late infundibulares, tubis ca. 2.0 mm longis extus plerumque glabris, limbis 2.5 mm longis, lobis longe triangularibus extus setiferis; filamenta antherarum in parte superiore angusta, thecae antherarum ca. 1.0 longae basi breviter hastatae, appendicibus 1 2/3 longioribus quam latioribus; styli inferne parum nodulosi, appendicibus dense breviter papillosis; achaenia in costis plerumque glabra; carpopodia breviter subcylindrica, cellulis oblongis, parietibus firmis; pappi setae ca. 20 basi subfragiles ad apicem vix dilatatae, series secundaria brevis. Grana pollinis ca. 22-25$\mu$ diam.

Type: COSTA RICA: Alajuela. Wet cloud forest, cut over mountains forest, Cordillera Central, near Palmira about 5 kms east of Zarcero. Alt. 2300 meters. Feb. 23, 1966. Molina, Williams, Burger, Wallenta 17782 (Holotype F!).

The new species is related to A. allenii but has distinctive leaf form and venation, near glabrous achenes with few short spicules near the tip and the base, and anther collars narrower.

Ageratina cartagoensis R.M.King & H.Robinson, sp. nov.
Suffrutices erecti usque ad 1 m alti. Caules teretes hirsuti. Folia opposita distincte petiolata, petiolis 1.0-4.5 cm longis; lamina late elliptica plerumque 5.5-14.0 cm longa 3.0-6.5 cm lata acuta vel breviter acuminata margine subserrulata vel grosse serrata base breviter cuneata supra et subtus pilosa, nervis e basi ternatis vel quinatis valde ascendentibus. Inflorescentiae late corymbosae, pedicellis dense puberulis 5-9 cm longis. Capitula ca. 6 mm alta, floribus ca. 29; involucri squamae ca. 16, eximbricatae biseriatae subaequilongae anguste ellipticae vix

acuminatae vel anguste attenuatae 3.5-5.5 mm longae; corollae albae inferne anguste tubulares superne late infundibulares, tubis ca. 1.5 mm longis extus glabris vel setiferis, limbis 1.5-2.0 mm longis, lobis longe triangularibus extus setiferis; filamenta antherarum in parte superiore non incrassata, thecae antherarum ca. 0.8 mm longae basi breviter hastatae, appendicibus 1 1/3 longioribus quam latioribus; styli inferne leviter nodulosi, appendicibus dense longe patenter papillosis; achaenia fusiformia valde setifera, setis aliquantum longis plerumque in costis; carpopodia breviter cylindrica, cellulis quadratis vel breviter oblongis, parietibus firmis; pappi setae ca. 20 basi fragiles ad apicem vix dilatatae, series secundaria brevia. Grana pollinis 18-26μ diam.

Type: COSTA RICA: Cartago. Cut over forest area near El Canon, 40 km south of Cartago. Cordillera de Talamanca. Alt. 2500 meters. Jan. 26,1965. Williams, Molina, Williams, Gibson 28191 (Holotype US!, Isotype F!). Additional specimens: Costa Rica: Cartago: Along the Rio Reventado, north of Cartago. Alt. 1460-1650 meters. Feb. 26, 1926, Standley & Valerio 49493 (US); San Jose: Beside stream in open, vicinity of El General. Alt. 1460 meters, Feb. 1939, Skutch 4196 (US).

In nervation of the leaves the new species is nearer Ageratina pazcuanensis (H.B.K.) R.M.King & H. Robinson of Mexico and Guatemala than to any other species of Costa Rica. The more northern species differs by the cuneate rather than rounded or truncate leaf bases, by the cells of the carpopodium being more oblong rather than quadrate, and by the phyllaries being more obtusely acute.

Ageratina (Neogreenella) cerifera (McVaugh) R.M.King & H.Robinson, comb. nov. Eupatorium ceriferum McVaugh, Contr. Univ. Mich. Herb. 9: 390. 1972. Mexico.

Ageratina chirquensis (B.L.Robinson) R.M.King & H. Robinson, Phytologia 19: 213. 1970. Panama: Chiriqui: Chiriqui Volcano, alt. 3600 meters, Feb. 27, 1918, Killip 3599 (US); Volcan de Chiriqui, April 1899, Sapper sn (US); Volcan Chiriqui, 3000-3374 meters, March 10-13, 1911, Pittier 3089 (US); ca. 2500-3380 meters, July 4-6, 1938, Woodson, Allen, Seibert 1077 (US); El Baru, El. 11000 ft. March 27, 1970, Tyson & Loftin 6157 (US).

Ageratina (Neogreenella) contorta(C.D.Adams) R.M.King & H.Robinson, comb. nov. Eupatorium contortum C.D.Adams, Phytologia 21: 408. 1971. Jamaica.

Ageratina costaricensis R.M.King & H.Robinson, sp. nov. Frutices erecti pauce ramosi usque ad 7.5 dm alti. Caules teretes dense purpureo-tincti puberuli. Folia opposita petiolata, petiolis gracilibus plerumque 1.0-1.5 cm longis; lamina ovata usque ad 4 cm longa, 2.5 mm lata, vix acuminata, serrata vel biserrata, basi truncata, trinervata, chartacea, parce in nervis hirtella. Inflorescentiae laxe corymbosae, pedicellis gracilibus puberulis plerumque 3-12 mm longis. Capitula ca. 6 mm alta, floribus ca. 20; involucri squamae 16-18, eximbricatae bi-triseriatae subaequilongae, anguste lanceolatae, breviter attenuatae 4.0-5.0 mm longe, corolla alba vel rosea, inferne anguste tubularis superne campanulata, tubis ca. 1.5 mm longis glabris vel hirsutis, limbis ca. 1.5-2.0 mm longis, lobis longe triangularibus extus setiferis; thecae antherarum 0.8-1.0 mm longae, basi distincte hastatae, appendicibus 1½ longioribus quam latioribus; styli inferne distincte nodulosi, appendicibus longe dense papillosis; achaenia distincte setifera, setis longis numerosis; carpopodia cylindrica, cellulis oblongis; pappi setae ca. 20 basi fragiles ad apicem vix dilatatae, series secundaria brevis aliquantum simplex.

Type: COSTA RICA: Cartago: Km 73 along Carretera Interamericana S of San Jose, Cordillera de Talamanca. El. 2775 meters. 22July 1966. Gerrit Davidse 697 (Holotype US!). Additional specimens: Costa Rica: Cartago: Region of La Esperanza, southern slope of Volcan de Irazu. Feb. 23, 1924. Standley 35367 (US); Southern slopes of Volcan de Turrialba, near the Finca del Volcan de Turrialba; alt. 2000-2400 meters. Feb. 22, 1924. Standley 35300 (US); Alajuela: Wet cloud forest, cut over mountains forest. Cordillera Central near Palmira about 5 kms east of Zarcero. Alt. 2300 meters. Feb. 23, 1966. Molina, Williams, Burger, Wallenta 17754 (F).

Material of the new species has been identified in the past as Ageratina subcordata, but the latter is a very different species with clusters of hairs inside of the corolla. Ageratina costaricensis is also rather distinct by its lax inflorescence. The various specimens show a variation in corolla pubescence that is common in the genus but the variation seems to correlate with geography. The specimens from the more northern volcanos show glabrous basal tubes while material from the Talamanca region has basal tubes with many long hairs.

Ageratina (Neogreenella) cuatecasasii R.M.King & H. Robinson, sp. nov. Frutices erecti multo ramosi. Caules teretes parce puberuli vel glabrescentes. Folia opposita breviter petiolata, petiolis 2-8 mm longis, laminis oblongo-ellipticis 3-11 cm longis 1.5-5.0 cm latis obtusis margine crenato-serratis base rotundatis vel vix cuneatis, supra et subtus glabris vel minute glandulo-punctatis, nervis secundariis pinnatis vel in partibus basilaribus laminarum infirme trinervatis. Inflorescentiae corymbosae, pedicellis minute puberulis vel subglabris plerumque 1-2 cm longis interdum distincte unibractiferis. Capitula 8-12 mm alta, floribus ca. 30-45; involucri squamae "violaceae" induratae ca. 20 subimbricatae biseriatae subaequilongae anguste lanceolatae vel lineares acutae extus dense minute glanduliferae leviter striatae 6-9 longae; corollae "lilacinae" 5.5-6.5 mm longae anguste infundibulares, tubis non distinctis, lobis longe triangularibus extus parce glanduliferis; filamenta antherarum in parte superiore ca. 400μ longa, thecae ca. 2 mm longae basi cordatae, appendicibus $1\frac{1}{2}$ longioribus quam latioribus; styli inferne vix vel leniter nodulosi, appendicibus dense papillosis; achaenia dense glandulifera; carpopodia brevia prominula rotundata, cellulis quadratis, parietibus firmis; pappi setae ca. 30 vix fragiles ad apicem interdum leniter dilatatae, series secundaria distincta plerumque 300-500μ longa. Grana pollinis 27-30μ diam.

Type: COLOMBIA: Magdalena: Sierra de Perija, east of Manaure: Quebrada de Floridablanca, Andean forest and bushes, 2700-2800 meters alt. Nov. 9, 1959. Cuatrecasas & Romero Castaneda 25154 (Holotype US!). Additional specimen: Colombia: Magdalena: Sierra de Perija, east of Manaure: Sabana Rubia, paramo 3000-3100 meters alt. Nov. 6, 1959, Cuatrecasas & Romero Castaneda 25042 (US!).

The species has some of the aspect of the group represented by Ageratina tinifolia (H.B.K.) R.M.King & H.Robinson and A. ocanensis (B.L.Robinson) R.M.King & H.Robinson in Colombia. The new species is distinct by the longer pedicels and by the more flowers per head. There is some resemblance to A. viscosa (H.B.K.) R.M.King & H.Robinson but that species has reduced upper leaves, a laxer inflorescence and setiferous achenes.

Ageratina (Neogreenella) cupressora (Standl. & Steyerm.) R.M.King & H.Robinson, comb. nov. Eupatorium cupressorum Standl. & Steyerm., Publ. Field Mus. Nat. Hist. Bot. Ser. 23: 183. 1944. Guatemala.

Ageratina (Neogreenella) cylindrica (McVaugh) R.M.King & H.Robinson, comb. nov. Eupatorium cylindricum McVaugh, Contr. Univ. Mich. Herb. 9: 393. 1972. Mexico.

Ageratina diversipila R.M.King & H.Robinson, sp. nov. Frutices erecti usque ad 2 m alti. Caules teretes dense breviter hirsuti. Folia opposita longe petiolata, petiolis ca. 1.0 cm longis dense hirtellis; lamina late ovata usque ad 7.0 cm longa 3.5 cm lata breviter acuminata subcrenata, basi breviter cuneata, hirtella, pilis in nervis et subtus pluribus, nervis secundariis paucis valde ascendentibus. Inflorescentiae late paniculatae, pedicellis hispido-pilosis 2-6 mm longis. Capitula 5-6 mm alta, floribus ca. 20; involucri squamae ca. 15, eximbricatae bi-triseriatae plerumque subaequilongae ca. 5 mm longae anguste lanceolatae longo-attenuatae in apicem parce pilosae corolla alba inferne anguste tubularis superne infundibularis, tubis ca. 1.5 longis extus glabris, limbis ca. 2.5 mm longis, lobis longe triangularibus extus setiferis, setis biformibus aliquot ad apicem clavatis multiseptatis, cellulis uniseriatis; thecae antherarum 0.9 mm longae basi breviter hastatae, appendicibus 1 2/3 longioribus quam latioribus; styli inferne leviter nodulosi, appendicibus longe dense papillosis; achaenia setifera, setis aliquantum longis plerumque in costis; carpopodia plerumque breviter subcylindrica, cellulis elongatis; pappi setae ca. 25, basi subfragiles ad apicem vix dilatatae, series secundaria subnulla. Grana pollinis ca. 22-24μ diam.

Type: COSTA RICA: San Jose. Vicinity of El General. Alt. 1890 meters. Dec. 1936. Skutch 3045 (Holotype US!).

The new species is unquestionably close to A. badia, showing even the same form of phyllaries and the same type of slightly sclerotized capitate glands on the style branches. The new species is most clearly distinct from A. badia by the presence of the two types of hairs on the corolla lobes, the one type with a series of short broad cells at the tip. Subtle differences in the leaf shape allow macroscopic distinction of the species. The occurence of club-tipped hairs is also a character of A. subglabra but the latter is less closely related, having differences in stem pubescence and leaf form.

Ageratina dolichobasis (McVaugh) R.M.King & H.Robinson, comb. nov. Eupatorium dolichobasis McVaugh, Contr. Univ. Mich. Herb. 9: 395. 1972. Mexico.

Ageratina esmeraldae (Cuatrecasas) R.M.King & H.Robinson, comb. nov. Eupatorium esmeraldae Cuatrecasas, An. Univ. Madrid 4(2): 221. 1935. Ecuador.

Ageratina geminata(McVaugh) R.M.King & H.Robinson, comb nov. Eupatorium geminatum McVaugh, Contr. Univ. Mich. Herb. 9: 396. 1972. Mexico.

Ageratina (Neogreenella) halbertiana (McVaugh) R.M.King & H.Robinson, comb. nov. Eupatorium halbertianum McVaugh, Contr. Univ. Mich. Herb. 9: 398. 1972. Mexico.

Ageratina helenae R.M.King & H.Robinson, sp. nov.

Suffrutices erecti 0.5-2.0 m alti plerumque multo ramosi. Caules teretes breviter puberuli. Folia opposita petiolata, petiolis gracilibus 1.0-3.0 cm longis; laminis late ovatis usque ad 4.0 cm longis 3.5 cm latis papyraceis breviter acutis obtuse serrulatis basi subtruncatis trinervatis utrinque parce breviter puberulis in nervis hirtellis. Inflorescentiae dense corymbosae, pedicellis gracilibus puberulis 2-6 mm longis. Capitula ca. 5 mm alta, floribus ca. 15-23; involucri squamae ca. 14 eximbricatae biseriatae subaequilongae anguste lanceolatae attenuatae ca. 4.0 mm longae; corollae albae inferne anguste tubulares superne infundibulares, tubis 1.0-1.5 mm longis, limbis ca. 1.2 mm longis, lobis triangularibus vix longioribus quam latioribus extus setiferis; thecae antherarum ca. 0.4 mm longae basi vix hastatae appendibus 1 1/3 longioribus quam latioribus; styli inferne indistincte nodulosi, appendicibus longe dense papillosis; achaenia temere setifera; carpopodia cylindrica, cellulis elongatis; pappi setae ca. 20-25 ad apicem subaequaliter tenues, base subfragiles, series secundaria nulla. Grana pollinis 18-22$\mu$ diam.

Type: GUATEMALA: San Marcos. Ravines in mixed forest on slopes of Cerro Tunbador, Sierra Madre Mountains, about 15 km west of San Marcos. Alt. 2600 meters. Dec. 15, 1962. Flowers white, shrub 0.5 meters tall. Williams, Molina, Williams 23101 (Holotype US!). Additional specimens: Guatemala: San Marcos. Ravines in mixed forest on slopes of Cerro Tumbador, Sierra Madre Mountains, about 15 km west of San Marcos. Alt. 2600 meters. Dec. 15, 1962, Williams, Molina, Williams 23102 (US!); Montane cloud forest area on out slopes of Tajumulco Volcano, Sierra Madre Mountains about 8-10 kms west of San Marcos. Alt. ± 2300 meters. Dec. 31, 1964-Jan. 1, 1965. Williams, Molina, Williams Laskowski 26883 (US!).

The species is very close to *A. molinae* but differs by the shorter tubes on the corollas and by the more attenuate phyllaries. Both species might be related to *A. anchista* (Grashoff) R.M.King & H.Robinson of Guatemala and Honduras but the latter has a laxer inflorescence and more blunt phyllaries and more cordate leaf bases.

We take great pleasure in naming this new species in honor of Mrs. Helen Dawson of Baltimore, Maryland, who has greatly helped us in our work.

**Ageratina infiernillensis** R.M.King & H.Robinson, sp. nov. Suffrutices erecti vel decumbentes .20-.30 m alti. multiramosi. Caules teretes glabri. Folia oppositia breviter petiolata sensim anguste elliptica, petiolis ca. 1.0 mm longis; lamina usque ad 0.8 mm longa 0.2 mm lata, integra vel pauce crenulata, glabra. Inflorescentiae non vel pauce ramosae, pedicellis 1-3 cm longis, parce puberulis. Capitula 0.8-0.9 mm alta, floribus ca. 40; involucri squamae ca. 25 bi-triseriatae inaequilongae, plerumque 5.0-6.0 mm longae oblongo-lanceolatae, late acutae; corolla albe anguste infundibularis ca. 5 mm longa, tubis 1.5-2.0 mm longis, lobis longe triangularibus extus glabris; thecae antherarum ca. 1.8 mm longae, basi distincte breviter hastatae, appendicibus vix longioribus quam latioribus; styli inferne distincte nodulosi, appendicibus longe dense papillosis; achaenia superne in costis parce setifera; carpopodia cylindrica, cellulis oblongis; pappi setae ca. 25 ad apicem parum dilatatae, basi fragiles, series secundaria nulla. Grana pollinis ca. 25µ diam.

Type: PERU: Huarochiri: Lima: Infiernillo, km 106 de la carretera Lima-Oroya. Alt. 3200-3300 meters. June 19, 1950. Sufruticosa 0.20-0.30 meters, flores blancas. Ferreyra 7718 (Holotype US!).

The new species is very near the common peruvian species *A. scopulora* (Weddell) R.M.King & H.Robinson with the same form of the head and phyllaries. The very small narrow leaves with short petioles, and the glabrous stems and corollas are extremes not seen among variations of *A. scopulora*.

Ageratina ixiocladon (Bentham ex Oerst.) R.M.King & H. Robinson, Phytologia 19: 223. 1970. Costa Rica: Cartago: Paa den sydlige Skraaning af Vulkanen Irasu (9000'), 1845-1848. Orsted 51, (Type of Eupatorium ixiocladon Bentham ex Oerst C!); Volcan Irazu, Jan. 1900, Pittier 14077 (US); Vicinity of La Congreja about 10 km south of El Tejar, Cordillera de Talamanca. Alt. 1750-1850 meters, Feb. 1, 1963, Williams, Jimenez, Williams, 24179a (F!); Volcan de Turrialba. Alt. 2800 meters Jan. 1899, Pittier 7501 (US!); Southern slope of Volcan de Turrialba, near Finca del Volcan de Turrialba. Alt. 2000-2400 meters. Feb. 22, 1924, Standley 35167, 34994, 35043 (US!); San Jose: Cerro de las Vueltas. Alt. 2700-3000 meters. Dec. 29, 1925-Jan. 1, 1926, Standley & Valerio 43884, 43947, 43587, 43497, 43947a (US!); Above El Empalme cloud forest area Cordillera Talamanca, mountain of Cerro de la Muerte, alt. 2000 meters, Feb. 26, 1966, Molina, Burger, Wallenta 17919, 17921 (F!) Along the trail from Canaan to Chirripo via Los Angeles above the Rio Talari at 3200-3400 meters. 19-22 Jan. 1970, Burger, Liesner 7407, 7393 (F!) Panama: Chiriqui: West slopes El Baru between 8 8000-9000 ft el. March 27, 1970, Tyson & Loftin 6116b (US!); Boquete District. Volcan de Chiriqui. El. 8000 ft. July 13, 1938, Davidson 940 (F!, US!).

Ageratina kupperi (Suesseng.) R.M.King & H.Robinson, Phytologia 19: 223. 1970. Costa Rica: San Jose: Chirripo Grande, 3830 meters, Kupper 1149,(Type Eupatorium kupperi Suesseng. M!); Additional specimens: Costa Rica: San Jose: Chirripo Grande, 3800 meters, Kupper 1155 (M!); 3430 meters, Kupper 1300 (M!); Elevation 3500 meters, April 3, 1969, Davidse & Pohl 1551 (US!); Cartago: Cordillera Talamanca, mountain of Cerro de La Muerte. Alt. 3335 meters, March 4, 1966, Molina, Burger, Wallenta 18327 (US!); 3200 meters, May 17, 1956, Williams 20070 (US!).

Ageratina (Neogreenella) lasioneura (Hook. & Arn.) R. M.King & H.Robinson, comb. nov. Eupatorium lasioneuron Hook. & Arn., Bot. Beech. Voy. 297. 1838. Mexico.

Ageratina longipetiolata(Schultz-Bip ex Rusby) R.M.King & H.Robinson, comb. nov. Eupatorium longipetiolatum

Schultz-Bip ex Rusby, Mem. Torr. Bot. Club 3, No 3: 52. 1893. Bolivia.

Ageratina modesta (Kunth) R.M.King & H.Robinson, comb. nov. Eupatorium modestum Kunth, Ind. Sem. Hort. Berol. p. 13, 1847. Mexico.

Ageratina molinae R.M.King & H.Robinson, sp. nov.

Frutices erecti vel decumbentes ca. 1 m alti. Caules teretes purpureo-tincti puberuli. Folia opposita petiolata, petiolis gracilibus 0.5-3.0 cm longis, laminis ovatis usque ad 4.5 cm longis, 3.5 cm latis, papyraceis breviter acuminatis serratis vel subintegris, basi subtruncatis trinervatis, parce breviter puberulis in nervis hirtellis. Inflorescentiae aliquantum laxe corymbosae, pedicellis gracilibus puberulis plerumque 2-9 mm longis. Capitula ca. 5 mm alta, floribus ca. 19-28; involucri squamae 16-18 eximbricatae biseriatae subaequilongae, anguste lanceolatae, plerumque longe acutae, vix attenuatae 3.5-4.0 mm longae; corollae albae inferne anguste tubulares, superne breviter campanulatae, tubis 1.5-2.0 mm longis, glabris, limbis ca. 1.0 mm longis, lobis triangularibus vix longioribus quam latioribus extus setiferis; thecae antherarum ca. 0.5 mm longae, basi truncatae vel breviter hastatae, appendicibus 1½ longioribus quam latis; styli inferne distincte nodulosi, appendicibus longe dense papillosis; achaenia parce temere setifera; carpopodia cylindrica, cellulis elongatis; pappi setae ca. 25 ad apicem subaequaliter tenues, basi subfragiles, series seconderia nulla. Grana pollinis 18-24μ diam.

Type: HONDURAS: Morazan: Cloud forest area above San Juancito. Alt. 2000 meters. March 25, 1948. Fls. white, sprawling shrub one meter, Williams, Molina 13767 (Holotype US!). Additional specimens: COSTA RICA: San Jose: Cut over montane cloud forest area, Cordillera de Talamanca, about 25 km N of San Isidro de El General along Pan-American Highway. Alt 3200 meters. Jan. 29, 1965, Williams, Molina, Williams, Gibson 28564 (US!); Alajuela: Region of Zarcero. Alt. 5500 ft. Jan.6, 1938, Austin Smith H 8 (F!); EL SALVADOR: Santa Ana: Moist cloud forest on Cordillera Miramundo, mountain of Montecristo. Alt. 2000-2200 meters. Jan. 27-31, 1966, Molina, Burger, Wallenta 16880 (US!).

The new species is notable for the thin texture of the leaves, for the long tubes of the corollas and for the short anther sacs. The most closely related species is A. helenae described above. Material of A. molinae was the basis for our concept of Eupatorium bimatrum Standley & L.O.Williams which we transferred to Ageratina in a previous paper. True E. bimatrum is a Fleischmannia near to or the same as F. microstemon (Cassini) R.M.King & H.Robinson.

**Ageratina multiserrata** (Schultz-Bip.) R.M.King & H. Robinson, comb. nov. Eupatorium multiserratum Schultz-Bip. in Seem. Bot. Voy. Herald 301. 1856. Mexico.

**Ageratina (Neogreenella) mutiscuensis** (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium mutiscuense B.L.Robinson, Contr. Gray Herb. n.s. 80: 25. 1928. Colombia.

**Ageratina nelsonii** R.M.King & H.Robinson, sp. nov.
Suffrutices erecti pauce ramosi. Caules teretes vel parum sexangulari appresso-puberuli. Folia opposita breviter petiolata, petiolis plerumque 10-14 mm longis, laminis lanceolatis 5-7 cm longis 2.0-2.5 cm latis leniter acuminatis margine serrulatis base cuneatis, supra sparsim minute puberulis, subtus in nervis et nervulis appresso-puberulis, nervis secundariis in quadrante basilari aliquantum congestis. Inflorescentiae late corymbosae, pedicellis dense puberulis 3-7 mm longis. Capitula 5-7 mm alta, floribus ca. 20; involucri squamae 12-15 subimbricatae biseriatae subaequilongae late lanceolatae vel oblongae breviter acuminatae parce pilosae 3.0-4.0 mm longae; corollae albae inferne anguste tubulares superne late infundibulares, tubis 1.0-1.5 mm longis, limbis 1.5-2.0 mm longis, lobis longe triangularibus extus setiferis; filamenta antherarum in parte superiore ca. 300µ longa, thecae ca. 0.9 mm longae basi breviter hastatae, appendicibus 1½ longioribus quam latioribus; styli inferne leniter nodulosi, appendicibus longe dense papillosis; achaenia in costis dense setifera, setis longis; carpopodia breviter subcylindrica, cellulis oblongis, parietibus firmis; pappi setae 20-25 fragiles ad apicem distincte dilatatae, series secundaria distincta brevis. Grana pollinis ca. 20µ diam.

Type: MEXICO: Guerrero: Top of Sierra Madre near Chilpancingo. Alt. 9000-10200 ft. Dec. 24, 1894, E.W.Nelson 2251 (Holotype US!).

Nelson's specimen is the basis for reports of *A badia* in Mexico. The stems, however, have numerous short appressed hairs. The most distinctive feature of the species is the rather broad short-acuminate phyllaries. The phyllaries resemble those of *Ageratina geminata* (McVaugh) R.M.King & H.Robinson but the latter differs most prominently by the leaves being sessile.

*Ageratina* (Neogreenella) *plethadenia* (Standl. & Steyerm.) R.M.King & H.Robinson, comb. nov. *Eupatorium plethadenium* Standl. & Steyerm., Publ. Field Mus. Nat. Hist. Bot. Ser. 23: 186. 1944. Guatemala.

*Ageratina reticulifera* (Standl. & L.O.Williams) R.M. King & H.Robinson, Phytologia 19: 226. 1970. Costa Rica: Cartago: Cerro de Las Vueltas. Cordillera de Talamanca. Alt. 2700 meters, Williams 16103 (Isotype of *Eupatorium reticuliferum* Standl. & L.O.Williams F! US!); near Km 56 on Interamerican Hwy south of Cartago. March 23, 1967. P.H.Raven 20934 (F!).

*Ageratina standleyi* R.M.King & H.Robinson, sp. nov.

Suffruteces erecti usque ad 1.5 m alti. Caules teretes dense hirtelli. Folia opposita longe petiolata, petiolis usque ad 3 cm longis dense hirtellis; lamina late ovata usque ad 8 cm longa, 6 cm lata, breviter acuta, plerumque obscure serrulata, basi truncata vel subcordata 3-5-nervata, supra et subtus hirtella in nervis densius. Inflorescentiae dense corymbosae, pedicellis dense hirtellis 1-6 mm longis. Capitula 5 mm alta, floribus 21-23; involucri squamae ca. 15 eximbricatae biseriatae subaequilongae, ca. 4 mm longae, anguste lanceolatae, longo-attenuatae; corolla inferne anguste tubularis superne abrupte late campanulata, tubis 1.0-1.2 mm longis, extus glabris, limbis ca. 1.5 mm longis, lobis subequilateraliter triangularibus extus setiferis; thecae antherarum ca. 0.8 mm longae, basi breviter rotundatae, appendicibus $1\frac{1}{4}$ longioribus quam latioribus; styli inferne leviter nodulosi, appendicibus breviter dense papillosis; achaenia pauce breviter setifera; carpopodia cylindrica, cellulis oblongis; pappi setae ca. 25, basi subfragiles ad apicem vix dilatatae, series secundaria subnulla. Grana pollinis ca. 20$\mu$ diam.

Type: COSTA RICA: San Jose: Las Nubes, alt. ca. 1500-1900 meters. March 20-22, 1924. Wet bank; herb 4 ft. Flowers dry. Standley 38395 (Holotype US!).

The new species is near A. vulcanica (Benth.) R.M.King & H.Robinson, but the phyllaries have longer narrower non-acuminate tips with only slightly scarious margins, and the throat of the corolla is more broadly campanulate with more broadly triangular lobes.

Ageratina subcordata (Benth. ex Oerst.) R.M.King & H. Robinson, Phytologia 19: 217. 1970.

The species has been badly misinterpreted in the past but the elongate throat of the corolla and clusters of hairs inside the corolla lobes are distinguishing characters. The phyllaries are also different from those of related Costa Rican species by having both prominent hairs and glands. Eupatorium splendens Klotsch ex Polak nom. nud. is often placed in the synonymy of A. subcordata but specimens from the Schultz-Bipontinus herbarium at Paris prove to be a species of Fleischmannia.

Costa Rica: Cartago: Paa den sydlige Skraaning af Vulkanen Irasu, en Hoide af c. 8000 fod. 1845-1848, Oersted 50 (type of Eupatorium subcordatum Benth. ex Oersted C!); Irazu, 2800 meters, 1901, Pittier 14076, 14077 (US!); Volcan Irazu, alt. 3400 meters, Jan. 29, 1963, Williams & Williams 24079 (F!), 24098 (F!); near summit of Volcan Irazu. Alt. 3200 meters, March 20, 1945, Williams 16027 (F!, US!); Alt. 3500 meters, March 14, 1948, Williams & Molina 13935 (F!); Alt. 3400 meters, April 30, 1956, Williams 19404 (F!); Alt. 3100 meters, March 14, 1948, Williams & Molina 13876 (F!); Alt. 1000-11330 ft. Dec. 1, 1937- Jan. 1, 1938, Allen 684 (F!); Alt. 9700 ft. Feb.24, 1957, Carlson 3552 (F!); Cerro de La Muerte. Alt. 3200 meters. April 10, 1949, Williams 16256 (F!); Alt. 2800 meters, May 17, 1956, Williams 20102, 20107 (F!); Alt. ca. 3200 meters, Williams, Molina, Williams, Gibson 28325 (F!); Ojo de Agua. Elev. ca. 8200 ft. Feb. 1, 1972, R.M.King 6435 (US!); Alt. 10000 ft. Feb. 1, 1965, Williams, Molina, Williams, Gibson 28853 (US!); Vicinity of La Congreja about 10 kms south of El Tejar. Cordillera de Talamanca. Alt. 1750-1850 meters, Feb. 1, 1963, Williams, Jimenez, Williams 24187 (F!); Near Km 68 on Interamerican highway south of Cartago. March 23, 1967, P.H.Raven 20959 (F!); ca. 18 kms SW of Empalme. Elev. 9200 ft. Jan. 22, 1972, R.M.King 6412 (US); San Jose: Cerro de La Muerte. Cordillera de Talamanca. Alt. 2600 meters Feb. 1, 1963, Williams, Jimenez, Williams 24174

(F!, US!); 20 kms north of San Isidro de General. Alt. 2800 meters. Jan. 29, 1965, Williams, Molina, Williams, Gibson 28509 (F!); Near La Division, north of San Isidro de El General. Alt. 2400-2900 meters. Feb. 6, 1963, Williams, Jimenez, Williams 24415 (F!), 24420 (F!); Cartago and San Jose Provinces: cut over cloud forest area, Cordillera de Talamanca near Ojo de Agua. Alt. Feb. 1, 1965, Williams, Molina, Williams, Gibson 28853 (F!).

Ageratina subglabra R.M.King & H.Robinson, sp. nov.

Frutices erecti usque ad 2 m alti. Caules parum sexangulati vel teretes appresso-puberuli. Folia opposita breviter petiolata, petiolis 1-2 cm longis; lamina elliptica plerumque 5.5-15.0 cm longa et 2.5-5.0 cm lata, acuminata margine crenulata vel serrulata base anguste cuneata supra et subtus sparse appresso-puberula, nervis plerumque pinnatis in mediis saepe binatim fasciculatis. Inflorescentiae late corymbosae, pedicellis puberulis 5-8 mm longis. Capitula ca. 5 mm alta, floribus ca. 20-22; involucri squamae ca. 15, eximbricatae plerumque biseriatae subaequilongae anguste lanceolatae vix attenuatae 4.0-5.0 mm longae; corollae albae inferne anguste tubulares superne late infundibulares, tubis ca. 1.5 mm longis extus plerumque setiferis, limbis ca. 2.0 mm longis, lobis longe triangularibus extus setiferis, setis biformibus aliquot ad apicem clavatis multiseptatis, cellulis uniseriatis; filamenta antherarum in parte superiore vix incrassata, thecae antherarum 0.8 mm longae, basi breviter hastatae, appendicibus 1 1/3 longioribus quam latioribus; styli inferne leviter nodulosi, appendicibus longe dense papillosis; achaenia setifera, setis plerumque brevibus vel partim longioribus plerumque in costis; carpopodia breviter subcylindrica, cellulis oblongis, parietibus firmis; pappi setae ca. 25-30 subfragiles ad apicem vix dilatatae, series secundaria subnulla. Grana pollinis ca. 18-20μ diam.

Type: COSTA RICA: San Jose: Oak forest near Quebradillas, about 7 km north of Santa Maria de Dota. Alt. ca. 1800 meters. Dec. 24, 1925. Slender shrub 4 ft., flowers white. Standley 42888 (Holotype US!). Additional specimens: Costa Rica: San Jose: 6 km al NE de Santa Maria de Dota. Alt. 1735 meters, Dec. 21, 1963, Jimenez 1479 (F!); Laguna de La Chonta, northeast of Santa Maria de Dota. Alt. 2000-2100 meters. Dec. 18, 1925, Standley 42233 (US!); Vicinity of Santa Maria de Dota. Alt. 1500-1800 meters. Dec. 14-26, 1925, Standley 41627 (US!); about 7 km north of Santa Maria de Dota, alt. ca. 1800 meters. Dec. 24, 1925, Standley 42871 (US!); Near Finca La Cima, above Los Lotes, north of El Copey. Alt. 2100-2400 meters. Dec. 21-22, 1925, Standley 42556 (US!); Cloud forest area, slopes of Cordillera de Talamanca, north of San Isidro de El General. Alt. 1750-2000 meters. Feb. 5, 1963, Williams, Jimenez, Williams 24315 (F!); Vicinity of El General. Alt. 1525 meters Feb. 1939, Skutch 4200 (US!).

The new species is related to A. allenii and has similar stem pubescence, but the leaf shape and corolla pubescence are different. The leaf blades of the new species are more elliptical with the widest part and the congestion of secondary veins nearer the middle. The hairs of the corolla lobes are of two types as in A. diversipila. A superficial check has shown at least some club-tipped hairs on corollas of all but one of the specimens of A. subglabra.

Ageratina tonduzii (Klatt) R.M.King & H.Robinson, Phytologia 19: 217. 1970. Costa Rica: Cuesta de Tarrazu. 1900 meters. April 1893, Tonduz 7799 (type of Eupatorium tonduzii Klatt GH!).

The species has been misrepresented in herbaria by material of A. anisochroma and A. subglabra but the type specimen from the Gray Herbarium represents a distinct species that has apparently not been recollected. The type specimen consists of a much over-aged inflorescence with no adhering flowers, two leaves mounted separately and one flower in the packet with a mature achene. The following brief description is taken from these type fragments.

Leaves narrowly elliptical, 10 cm long, 2.5 cm wide, lateral veins pinnate and not congested, pubescence very short sparse appressed. Pedicels appressed-puberulous. Heads with ca. 28 flowers. Achenes with very short setae, a few long setae near upper end; carpopodium rather elongate, cylindrical with elongate cells.

Ageratina trapezoidea (Kunth) R.M.King & H.Robinson, comb. nov. Eupatorium trapezoideum Kunth, Ind. Sem. Hort. Berol. p 13, 1847. Mexico.

Ageratina (Neogreenella) triniona (McVaugh) R.M.King & H.Robinson, comb. nov. Eupatorium trinionum McVaugh, Contr. Univ. Mich. Herb. 9:402. 1972. Mexico.

Ageratina vulcanica (Benth. ex Oerst.) R.M.King & H. Robinson, Phytologia 19: 218. 1970. Costa Rica: Cartago: Paa den sydlige Skraaning af Vulkanen Irasu (9000'). 1845-1848, Orsted 56 (type of Eupatorium vulcanicum Benth. ex Oerst. C!). Additional specimens: Costa Rica: Cartago: El Muneco, south of Navarro. Alt. 1400 meters. Feb. 8-9, 1924, Standley 33689 (US!); Juan Vinas, Reventazon Valley. Alt. 1000 meters. April 25, 1903, Cook & Doyle 323337 (US!); San Jose: Cerro de Piedra Blanca, Jan. 31, 1924, Standley 32578 (US!); Vicinity of El General. Alt. 1490 meters, Feb. 1939, Skutch 4190 (US!); Nicaragua: San Rafael de Norte. Alt. 1200-1350 meters, March 25, 26, 1917, Miller & Griscom 14 (US!), 32 (US!), 67 (US!); Panama: Chiriqui: El Baru. Elev. 6000-7000 ft. March 27, 1970, Tyson & Loftin 5951 (US!); Volcan de Chiriqui, 4400 ft. Feb. 1938. Bro. Maurice 870 (US!); Vicinity of Casita Alta,, Volcan de Chiriqui. Alt. ca. 1500-200 meters, June 28-July 2, 1938, Woodson, Allen, Seibert 861 (US!); Vicinity of Finca Lerida. Alt. 1750 meters, July 7-11, 1940, Woodson & Scherry 211 (US!); Vicinity of Monte Lirio. Alt. 1300-1900 meters, June 27-July 13, 1935, Seibert 134 (US!).

Key to the Costa Rican species of Ageratina

1. Corollas with short-stalked glands on the outer surface, without long slender hairs; phyllaries without distinct longitudinal striations on outer surface

2. Corollas broadly expanded above from a short narrow tube; achenes with ca. 20 pappus setae which are very widely spreading when old; heads with 10-22 flowers; leaves very pale on lower surface A. anisochroma

2. Corollas narrowly funnelform; achenes with ca. 30 pappus setae which are only slightly spreading when old; heads often with less than 10 flowers;

3. Leaves elliptical, with glandular punctations on the lower surface, hairs short or lacking A. ligustrina

3. Leaves ovate, without glandular punctations, distinct coarse hairs on lower surface
*A. reticulifera*

1. Corollas with distinct slender hairs on outer surface; phyllaries with distinct longitudinal striations on outer surface

4. Corollas with many hairs in clusters on inner surface near bases of lobes, lobes of corollas a fourth or less as long as the throat
*A. subcordata*

4. Corollas with few or no hairs on inner surface near bases of lobes, lobes of corolla a fourth or more as long as the throat

5. Phyllaries with only glands on outer surface, without hairs

6. Leaves subsessile, petioles ca. 1 mm long
*A. chiriquensis*

6. Leaves distinctly petiolate, petioles 0.5-5.0 cm long

7. Leaves narrowly ovate to lanceolate; heads with 11-18 flowers; corollas without any hairs on inner surface *A. kupperi*

7. Leaves ovate; heads with 19-29 flowers; corollas with a few hairs on inner surface near bases of lobes *A. ixiocladon*

5. Phyllaries with few to many hairs on outer surface, without glands

8. Laminae of leaves rounded to cordate at base

9. Heads usually with 30-50 flowers
*A. aschenborniana*

9. Heads usually with 15-25 flowers

10. Veins of leaves densely tomentose on lower surface, bases of leaves slightly to distinctly cordate

11. Phyllaries acute at tips with prominent scarious margins; corollas narrowly funnelform in upper part *A. vulcanica*

11. Phyllaries attenuate without distinct scarious margins; corollas broadly campanulate in upper part *A. standleyi*

10. Veins of leaves short puberulous to nearly glabrous on lower surface, bases of laminae rounded to truncate

12. Corolla tube not as long as limb. anther sacs 0.8-1.0 mm long *A. costaricensis*

12. Corolla tube as long as or longer than the limb, anther sacs ca. 0.4-0.5 mm long

13. Corolla tube 1.5-2.0 mm long, distinctly longer than the limb; phyllaries acute to very short attenuate *A. molinae*

13. Corolla tube 1.0-1.5 mm long, about as long as the limb; phyllaries distinctly attenuate at the tips *A. helenae*

8. Laminae of leaves cuneate at base

14. Leaf prominently trinervate from near base of lamina; carpopodium with many quadrate cells *A. cartagoensis*

14. Leaf laminae with lateral veins mostly pinnate

15. Heads with ca. 28-30 flowers, leaf laminae very narrowly elliptical; carpopodia narrowly cylindrical *A. tonduzii*

15. Heads with ca. 20-23 flowers, leaf laminae rhomboidal to lanceolate with lateral nerves sometimes congested near middle or base; carpopodia rather short and broadly cylindrical

16. Stems with very sparse or appressed pubescence

17. Lateral veins of leaf laminae strongly ascending, margins sharply serrate; achenes essentially glabrous *A. burgeri*

17. Lateral veins of basal part of leaf lamina spreading, margins crenulate to bluntly serrate; achenes scabrous

18. Leaf laminae widest near basal third; stems sparsely pubescent; corolla lobes with only one type of hair on outer surface _A. allenii_

18. Leaf laminae usually widest near middle; stems densely puberulous; corolla lobes with hairs dimorphic, occassional hairs ending in a series of short broad cells _A. subglabra_

16. Stems densely hirsute

19. Achenes with only prickles on the costae; phyllaries shortly acuminate with many marginal hairs near tips; leaves with hairs only on primary and secondary veins, laminae with oil droplets internally that are visible as minute pellucid spots; glands on inner surfaces of style branches scarcely visible _A. barbensis_

19. Achenes distinctly setiferous; phyllaries slenderly attenuate with few marginal hairs near the tips; leaves with short hairs distributed evenly over the surface, laminae without oil droplets internally; glands of style branches partially indurated and easily visible under the compound microscope

20. Internodes 3-9 cm long; leaves slightly acuminate with essentially entire tips 1-2 cm long; corolla lobes with hairs all slender tipped, hairs not dimorphic _A. badia_

20. Internodes 1-3 cm long; leaves rather abruptly acuminate with short tips 5-8 mm long; corolla lobes with hairs dimorphic, some hairs ending in a series of short broad cells _A. diversipila_

References

Adams, C.D. 1971. Miscellaneous additions and revisions to the flowering plants of Jamaica. Phytologia 21: 405-410.

Grashoff, J.L. & J.H.Beaman. 1969. Studies in Eupatorium (Compositae) I. Revision of Eupatorium bellidifolium and allied species. Rhodora 71: 566-576.

Hass, Eric. 1970. White Snakeroot and a frontier tragedy. Garden Journal (New York Bot. Gard.) 20(5): 138-139.

King, R.M. & H.Robinson. 1970. Studies in the Eupatorieae (Compositae) XIX. New combinations in Ageratina. Phytologia 19: 208-229.

_____ & _____ 1972. Studies in the Eupatorieae (Asteraceae) LXVI. The genus, Pachythamnus. Phytologia 23: 153-154.

McVaugh, R. 1972. Compositarum Mexicanarum Pugillus. Contr. Univ. Mich. Herb. 9: 359-484.

Robinson, B.L. 1919. II A recension of the Eupatoriums of Peru. Proc. Amer. Acad. 55(1): 42-88.

Turner, B.L., Powell, A.M. and R.M.King. 1962. Chromosome numbers in the Compositae. VI. Additional Mexican and Guatemalan species. Rhodora 64: 251-271.

Acknowledgement

We wish to thank the curators of the following herbaria for the loan of their matieral: Jardin Botanique de l'Etat, Bruxelles (BR), Botanical Museum and Herbarium, Copenhagen (C), Chicago Natural History Museum (F), Gray Herbarium of Harvard University (GH), Royal Botanic Gardens, Kew (K), University of Michigan (MICH), Botanische Staatssammlung, Munchen (M), New York Botanical Garden (NY), and Museum National d'Histoire Naturell, Laboratore de Phanerogamie, Paris (P).

Fieldwork in Costa Rica was supported by a grant from the Penrose fund of the American Philosophical Society to the senior author. Special thanks are due Dr. William Burger of the Field Museum who generously allowed the use of his jeep while in Costa Rica.

We also wish to acknowledge the help throughout the study by the late Conrad V. Morton who checked most of the latin descriptions.

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 to the senior author.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXXXVI.

ADDITIONS TO THE GENUS, *NEOCUATRECASIA*.

R. M. King and H.Robinson
Smithsonian Institution, Washington, D.C. 20560.

In an earlier paper (King & Robinson, 1970) four Eupatorian species from Peru and Bolivia were placed in a new genus, *Neocuatrecasia*. The genus showed much resemblance to species of *Ageratina* having narrow tubular bases on the corolla, similar carpopodia and papillose inner surfaces of the corolla lobes. The genus differed strikingly by the hairy style bases and the transversely annulate thickenings in the cells of the anther collars. A further indication of relationship is now provided by the species of *Neocuatrecasia* described below which resembles *Trichogonia*. The latter genus is similar in habit and also has the long slender achene bases seen in *Neocuatrecasia*, but it differs in the presence of plumose pappus setae and by the lack of hairs on the base of the style. Actual relationship of *Neocuatrecasia* does seem closer to *Trichogonia* and the Gyptoid series though the style base is unlike any of the series.

The purpose of the present paper is to add two species to the genus *Neocuatrecasia*, one species being previously undescribed. The six species now known for the genus can be distinguished by the following key.

1. Leaves sessile; about 20 fragile pappus setae very slender, not contiguous at base ........ *N. sessilifolia*

1. Leaves distinctly short petiolate; 25-30 persistent pappus setae nearly contiguous at the base ........ 2.

  2. Leaves broadly ovate to cordate with large teeth or lobes; ........ 3.

  2. Leaves narrowly ovate to elliptical with small serrations; ........ 4.

3. Leaves coarsely toothed; achenes scabrous on the angles; corolla lobes with many hairs on the outer surface ........ *N. dispar*

3. Leaves deeply lobed; achenes distinctly setiferous; corolla lobes with few or no hairs on outer surface ... *N. lobata*

4. Throat of the corolla rather indistinct, not or scarcely longer than the basal tube; pappus setae shorter than achene ... *N. mancoana*

4. Throat of corolla distinctly longer than basal tube; pappus setae mostly longer than achene ... 5.

5. Heads with ca. 50 flowers; petioles 3-7 mm long ... *N. weddellii*

5. Heads with ca. 30 flowers; petioles 1-3 mm long ... *N. thymifolia*

The species previously known for the genus include: *N. dispar* (B.L.Robinson) R.M.King & H.Robinson, Peru, Dpt. Cusco; *N. lobata* (B.L.Robinson) R.M. King & H.Robinson, Bolivia, Dpt. La Paz; *N. mancoana* (B.L.Robinson) R.M.King & H.Robinson, Peru, Dpt. Cusco; *N. thymifolia* (Britton) R.M.King & H.Robinson, Bolivia, Dpt. La Paz.

The following two species are added to the genus.

**Neocuatrecasia sessilifolia** R.M.King & H.Robinson, sp. nov. Frutices erecti vel suberecti ca. 3 dm alti, multo ramosi. Caules teretes glandulis longiuscule stipitatis dense obsiti. Folia opposita sessilia anguste oblonga 2-4 cm longa 5-10 mm lata obtusa margine serrulata basi subauriculata elongate reticulato-venosa, utrinque in nervis et nervulis glandulis longiuscule stipitatis dense obsita supra etiam breviter pilosa subtus etiam glandulo-punctata. Inflorescentiae dense corymbosae, pedicellis 5-15 mm longis, pedicellis et squamis exterioribus extus glandulis stipitatis dense obsitis. Capitula 9-10 mm alta ca. 10 mm lata, floribus ca. 40; involucri squamae ca. 20 subimbricatae inaequilongae ca. 3-seriatae oblongo-ellipticae acutae 3-7 mm longae; corollae inferne anguste tubulares superne anguste infundibulares, tubis 1.0-1.5 mm longis extus glanduliferis, limbis 2.0-2.5 mm longis, lobis brevibus late triangularibus extus glanduliferis ad apicem et intus papillosis; filamenta antherarum in parte superiore ca. 300μ longa, parietibus valde transverse annulate ornatis, thecae ca. 1.0 mm longae basi cuneatae, appendicibus non longioribus quam latioribus; styli inferne non nodulosi hirsuti, appendicibus longe incrassatis dense papillosis; achaenia anguste stipitata in costis breviter multo-setifera; carpopodia breviter subcylindrica, cellulis subquadratis, parietibus tenuis firmis; pappi setae ca. 20 fragiles infirne tenues subintegrae non contiguae superne valde scabrae. Grana pollinis ca. 25μ diam., spinis brevibus.

Type: PERU: Junin: Huancayo; alt. 4000 meters. March 1947. J. Soukup 3146 (Holotype US !). Paratype PERU: Concepcion: Ingenio. February 1948. J. Soukup 3658 (US!)

Neocuatrecasia weddellii (B.L.Robinson) R.M.King & H. Robinson, comb. nov. Eupatorium weddellii B.L. Robinson, Contr. Gray Herb. n.s. 77: 44. 1926. near Quiaca, Prov. Carabaya, Dpt. Puna, Peru.

## Reference

King, R.M. & H.Robinson 1970. Studies in the Eupatorieae (Compositae). XXXII. A new genus, Neocuatrecasia. Phytologia 20: 332-333.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 to the senior author.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXXXVII.

THE GENUS, ALOMIA

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560

The genus Alomia has long been recognized in the Eupatorieae primarily on the basis of one character, the lack of a pappus. The long over-due critical study of the genus has provided the basis for considerable subdivision and redistribution of the species. The subdivisions prove to have vastly differing relationships which we summarize here and place in other genera in following papers of the series. A remnant of Alomia does survive containing four of the previously recognized species and a fifth species newly described here.

The broad concept of Alomia, which is rejected here, contains six very distinct elements. The first element Alomia itself, is strictly Mexican and contains some species which in both habit and corolla structure indicate unmistakeable relationship to Brickellia. A second element, that has affected previous concepts of relationship of the genus, is a group to be transferred to Ageratum, having conical receptacles, glandular punctations on the leaves and strongly annulated anther collars. These species lack the particular form of distorted carpopodium with thick-walled cells found in Alomia and also lack the peculiar gland shaped setae on the achene. Ageratum has no close relationship to Alomia but is instead allied to the Gyptoid series. Perhaps in the latter relationship, is a third element from Alomia from Guatemala and Honduras which has a plane receptacle, scarcely annulated anther collars, nearly symmetrical carpopodia and different forms of glands on the leaves, which we place in a distinct genus Blakeanthus. A fourth element from Alomia, in eastern Brazil, has plane receptacles, glabrous leaves with closely reticulate veins and a few very short smooth pappus setae. This last we place in a separate genus, Acritopappus which might be a remote relative of Ageratum. The fifth element in Brazil belongs in Trichogonia as suspected by B.L.Robinson (1913). The sixth element from Alomia is a species of Matto Grosso in Brazil that has an enlarged style base and other features of the Ayapana series. This last species we place in Alomiella with relationships to two other Central Brazilian genera, Monogerion and Gymnocondylus. The artificial series of "Alomia" has paralleled to an amazing extent the artificial series of "Eupatorium" in the old concept.

The species retained in Alomia show rather complete uniformity in a number of features. The receptacles are all broadly convex with generally the same number of flowers, the leaves and stems show a strong tendency toward long-stalked glands and have no sessile glands, the carpopodia have a sharp double bend with sharply defined foramens directed downward, the carpopodial cells are oblong with thickened lateral walls, and the achenes bear few to many peculiar short gland-shaped setae. These latter structures are setae structurally though they look like glands, and they are apparently unique to the genus. Lack of uniformity occurs in the genus in an expected form with variations of phyllaries in different species. A less expected variation is that of corolla form and style branch papillosity. It is unusual to find forms with flaring corollas and slender papillose style branches like A. ageratoides and A. hintonii so closely related to forms with very narrow corollas and broad smooth style branches like A. alata and A. callosa. The former seem particularly out of place considering the apparently Brickellioid relationships of the genus Alomia.

Alomia Humbolt, Bonpland and Kunth, Nov. Gen. et Sp. 4: 118. 1818. Ed. fol.

Sparingly branched erect to decumbent annual herbs. Stems terete to six-angled, puberulous to pilose, hairs with or without gland tips. Leaves opposite, long petiolate, blades ovate with short cuneate to cordate bases, weakly trinerved at the base, lower surface without sunken glandular punctations. Inflorescence cymose, phyllaries 25-30 subimbricate in 2-4 series unequal to subequal externally with few hairs or glands; receptacle broadly convex. Heads with 40-50 flowers; corollas tubular or funnelform with short lobes, externally glabrous or with short minute glands; collars of anthers narrow with mostly elongate cells, cell walls with only weak annular thickenings, anther appendages about as long as wide; style scarcely broader near the base, glabrous, style appendages long-clavate to scarcely thickened, smooth or with short papillae; achene prismatic, 5-angled, bearing short gland-shaped setae; carpopodium greatly twisted

with distinct foramen, cells elongate with thickened lateral walls; pappus completely lacking.
Type species: *Alomia ageratoides* H.B.K.

All the species of *Alomia* seem to be small herbaceous annual plants growing by or in streams. The five species are distinguished by the following key.

1. Corollas funnelform with spreading throat; style branches with short papillae 2

1. Corollas tubular; style branches smooth 3

 2. Stems with long non glandular hairs and short gland tipped hairs; leaves rounded to cordate at base with rather blunt tip and blunt teeth *A. hintonii*

 2. Stems with only gland tipped hairs; leaves with shortly cuneate bases and sharp teeth *A. ageratoides*

3. Petiole narrowly but distinctly winged *A. alata*

3. Petiole not winged 4

 4. Phyllaries acute or with short apiculus *A. callosa*

 4. Phyllaries with very long acuminate tips *A. stenolepis*

Our studies of the genus indicate that it contains the following five species.

*Alomia ageratoides* H.B.K. Nov. Gen. et Sp. 4: 119. 1818. Ed. Folio. Mexico.

*Alomia alata* Hemsl., Biol. Centr. Am. Bot. 2: 79. 1881. Mexico.

*Alomia callosa* (Watson) B.L.Robinson, Proc. Amer. Acad. 49: 443. 1913. Mexico.

*Alomia hintonii* R.M.King & H.Robinson, sp. nov.
Herbae erectae 2-3 dm altae pauce ramosae. Caules sexangulares longe pilosi etiam glandulis

breviter stipitatis obsiti. Folia opposita petiolata, petiolis tenuibus 1.0-4.5 cm longis, laminis ovatis 3.0-7.0 longis 1.5-4.0 cm latis ad apicem anguste obtusis margine crenato-serratis basi rotundatis vel leniter cordatis infirme trinervatis, subtus in nervis et nervulis hirsutis. Inflorescentiae profuse cymosae, pedicellis plerumque 1-2 cm longis glandulis breviter stipitatis obsitis. Capitula 2.5-3.0 mm alta; involucri squamae 25-30 subimbricatae 3-seriatae inaequilongae 1.5-3.0 mm longae lanceolatae vel anguste oblanceolatae extus leniter striatae parce glanduliferae. Flores ca. 45-50 in capitulo; corollae 1.5 mm longae infundibulares inferne distincte breviter tubulares extus glabrae, lobis late triangularibus extus raro glanduliferis; filamenta antherarum in parte superiore ca. 150μ longa, cellulis oblongis vel longioribus, thecae ca. 0.6 mm longae, appendicibus non longioribus quam latioribus; appendices stylorum vix incrassatae dense breviter papillosae; achaenia ca. 1.0 mm longa temere setiferae, setis glanduliformibus. Grana pollinis 15-20μ diam.

Type: MEXICO: Mexico: District of Temascaltepec: Platanal. In the water. Feb. 7, 1933. G.B.Hinton 3347 (Holotype US!); additional specimen: Mexico: Mexico: District of Temascaltepec: Ocotepec. Alt. ca. 1500 m In the water. Dec. 9, 1932. G.B.Hinton 2911 (US!).

The species is close to *Alomia ageratoides* H.B.K. with the broad corolla and papillose style branches, but the stems have long hairs not found in the latter and the leaves are more rounded to cordate at the base with blunter tips and teeth. The new species also differs slightly in its corollas having few or no glands.

*Alomia stenolepis* Blake, Journ. Wash. Acad. Sc. 27: 375. 1937. Mexico.

## Reference

Robinson, B.L. 1913. Revision of *Alomia*, *Ageratum* and *Oxylobus*. Contr. Gray Herb. n.s. 42: 438-491.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB-20502 A #1 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). LXXXVIII.

## ADDITIONS TO THE GENUS, AGERATUM

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

A recent monographic study of the genus *Ageratum* (Johnson, 1971) has recognized 29 species with 2 subspecies and 14 forms in America. In the study, *Ageratum* was characterized as having a conical receptacle and a coroniform to squamose pappus among other characters and species placed in *Alomia* were not included. Our own studies show that the existing generic separation between *Ageratum* and *Alomia* is unnatural and a number of species of the latter must be returned or transferred to *Ageratum*. One recently discovered undescribed species is also added.

Species transferred here to *Ageratum* from *Alomia* lack any pappus structure but agree with *Ageratum* by having conical receptacles, strongly indurated phyllaries, prominent sunken capitate glands on the leaves and strong annulate thickenings in the cells of the anther collars. Typical *Alomia* differs in all these characters and also has a unique form of short setae on the achene. The somewhat broadened concept of *Ageratum* includes some variation of style branch and carpopodial structure. The style branches are usually strongly and densely papillose but show only slight papillosity in *A. ballotaefolium* of Venezuela. The carpopodia are usually enlarged and strongly asymmetrical with thin walled cells and a poorly defined foramen but the structure is nearly vestigial in one Mexican species, *A. stachyofolium*, and nearly symmetrical in one Brazilian species, *A. glomeratum* . Not included here in *Ageratum* are some possibly related species having flat receptacles such as *Alomia cordata* Blake which we place in *Blakeanthus* and *Alomia longifolia* (Gardner) B.L.Robinson which we place in *Acritopappus*.

We would exclude one of the species included in the monograph by Johnson, *Ageratum domingense* Spreng. The species has been placed in the West Indian genus *Phania* by some authors. *Phania* is closely related to *Ageratum*, having the same type of glandular punctate leaves and the same type of conical receptacle. *Phania* differs by the reduced anther appendages, shorter campanulate flowers, the short anther filaments consisting almost entirely of collars, and large laciniate oblong pappus squamae with strongly sinuose-walled cells. The Sprengel species agrees with Phania in all the significant features, but the anther appendage, while short, is large enough to see with a handlens.

From descriptions it would seem that the characteristic glandular punctations on the leaves of Ageratum are often overlooked. These are usually flush with the surface or even depressed. The cells of the glands are large but usually collapsed. The glands are sometimes hidden under other pubescence or concolorous with surrounding leaf surface but they are present on every specimen we have examined.

We would presently recognize the following 41 species in Ageratum based on the work of Johnson and on our own investigations. Some other species formerly placed in Alomia may prove to be Ageratum but material has not been seen. The species preceeded by an asterisk are not included in the genus by Johnson.

Ageratum albidum (A.P.Decandolle) Hemsl., Biol. Cent. Amer., Bot. 2: 81. 1881. Mexico.

* Ageratum ballotaefolium (Maguire, Steyermark & Wurdack) R.M.King & H.Robinson, comb. nov. Alomia ballotaefolium Maguire, Steyermark & Wurdack, Mem. N.Y. Bot. Gard. 9: 425. 1957. Venezeula.

* Ageratum benjamin-lincolnii R.M.King & H.Robinson, nom. nov. Alomia guatemalensis B.L.Robinson, Proc. Amer. Acad. 49: 448. 1913. Not Ageratum guatemalensis Johnson. Guatemala.

* Ageratum candidum G.M.Barroso, Sellowia 17: 83. 1965. Brazil.

* Ageratum chirquense (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Alomia chiriquensis B.L.Robinson, Contr. Gray Herb. n.s. 61: 4. 1920. Panama.

Ageratum chortianum Standley & Steyermark, Publ. Field Mus. Nat. Hist., Bot. Ser. 23: 98. 1944. Guatemala, Honduras.

Ageratum conyzoides L. Sp. Pl. 2: 839. 1753. Mexico, Central America, West Indies, South America, Widely adventive.

Ageratum corymbosum Zuccag. ex Pers., Syn. 2: 420. 1807. Mexico, Guatemala, El Salvador, Honduras.

Ageratum echioides (Less.) Hemsl., Biol. Centr. Amer., Bot. 2: 81. 1881. Guatemala, Mexico.

Ageratum elassocarpum Blake, Contr. U.S. Nat. Herb. 22: 588. 1924. Mexico.

Ageratum ellipticum B.L.Robinson, Contr. Gray Herb. n.s. 90: 5. 1930. British Honduras.

* Ageratum fastigiatum (Gardn.) R.M.King & H.Robinson, comb. nov. Isocarpha fastigiata Gardn. in Hook. Lond. Jour. Bot. 5: 495. 1846. Brazil.

Ageratum gaumeri B.L.Robinson, Proc. Amer. Acad. 47: 191. 1911. Guatemala, Mexico.

* Ageratum glomeratum Barroso & King, Brittonia 23: 121. 1971. Brazil.

Ageratum guatemalense M.F.Johnson, Ann. Missouri Bot. Gard. 58: 64. 1971. Guatemala.

Ageratum houstonianum Miller, Gard. Dict. ed. 8. 1768. Mexico, Central America, West Indies, Colombia, Widely adventive.

* Ageratum isocarphoides (A.P.Decandolle) Hemsl., Biol. Cent. Amer. Bot. 2: 82. 1881. Mexico.

Ageratum littorale Gray, Proc. Amer. Acad. 16: 78. 1880. Florida, West Indies, British Honduras.

Ageratum lucidum B.L.Robinson, Proc. Amer. Acad. 36: 475. 1901. Mexico.

Ageratum maritimum H.B.K., Nov. Gen. et Sp. 4: 117. 1818. Ed. Fol. Greater Antilles, Mexico (Quintana Roo).

* Ageratum microcarpum (Benth. ex Oersted) Hemsl., Biol. Cent. Amer., Bot. 2: 82. 1881. Costa Rica, Honduras, Nicaragua.

* Ageratum microcephalum Hemsl., Biol. Cent. Amer., 2: 82. 1881. Mexico.

* Ageratum micropappum Baker, Mart. Fl. Bras. 6(2): 198. 1876. Brazil.

* Ageratum myriadenium (Schultz-Bip. ex Baker) R.M. King & H.Robinson, comb. nov. Alomia myriadenia Schultz-Bip. ex Baker, Mart. Fl. Bras. 6(2): 192. 1876. Brazil.

Ageratum nelsonii (B.L.Robinson) M.F.Johnson, Ann. Missouri Bot. Gard. 58: 42. 1971. Mexico.

Ageratum oerstedii B.L.Robinson, Contr. Gray Herb. n. s. 42: 472. 1913. Costa Rica.

Ageratum paleaceum (A.P.Decandolle) Hemsl., Biol. Cent. Amer., Bot. 2: 83. 1881. Mexico.

Ageratum peckii B.L.Robinson, Proc. Amer. Acad. 47: 192. 1911. British Honduras.

Ageratum perplexans M.F.Johnson, Ann. Missouri Bot. Gard. 58: 80. 1971. Bolivia.

Ageratum petiolatum (Hook. & Arn.) Hemsl., Biol. Cent. Amer., Bot. 2: 83. 1881. Costa Rica, Nicaragua, Panama.

* Ageratum pinetorum (L.O.Williams) R.M.King & H.Robinson, comb. nov. Alomia pinetorum L.O.Williams, Fieldiana, Bot. 31: 25. 1964. Honduras.

* Ageratum platylepis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Alomia platylepis B.L.Robinson, Proc. Amer. Acad. 49: 448. 1913. Guatemala.

Ageratum platypodium B.L.Robinson, Contr. Gray Herb. n.s. 42: 464. 1913. Mexico.

Ageratum radicans B.L.Robinson, Proc. Amer. Acad. 47: 192. 1911. British Honduras.

* Ageratum reedii R.M.King & H.Robinson, sp. nov.

Suffrutices erecti multo ramosi. Caules teretes parce puberuli. Folia plerumque opposita superiore alterna distincte petiolata, petiolis 0.7-2.0 cm longis, laminis ovatis 3-7 cm longis 2-5 cm latis acutis vel breviter acuminatis margine argute serratis base rotundatis vel perbreviter cuneatis tri- vel quinquenervatis supra atrovirentibus subtus pallidis dense glandulo-punctatis utrinque scabrellis. Inflorescentiae laxe cymosae, ramis longis valde ascendentibus, pedicellis ultimis congestis 1-11 mm longis dense puberulis. Capitula ca. 5 mm alta, floribus ca. 125; involucri squamae ca. 40, eximbricatae subaequilongae 4-5 mm longae bi-tri-seriatae induratae, anguste lanceolatae extus tristriatae parce piliferae; receptacula conica ebractifera; corollae ca. 3 mm longae inferne breviter tubulares in medio leniter constrictis superne anguste infundibulares extus pauce piliferae; filamenta antherarum in parte superiore ca. 300μ longa angusta; thecae ca. 1 mm longae, appendicibus non longioribus quam latioribus; appendices stylorum filiformes dense patente papillosi; achaenia glabra; carpopodia subcylindrica nervis distincte excentricis, cellulis oblongis vel longioribus, parietibus incrassatis; pappi squamae 5 perbreves latioribus lobatis et denticulatis. Grana pollinis 15-17μ diam.

Type: COSTA RICA: Monteverde, elevation 4500 ft. January 31, 1972. Walter James 14B (Holotype US!).

The new species is close to A. petiolatum (Hook. & Arn.) Hemsl. of Costa Rica and Nicaragua but the latter is more herbaceous with more compact more scapose inflorescences, upper leaves are opposite, leaf bases are more cuneate and glands on under surface are sunken into pits.

We take great pleasure in naming this new species for Dr. Clyde F. Reed of Baltimore, Maryland who very generously donated the type specimen to the United States National Herbarium.

Ageratum riparium B.L.Robinson, Contr. Gray Herb. n.s. 42: 473. 1913. Costa Rica, Panama.

Ageratum rugosum Coult., Bot. Gaz. 20: 42. 1895. Mexico, Central America.

Ageratum scorpioideum Baker in Mart., Fl. Bras. 6(2): 197. 1876. Guayana.

Ageratum stachyofolium B.L.Robinson, Proc. Amer. Acad. 36: 476. 1901. Mexico.

Ageratum standleyi B.L.Robinson in Standley, Jour. Arnold Arbor. 11: 44. 1930. Honduras.

Ageratum tomentosum (Benth. ex Oerst.) Hemsl., Biol. Cent. Amer., Bot. 2: 82. 1881. Mexico, Costa Rica ?

## Reference

Johnson, M.F. 1971. A monograph of the genus Ageratum L. (Compositae-Eupatorieae). Ann. Missouri Bot. Gard. 58: 6-88.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE) LXXXIX.

## A NEW GENUS, BLAKEANTHUS

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560

A new genus is described here for a single Central American species that has been placed in Alomia and which superficially resembles Ageratum. A revision of the complex has shown the species to be very distinctive in many significant details. The genus is named after Dr. Sidney Fay Blake, the author of the species.

The species has resided in Alomia as part of an overly broad concept and has no evident relationship to that genus as redefined. The smaller number of flowers, the plane receptacle with some paleae, the indurated phyllaries, the achene with only a few glands and spicules and the symmetrical carpopodium are all different from Alomia. Closer relationship seems to be with Ageratum but that genus has conical receptacles, very strong annular thickenings in the cells of the anther collars, usually asymmetrical carpopodia, usually densely long papillose style branches, and very distinct glandular punctations in the surface of the leaves. The degree of difference between Ageratum and Blakeanthus is particularly significant in view of the great uniformity of most of these features throughout the many species of Ageratum.

The similar habit and phyllaries as well as common centers of geographical distribution suggest that Blakeanthus is closely related to Ageratum. Still, the scarcely ornamented walls of the anther collar cells of Blakeanthus are very different from those of known genera in the Ageratum -Gyptoid-Piqueria series. On the basis of the one characteristic we would provisionally place the new genus in the separate Critonioid series where it is distinct from all but one species of Koanophyllon by the lack of a pappus.

The leaf pubescence in Blakeanthus is of particular interest for the variety of hairs and glands. Any small area of the lower leaf surface shows completely intermixed short-stalked glands, long-stalked glands of a slightly different color, and still longer non-glandular hairs. In no case are the short-stalked glands as large or as sunken into the surface as in Ageratum.

Blakeanthus R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Frutices erecti usque ad 2 m alti multo ramosi. Caules teretes hirsuti. Folia opposita longe petiolata, laminis ovatis basi truncatis vel cordatis utrinque pilosis subtus pilis densioribus, glandulis minutis plerumque sessilis aliquot longe stipitatis. Inflorescentiae glomerato-corymbosae. Involucri squamae ca. 20 subimbricatae subaequilongae lanceolatae rigide chartaceae viridis parce pilosae; receptacula plana vel concava paleacea, paleis phyllariaeformis. Flores ca. 25 in capitulo; corollae anguste infundibulares, lobis brevibus vix longioribus quam latioribus extus glanduliferis; filamenta antherarum in parte superiore angusta, cellulis inferne subquadratis vel oblongis superne elongatis, parietibus inornatis vel leniter annulate ornatis, appendicibus vix longioribus quam latioribus; styli inferne non nodulosi, appendicibus linearibus subpapillosis; achaenia prismatica 5-costata plerumque glabra ad apicem glandulifera; carpopodia breviter subcylindrica basi rotundata, cellulis parvis irregulariter subquadratis multiseriatis; parietibus tenuis; pappus nullus.

Species typica: Alomia cordata S.F.Blake

The genus contains the following species.

Blakeanthus cordatus (Blake) R.M.King & H.Robinson, comb. nov.
Alomia cordata Blake, Proc. Biol. Soc. Wash. 60:41. 1947. Guatemala, Honduras.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB-20502 A #1 to the senior author.

TWO SPECIES OF ATELEIA (LEGUMINOSAE) NEW TO NORTH AMERICA

Velva E. Rudd, Smithsonian Institution

Immediately after a treatment of Ateleia went to press in North American Flora (series 2, part 7: 6-12. 1972) material of two additional species arrived. One appears to be an interesting range extension of A. herbert-smithii Pittier, the other a new species from Mexico.

Ateleia herbert-smithii Pittier (Contr. U. S. Nat. Herb. 20: 112. 1918) has been known only from the type collection (H. Smith 817) made "5 mi. S. of Mamatoco," Magdalena, Colombia and reported by the collector as "also found in fl. 3 mi. n. of Bonda." Efforts to recollect it in Colombia have been unsuccessful. Now, however, we have material from Costa Rica, collected by S. Salas D. (no. 1831) in the Parque Nacional Santa Rosa, Libería, Guanacaste, that seems to be referable to A. herbert-smithii. There is a slight difference in shape of the leaflets, those from Costa Rica being more sharply pointed at the apex and acute at the base, but in other characters the two collections agree very well.

The new species from Mexico, named for the collector, Rogers McVaugh, appears to be most closely related to A. arsenei Standl. but has smaller fruit and calyx. Unfortunately, complete flowers are not available so we do not know if the single petal is pubescent as in A. arsenei or glabrous as in other species.

The addition of A. mcvaughii brings to nine the total number of Mexican Ateleia. With the exception of A. gummifera which extends into the Caribbean area, each is known from a limited range. If material becomes available from intermediate areas we may be able to recognize transitional trends and, perhaps, combine a few of the species.

ATELEIA MCVAUGHII Rudd, sp. nov.

Frutex, A. arsenei Standl. affinis, sed foliolis numerosioribus, fructibus calycibusque minoribus differt.

Shrub, to about 50 cm. tall; leaves (23-) 27-29-foliolate, the axis puberulent, glabrescent, about 13-19 cm. long; leaflets lanceolate or lanceolate-ovate, 1-4 cm. long, 0.5-1.3 cm. wide, acute, the base rounded, almost symmetrical, the upper surface glabrous, the lower surface moderately pubescent with crispate hairs, glabrescent, the secondary veins inconspicuous, the petiolules about 1 mm. long, crisp-pubescent; inflorescences racemose, axillary; bracts linear-deltoid, 1-2 mm. long; complete flowers not seen; calyx tomentulose, 2.5-3 mm. long; fruit glabrous (2.5-) 3-3.5 cm. long including stipe 7-10 mm. long, 1-1.5 cm. wide including convex wing along upper margin about 1-1.5 mm. wide; seeds reniform, reddish-brown, 9 mm. long, 6 mm. wide, and 3 mm. thick, the hilum lateral, orbicular, about 7-8 mm. in diameter.

Type: R. McVaugh 23984, Mexico, Oaxaca, rocky calcareous hills 6-9 km. NW of Huajuapan de Leon, remnant of oak forest, 1800-1900 m. elev., 27 Sept. 1967. Holotype US no. 2624214; isotype MICH.

# NEW TAXA AND COMBINATIONS IN MACHAERIUM (LEGUMINOSAE). II.

Velva E. Rudd, Smithsonian Institution

MACHAERIUM QUINATA (Aubl.) Sandw. var. PARVIFLORUM (Benth.) Rudd, comb. nov.

Machaerium ferrugineum (Willd.) Pers. var. parviflorum Benth. in Mart. Fl. Bras. 15(1): 253. 1862, based on Machaerium nervosum Vog.

Machaerium nervosum Vog. Linnaea 11: 186. 1837. Type: A. Poiteau s. n., French Guiana (holotype B "Herb. Kunth" destroyed).

Although the holotype of this variety is no longer extant, the full description given by Vogel clearly shows that this name may be applied to the smaller-flowered individuals of this species.

What would appear to be an older name for this variety, Machaerium ferrugineum var. glabrescens E. Mey., is being rejected as a nomen dubium. The original description (Nov. Act. Acad. Nat. Cur. 12: 807. 1824) could conceivably be related to this taxon but no reliable type, presumably collected by Hostmann, has been located. A specimen at GOET labelled as "1. Machaerium ferrugineum Pers. Surinam. Prof. Meyer 1824.", with a second label "1. Nissolia ferruginea Willd. Surinam leg. Hostmann. Hb. Bg. [Herb. Bartling] 1841", which might be the type, is actually a specimen of Crudia glaberrima (Steud.) Macbr.

MACHAERIUM PIRESII Rudd, sp. nov.

M. quinata (Aubl.) Sandw. affine, sed differt floribus minoribus, fructibus plus minus sigmoideis, foliolorum venis secondariis paucioribus, venulis reticulatis inconspicuis.

Liana; young stems ferrugino-tomentulose, glabrescent; stipules deltoid, spinescent, to about 8 mm. long, 3 mm. wide at the base; leaves 7-13-foliolate, the axis 15-35 cm. long, tomentulose, glabrescent; leaflets coriaceous, ovate to elliptic-oblong or oblong-obovate, 6-17 cm. long, 3-7 cm. wide, acute or acuminate, the base rounded, the upper surface pubescent along the midvein, otherwise glabrous, the lower surface tomentulose, the secondary veins prominent, about 6-15 pair, approximately parallel, extending to the margin, the tertiary veins reticulate, inconspicuous; inflorescences terminal, paniculate, the axes tomentulose; bracts deltoid, striate, pubescent, spinescent, 7-8 mm. long, 3-5 mm. wide at the base; bracteoles broadly ovate, 1.5-2 mm. long and wide; flowers 5-6 mm. long; calyx tomentulose, 2-2.5 mm. long, 1.5 mm. in diameter, the teeth less than 1 mm. long; petals reddish, the vexillum pubescent on the outer face; stamens monadelphous; fruit winged, drying to dark brown, ferrugino-tomentulose, glabrescent, somewhat sigmoid, 8-10 cm. long including stipe about 5 mm. long, the body 2.5-3 cm. long, 1.2-1.5 cm. wide, the wing 5-7 cm. long, 2-2.5 cm. wide.

Type: J. Murça Pires 577, Brazil, Amazonas, Rio Negro, Serra de São Gabriel, virgin forest, 1 May 1947 (holotype IAN 28539; isotypes NY, US).

MACHAERIUM MACROPHYLLUM Benth. var. BREVIALATUM Rudd, var. nov.

A varietate typica floribus majusculis differt, legumine reniformi cum ala terminali abbreviata.

Liana; young stems puberulent, glabrescent; stipules deltoid, spinescent, to about 5 mm. long, 2 mm. broad at the base; leaves 5-9-foliolate, the axis 8-20 cm. long, puberulent, glabrescent; leaflets coriaceous, elliptic to obovate, 8-23 cm. long, 3-11 cm. wide, commonly obtuse, sometimes acuminate, the base rounded to cuneate, the upper surface glabrous, the lower surface moderately pubescent with minute, appressed hairs, sometimes glabrescent, the secondary veins moderately conspicuous to inconspicuous, 10-20 on each side, approximately parallel, mostly extending to the margin, the tertiary veins reticulate, inconspicuous; inflorescences terminal or axillary, paniculate, the axes ferrugino-tomentulose; bracts sericeous, deltoid, 3-5 mm. long, sometimes spinescent; bracteoles ovate or elliptic, obtuse, 1-1.5 mm. long and wide; flowers about 8-12 mm. long; calyx ferrugino-sericeous, 3-4.5 mm. long, 2.5-3 mm. in diameter, the teeth about 1 mm. long or less; petals white or yellowish, the vexillum pubescent on the outer face; stamens monadelphous; fruit reniform with a short terminal wing, ferrugino-velutinous, somewhat glabrescent, 5-7 cm long including stipe about 2 mm. long, the body 3-4 cm. long, 2-2.5 cm. wide, the wing 2.5-3 cm. long, 3-4 cm. wide.

Type: R. Fróes 20410, Brazil, Pará, Rio Guamá, 16 Jan. 1945 (holotype US 2266042; isotypes IAN, NY).

Examination of the holotype as well as modern collections of typical M. macrophyllum has shown that variety to have flowers about 5-8 mm. long and fruit with a terminal wing 5-6 cm. long and 1.5-2 cm. wide. I am indebted to the collection, Pires 530, from Vaupés, Rio Negro, Amazonas, Brazil, for the information that the fruit of M. macrophyllum Benth. var. macrophyllum has a long wing, quite unlike the reniform, short-winged pods of var. brevialatum. All other collections I have seen are in flower.

MACHAERIUM FLORIBUNDUM Benth. var. HYPARGYREUM (Harms) Rudd, comb. nov.

Dalbergia hypargyrea Harms, Notizbl. Bot. Gart. Berlin 9: 973. 1926. Type: Tessmann 4549, Peru, Loreto or Amazonas, "Oberer Marañon. Mündung des Santiago." (holotype B destroyed, represented by F Mus. photo 2267 and fragment F ex B; isotype G).

MACHAERIUM DUBIUM (H. B. K.) Rudd, comb. nov., non M. dubium Fr. Allem. 1856, nom. nud.

Drepanocarpus dubius H. B. K., Nov. Gen. & Sp. 6: 390. 1824. Type: A. Humboldt [mss. no.] 797, Venezuela, Guarico, "inter S. Geronimo del Pyrital & San Fernando de Apure," 11-27 March 1800 (holotype P-HUMB).

_MACHAERIUM_ _ELIASII_ Rudd, sp. nov.

Arbor vel frutex interdum scandens _M_. _aristulato_ (Spruce ex Benth.) Ducke et _M_. _lunato_ (L. f.) Ducke affinis; ab utroque foliolis minoribus, numerosioribus differt; a _M_. _aristulato_ foliolis sine arista terminali; a _M_. _lunato_ floribus fructibusque pubescentioribus.

Tree, shrub, or liana, to about 5 m. tall; young stems tomentulose, glabrescent; stipules spinescent, to about 10 mm. long, 5 mm. wide at the base; leaves (15-) 21-51-foliolate, the axis about 4-10 cm. long, tomentulose; leaflets elliptic to oblong, 1-3.5 cm. long, 4-15 mm. wide, obtuse, sometimes shallowly retuse, the base rounded, slightly asymmetrical, the upper surface glabrous, the lower surface glabrous or sparsely pubescent with appressed or subappressed hairs; inflorescences racemose, terminal or axillary, the axes cano- or fulvo-tomentulose; bracts striate, spinescent, to about 5 mm. long and 1-2 mm. wide at the base; bracteoles ovate, striate, sparsely pubescent, 3.5-4 mm. long, 3.5-4 mm. wide; flowers 10-12 mm. long; calyx 4-5 mm. long, moderately pubescent to subglabrous, sometimes sparsely setose, the lobes 1 mm. long or less; petals blue or purple, the vexillum pubescent on the outer face; fruit lunate, essentially sessile, cano- or fulvo-tomentulose (submature, probably glabrescent), about 3.5 cm. long, 1.5 cm. wide.

Type: _Bro_. _Elias_ 1242, Colombia, Atlántico, Las Flores, vicinity of Barranquilla, July 1934 (holotype US 1618733; isotype F).

_MACHAERIUM_ _TOLIMENSE_ Killip ex Rudd, sp. nov.

Frutex scandens, _M_. _complanato_ Ducke et _M_. _millefloro_ Pittier plus minusve interjectus; a _M_. _complanato_ foliolis floribusque majoribus, a _M_. _millefloro_ foliolis majoribus, floribus minoribus, calycibus pubescentibus differt.

Scandent shrub about 3 m. high; young stems ferrugino-tomentulose, glabrescent; stipules spinescent, about 5 mm. long, 3 mm. wide at the base, recurved; leaves 5-9-foliolate, the axis (4-) 7-11 cm. long, tomentulose; leaflets subcoriaceous, elliptic, 2-6.5 cm. long, 1.5-3.5 cm. wide, obtuse or slightly emarginate, the base rounded, the upper surface glabrous, the lower surface ferrugino-pubescent, the venation pinnate-reticulate, inconspicuous; inflorescences terminal, paniculate, the axes ferrugino-tomentulose; lower bracts spinescent; upper bracts pubescent, ovate, 1-2 mm. long, 1 mm. wide; bracteoles pubescent, broadly ovate or suborbicular, about 1 mm. long and wide; flowers 5-6 mm. long; calyx pubescent, 2-2.5 mm. long; petals dark or dull red, the vexillum pubescent on the outer face, somewhat reflexed; fruit not known.

Type: _F_. _W_. _Pennell_ 3610, Colombia, Tolima, Honda, arroyo, alt. 250-300 m., 3-4 January 1918 (holotype US 1044833; isotype NY).

MACHAERIUM LEIOPHYLLUM (DC.) Benth. var. COLOMBIENSE Rudd, var. nov.

A varietate typica fructibus longioribus angustioribusque necnon ala cum parte seminifera proportione diversa differt.

Tree or liana, to about 45 m. high; leaves 5-11-foliolate; leaflets elliptic to ovate-elliptic or elliptic-oblong, (1-) 2-9 cm. long, (0.5-) 1-3 cm. wide, acute, obtuse, or acuminate; flowers purple, 8-10 mm. long, the vexillum pubescent on the outer face; calyx subsericeous, 4 mm. long, 2.5-3 mm. in diameter; fruit essentially glabrous at maturity, winged, 8-8.5 cm. long including stipe 5-10 mm. long, the seminiferous body about 2.5 cm. long, 1.5-2 cm. wide, the wing 5-5.5 cm. long, 1.5-2 cm. wide.

Type: H. Garcia Barriga 11891, Colombia, Cundinamarca, Sasaima, Vereda San Bernardo, "a lo largo del rio Dulce," 1660 m. elev., 10 January 1946 (holotype US 1854469).

The winged fruit of this variety is more "normal" for Machaerium in contrast to the lunate, Drepanocarpus-type pods of var. latifolium and var. cristacastrense or the relatively short-winged fruit of var. leiophyllum.

MACHAERIUM OVALIFOLIUM Glaziou ex Rudd, sp. nov.

Machaerium ovalifolium Glaziou, Bull. Soc. Bot. France, Mem. 3: 147. 1906, nom. nud.

Machaerium ovalifolium Glaziou ex Hoehne, Fl. Brasílica 25(3): 37. 1941, in Portuguese, without Latin diagnosis.

Arbor grandis, M. scleroxylo Tul. et M. nyctitante (Vell.) Benth. affinis sed flores obtecti per bracteas ovatis confertis aequantibus notabilis; a M. scleroxylo foliolis fructibusque majoribus, a M. nyctitante fructibus basi latioribus differt.

Large tree; young stems ferrugino-or fulvo-tomentulose, glabrescent; stipules spinescent, indurated, straight, somewhat divaricate, to about 1.5 cm. long, 4 mm. wide at the base; leaves (7-) 11-15-foliolate, the axis about 4-10 cm. long, puberulent, glabrescent; leaves elliptic-oblong to obovate, 1-4 cm. long, 0.5-2 cm. wide, the apex obtuse to acute, usually apiculate, the base rounded to cuneate, the upper surface puberulent, glabrescent, the lower surface densely pubescent with lax or subappressed hairs, glabrescent, the venation reticulate; inflorescences axillary or terminal, the axes fulvo-tomentulose; lower bracts pubescent, deltoid, about 5 mm. long, 1-2 mm. wide, caducous; upper bracts pubescent, broadly ovate, 6-8 mm. long, 5-6 mm. wide enveloping the flowers, caducous; bracteoles obliquely spatulate, pubescent, 4 mm. long, 1 mm. wide; flowers 7-8 mm. long; calyx densely fulvo-pubescent, 4 mm. long, 2.5 mm. in diameter, the teeth deltoid, about 1 mm. long; petals reddish, the vexillum pubescent on the outer face; fruit winged, straight, fulvo-puberulent, glabrescent, 5-6 cm. long including stipe about 3 mm. long the body 1-1.5 cm. long, 1 cm. wide, the wing 3.5-4 cm. long, 1.5-1.7 cm. wide.

Type: A. Glaziou 13710, Brazil, Minas Gerais, Carandahy, 4 June 1882 (holotype P; isotypes G, P).

MACHAERIUM FALCIFORME Rudd, sp. nov.

Arbor vel arbuscula plerumque scandens M. lunato (L. f.) Ducke et M. microphyllo (E. Mey.) Standl. affinis; a M. lunato foliolis minoribus numerosioribus, fructibus subsessilibus; a M. microphyllo foliolis plerumque majoribus, fructibus falciformibus differt.

Tree or shrub, usually scandent, to about 30 m. tall; young stems puberulent, glabrescent; stipules spinescent, to about 10 mm. long, 2 mm. wide at the base, recurved; leaves (13-) 21-31-foliolate, the axis tomentulose, (5-) 7-11 cm. long; leaflets oblong, 5-20 mm. long, 3-5 mm. wide, obtuse at apex and base, the upper surface glabrous, the lower surface puberulent or glabrous; inflorescences terminal, paniculate, the axes ferrugino- or fulvo-tomentulose; bracts spinescent like the stipules; bracteoles pubescent, broadly ovate, 1-1.5 mm. long and wide; flowers 8-10 mm. long; calyx pubescent or subglabrous, sometimes setose, about 5 mm. long, the lobes 1 mm. long or less; petals blue, purple, or pink and white, the vexillum reflexed, moderately to sparsely pubescent on the outer face; fruit lunate or falciform, essentially sessile, cano-tomentulose, sometimes sparsely setose, glabrescent, 1-1.3 cm. wide, curved, forming a circle about 2.5 cm. in diameter.

Type: P. H. Gentle 4744, British Honduras, Toledo, Rio Grande, on river bank, 8 Aug. 1944 (holotype US 2329382; isotypes LJ, MEXU).

MACHAERIUM SARAENSE Rudd, sp. nov.

Arbol, primo adspectu M. amplo Benth. simule sed foliolis reticulati-nervatis haud crebri-nervatis; vere affinitate M. nyctitante (Vell.) Benth. et M. scleroxylo Tul. sed omnibus partibus glabris vel subglabris, ramis inermibus differt.

Tree about 8 m. tall, apparently unarmed; young stems glabrous or nearly so; stipules caducous, not seen; leaves 9-13-foliolate, the axis essentially glabrous, 3-4 cm. long; leaflets elliptic to obovate, 10-20 mm. long, 5-10 mm. wide, obtuse at the apex and base, the surfaces glabrous or sparsely pubescent with short, appressed hairs, the venation reticulate, the secondary veins inconspicuous; inflorescences terminal or axillary, the axes glabrous; bracts and bracteoles not seen; flowers about 8 mm. long; calyx 4-5 mm. long, apparently glabrous (only fragmentary flowers seen); fruit glabrous, winged, 6-7 cm. long including stipe 1-1.5 cm. long, the body about 1.5 cm. long, 8 mm. wide, the wing 3-4 cm. long, 1-1.2 cm. wide.

Type: J. Steinbach 6788, Bolivia, Santa Cruz, Sará, "camposregion, Rio Palometillas," 400 m. elev., 21 Dec. 1924 (holotype F; isotypes BM, G, K, MO, NY, U, UC, W).

ADDITIONAL NOTES ON THE GENUS *VERBENA*. XVI

Harold N. Moldenke

VERBENA RADICATA var. GLABRA (Hicken) Moldenke

Additional bibliography: Moldenke, Phytologia 24: 54. 1972.

Böcher and his associates (1963) describe this plant as a "Half-shrub, completely glabrous with large yellow flowers and very emarginate corolla lobes. According to Dr. Troncoso the anthers and their appendages are reduced, and the bracts lanceolate". They found the plant growing in arroyos and tributary valleys, at altitudes of 1900 to 2250 meters, flowering in November. They cite *Böcher, Hjerting, & Rahn 922, 938, & 1311* from Mendoza, Argentina.

VERBENA RAMBOI Moldenke

Additional bibliography: Moldenke, Phytologia 16: 197 & 203. 1968; Moldenke, Fifth Summ. 1: 178 (1971) and 2: 919. 1971.

VERBENA RAMULOSA R. A. Phil.

Additional bibliography: Reiche & Phil., Fl. Chil. 5: 289 & 293. 1910; Moldenke, Phytologia 11: 53—54. 1964; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 919. 1971.

VERBENA RECTA H.B.K.

Emended synonymy: *Verbena recta* Humb. & Bonpl. ex Steud., Nom. Bot. Phan., ed. 1, 873. 1821.

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 1, 873. 1821; Moldenke, Phytologia 16: 197. 1968; Moldenke, Fifth Summ. 1: 76 & 372 (1971) and 2: 661, 692, & 919. 1971; Moldenke, Phytologia 23: 293. 1972.

Recent collectors have found this species growing in pine or fir woods, maize or oats fields, and craters, at altitudes of 2500 to 3600 meters, flowering and fruiting from July to October. Beaman found it "in small open grassy meadows surrounded by *Abies* forest", Rowell says that it is "frequent in pine forests", and Vargas encountered it on "ladera andesítica con encinar abierto". The corollas are described as having been "purple" on *Díaz Luna 34*, *I. Martínez 124*, *J. Rzedowski 20443a*, and *Villegas D. 218*.

The *González Quintero 1178*, *S. López 89*, and *Ryesky 102*, distributed as *V. recta*, are actually *V. carolina* L., *Franco R. s.n.* [20.VIII.1967] is a mixture of *V. carolina* L. and *V. menthaefolia* Benth., *González Quintero 732* is *V. litoralis* H.B.K., and *Mears 441a* is a mint.

Additional citations: MEXICO: Federal District: *H. Hernández 26* (Ip); *J. Rzedowski 1926* (Ip), *20443a* (Au—243308, Ip); *Villegas D. 218* (Ip), *438* (Ip). Hidalgo: *Chávez O. s.n.* [4.VIII. 1963] (Ip); *González Quintero 243* (Ip, Mi); *E. C. West G. 1466* (Ws). México: *M. S. Fernández s.n.* [6.VIII.1967] (Ip); *I. Mar-*

tínez 124 (Ip); C. M. Rowell 2050 (Au—122623); Vargas N. 73 (Rf).. Michoacán: Beaman 4353 (Au—240679, Ca—1304923, W—2575718); Díaz Luna 34 (Ip). Morelos: Iñiguez s.n. [20.VII.1966] (Ip).

VERBENA REGNELLIANA Moldenke

Additional bibliography: Moldenke, Phytologia 11: 56--57. 1964; Moldenke, Fifth Summ. 1: 178 (1971) and 2: 919. 1971.

VERBENA REICHEI Acevedo de Vargas

Additional bibliography: Cabrera, Bol. Soc. Argent. Bot. 5: 96. 1953; Moldenke, Phytologia 11: 478. 1965; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 919. 1971.

According to Cabrera (1953) this species is found from Santiago to Concepción in Chile.

VERBENA REITZII Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 48: 10099. 1967; Moldenke, Phytologia 16: 197. 1968; Moldenke, Fifth Summ. 1: 178 (1971) and 2: 919. 1971.

VERBENA REITZII var. CASTRENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 14: 295. 1967; Moldenke, Biol. Abstr. 48: 10099. 1967; Moldenke, Fifth Summ. 1: 178 (1971) and 2: 919. 1971.

Additional citations: BRAZIL: Paraná: Smith, Klein, & Hatschbach 14526 (N—isotype).

VERBENA RIBIFOLIA Walp.

Additional & emended bibliography: Briq. in Chod. & Wilczek, Bull. Herb. Boiss., sér. 2, 2: 543. 1902; Reiche & Phil., Fl. Chil. 5: 285 & 286. 1910; Cabrera, Bol. Soc. Argent. Bot. 5: 96. 1953; Moldenke, Phytologia 14: 295. 1967; Moldenke, Fifth Summ. 1: 193 & 202 (1971) and 2: 919. 1971.

The species has been collected in flower and fruit in March. Briquet (1902) cites Wilczek 50 from Mendoza, Argentina.

Additional citations: ARGENTINA: Santiago del Estero: Pierotti 55 (N), "h" (Au—270830).

VERBENA RIBIFOLIA f. ALBA Acevedo de Vargas

Additional bibliography: Cabrera, Bol. Soc. Argent. Bot. 5: 96. 1953; Moldenke, Phytologia 13: 259. 1966; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 919. 1971.

VERBENA RIBIFOLIA var. FOETIDA (R. A. Phil.) Acevedo de Vargas

Additional bibliography: Cabrera, Bol. Soc. Argent. Bot. 5: 96. 1953; Moldenke, Phytologia 11: 478. 1965; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 668 & 919. 1971.

VERBENA RIBIFOLIA var. LONGAVINA (R. A. Phil.) Acevedo de Vargas

Additional bibliography: Cabrera, Bol. Soc. Argent. Bot. 5: 96. 1953; Moldenke, Phytologia 11: 60--62. 1964; Moldenke, Fifth Summ.

1: 193 (1971) and 2: 681 & 919. 1971.

VERBENA RIGIDA Spreng.

Additional & emended bibliography: Jan, Elench. Pl. 1. 1824; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1, 236 (1870), ed. 1, pr. 2, 236 (1871), ed. 1, pr. 3, 236 (1872), ed. 1, pr. 4, 236 (1873), ed. 1, pr. 5, 236 (1874), and ed. 1, pr. 6, 236. 1875; O. R. Willis in A. Wood, Am. Bot. & Flor., ed. 2, 236. 1889; L. H. Bailey in A. Gray, Field For. & Gard. Bot., ed. 2, 341. 1895; Reiche & Phil., Fl. Chile 5: 283--285. 1910; Fyson, Fl. Nilg. & Puln. Hill-tops 1: 319 & 320 (1915) and 2: pl. 213. 1915; F. W. Pennell, Bull. Torrey Bot. Club 46: 186. 1919; Lázaro e Ibiza, Comp. Fl. Españ., ed. 3, 3: 297. 1921; Macself in Sanders, Encycl. Gard., ed. 21, pr. 1, 457 (1931) and ed. 21, pr. 2, 457. 1934; Cheymol, Bull. Soc. Chim. Biol. 19: 1647--1653. 1937; Noack, Biol. Zentralbl. 57: 384 & 386, fig. 8. 1937; Cheymol, Journ. Pharm. Chim., ser. 8, 25: 110--117. 1937; Anon., Chem. Abstr. 31: 7473 (1937) and 32: 2977. 1938; Macself in Sanders, Encycl. Gard., ed. 21, pr. 3, 457 (1938) and ed. 21, pr. 4, 457. 1942; E. L. D. Seymour, New Gard. Encycl., ed. 3, 1279. 1944; Macself in Sanders, Encycl. Gard., ed. 21, pr. 5, 457 (1945) and ed. 21, pr. 6, 457. 1946; E. L. D. Seymour, New Gard. Encycl., ed. 4, 1279. 1946; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 1, 457. 1950; E. L. D. Seymour, New Gard. Encycl., ed. 5, 1279. 1951; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 2, 506 & 507. 1952; Cabrera, Man. Fl. Alred. Buenos Aires 395. 1953; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 3, 506 & 507. 1956; Barroso, Rodriguésia 32: 70. 1957; Schnack, Fehleisen, & Cocucci, Revist. Fac. Agron. La Plata 35: 49, [54], & 55, fig. 3. 1959; Withamfogg in Kiaer & Hancke, Gard. Fls. Colour, pr. 1, 127 & 190, fig. 490. 1959; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 617. 1960; Lewis & Oliv., Am. Journ. Bot. 48: [639]--641, fig. 23. 1961; M. Gray, Contrib. N. S. Wales Nat. Herb. 3: 61. 1961; Willaman & Schubert, Agr. Res. Serv. U. S. Dept. Agr. Tech. Bull. 1234: 237. 1961; Hartl, Beitr. Biol. Pfl. 37: 293, 296, & 300, fig. 28. 1962; Anon., Cat. Sem. Hort. Bot. Univ. Valent. 27. 1963; Hocking, Excerpt. Bot. A. 6: 91. 1963; E. L. D. Seymour, Wise [New] Gard. Encycl., ed. 6, 1279. 1963; Balakrishnan, Bull. Bot. Surv. India 6: 87. 1964; Radford, Ahles, & Bell, Guide Vasc. Fl. Carol. 281 & 282. 1964; E. L. D. Seymour, Wise [New] Gard. Encycl., ed. 7, 1279. 1964; T. M. Simpson, Gard. South. Afr. 87. 1964; Angely, Fl. Anal. Paran., ed. 1, 573. 1965; Backer & Bakh., Fl. Java 2: 596. 1965; Martínez-Crovetto, Bonplandia 2: 39, 52, 53, 59, & 70. 1965; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 128--129. 1965; J. W. Vickery, Contrib. N. S. Wales Nat. Herb. 3: 478. 1965; T. H. Everett, Reader's Digest Compl. Book Gard. 153. 1966; Hirata, Host Range & Geogr. Distrib. Powd. Mild. 277. 1966; Yotaro, Gard. Pl. World 3: 128, pl. 64, fig. 5. 1966; H. C. D. de Wit, Pl. World High. Pl. 2: 183. 1967; Ewan, Southwest. La. Journ. 7: 11 & 42. 1967; E. Lawrence, South. Gard., ed. 2, 114, 172, & 214. 1967; Rickett, Wild Fls. U. S. 2 (2): 462, [463], & 686, pl. 170. 1967; Zukowski in Pawlowskiego, Fl. Polsk. 11: 65. 1967; Martínez-

Crovetto, Bonplandia 1: 203. 1968; Moldenke, Phytologia 16: 197—199, 208, & 210. 1968; Moldenke, Résumé Suppl. 16: 1, 7, 8, 13, & 28 (1968) and 17: 7. 1968; Pullen, Jones, & Wats., Castanea 33: 333. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 267. 1969; Hansen, Bol. Mus. Munic. Funchal 24: 34. 1969; Hay & Synge, Dict. Gard. Pl. 177 & 369, pl. 1412. 1969; Rickett, Wild Fls. U. S. 3 (2): 364 & [367], pl. 111. 1969; Withamfogg in Kiaer & Hancke, Gard. Fls. Colour, pr. 5, 127 & 190, fig. 490. 1968; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 840 & xix, map 1395. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1314 & 1318. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1876 & 1877. 1970; E. L. D. Seymour, Wise [New] Gard. Encycl., ed. 8, 1279. 1970; Bostick, Castanea 36: 206. 1971; Guillarmod, Fl. Lesotho 236. 1971; Moldenke, Fifth Summ. 1: 23, 25, 27, 31—33, 47, 49, 60, 66, 76, 89, 92, 98, 101, 109, 111, 178, 184, 188, 190, 193, 202—204, 206, 255, 257, 262, 279, 312, 343, 349, 351, 372, & 402 (1971) and 2: 655, 666, 685, 693, 694, 705, 706, 708, 919, & 969. 1971; G. W. Park Seed Co., Park's Flower Book 1971: 75. 1971; Priszter, Delect. Sem. Spor. Pl. Hort. Bot. Univ. Hung. 59. 1971; D. Burpee, Burpee Seeds 1972: 56. 1972; Moldenke, Phytologia 22: 471, 477, & 478 (1972) and 23: 186, 421, & 427. 1972.

Additional & emended illustrations: Fyson, Fl. Nilg. & Puln. Hill-tops 2: pl. 213. 1915; Noack, Biol. Zentralbl. 57: 386, fig. 8. 1937; Schnack, Fehleisen, & Cocucci, Revist. Fac. Agron. La Plata 35: [54], fig. 3. 1959; Withamfogg in Kiaer & Hancke, Gard. Fls. Colour, pr. 1, 127, fig. 490 [in color] (1959) and pr. 5, 127, fig. 490 [in color]. 1968; Hartl, Beitr. Biol. Pfl. 37: 300, fig. 28. 1962; Yotaro, Gard. Pl. World 3: pl. 64, fig. 5 [in color]. 1966; Rickett, Wild Fls. U. S. 2 (2): [463], pl. 170 [in color] (1967) and 3 (2): [367], pl. 111 [in color]. 1969; Hay & Synge, Dict. Gard. Pl. 177, pl. 1412 [in color]. 1969.

Recent collectors have encountered this plant in sandy-loam soil in oak-pine associations, in sandy ditches with Juncus and grasses, on roadbanks, in full sunlight at the margins of pine woods, in sandy waste ground, and along weedy roadsides on river floodplains. Gray (1961) reports that it is now fairly common along roadsides in the Guyra area of New South Wales, while Healy refers to it as "a colony, garden escape", "a large colony in waste land", and "in grass along river, a well established garden escape" in New Zealand. McDaniel reports it as "locally common" in Lowndes County, Mississippi. Mueller-Dombois asserts that in Ceylon it is "probably escaped from cultivation". Ewan (1967) says "Verbena rigida is an introduced South American species, unknown in this state [Louisiana] before 1900, and so the species noticed by Bartram near Baton Rouge was more likely V. tenuisecta" Briq. [see under the latter species in this series of notes].

D'Arcy found V. rigida growing as scattered plants along roadside fences in Florida. Balakrishnan (1964) reports it cultivated in India. Lawrence (1967) tells us that in the southern United

States it starts blooming between April 30 and May 14 and ends in the autumn. Iltis and his associates found it growing in dry shallow soil of a prairie-like area on fossiliferous calcareous outcrops in Alabama. Pullen, Jones, & Watson (1968) record it from Adams, Amite, Clarke, Covington, Franklin, Hancock, Hinds, Jackson, Jasper, Jones, Lauderdale, Lawrence, Lincoln, Newton, Perry, Pike, Scott, Smith, Warren, Wayne, and Wilkinson Counties, Mississippi. Radford, Ahles, & Bell (1964) record it from waste ground and roadsides in the central parts of North Carolina north into Edgecombe and Martin Counties and south in the outer piedmont of South Carolina, blooming there from late March to July. Hansen (1969) reports it as escaped in Madeira and the Azores Islands. Fyson (1915) says of it "Native of Brazil. Common at Kodaikanal, where Mr. Tracey of the American Mission tells me it was introduced by him accidentally among grass seed. [Found now in the] Nilgiris: Ootacamund, Coonoor, etc., no doubt as a garden-escape". He cites Fyson 3061. He also notes that "Plants at Kew of the Himalayas and Nilgiris named by Clarke for F. B. I. [=Flora of British India] as V. bonariensis L. are V. venosa Gill and Hooker."

Lázaro e Ibiza (1921) describe V. rigida as "Hojas ásperas, oblongas, semi-abrazadoras, agudas, hendido-dentadas, rugosas, con nervios prominentes: brácteas más largas que el cáliz; corola lilácea o azulada. Fl. verano." Barroso (1957) describes it as "Planta pilosa com fôlhas lanceoladas, rijas, sésseis, amplexocaules, denteadas, agudas; flôres dispostas em espigas curtas; bracteola lanceolata longo acuminada, ciliada, com 6 mm de comprimento; cálice membranáceo piloso, denteado, com 3,5 mm de comprimento; corola com 1 cm de comprimento". He gives its distribution as "Sul de Brasil, Rio de Janeiro" and cites Campos Porto 1839 [RB 26050]. Troncoso (1965) gives its distribution as "Sur del Brasil, Paraguay, Bolivia, Uruguay, N. y NE. de la Argentina. Rara espontánea en la Provincia [Buenos Aires]. Muy cultivada especialmente en Europa, por sus flores vistosas". She cites Nicora 1988 (Si—3428) from Buenos Aires. Macbride (1960) states that V. rigida is "to be expected" in Peru, "has glandular inflorescences, bractlets and corolla tube longer than the calyx; probably more correctly classified as a variant [of V. bonariensis L.] as at least the glandular character varies in other specific entries. Said to be an introduction in Peru." I cannot agree that this taxon is only "a variant" of V. bonariensis: the two species are almost impossible to confuse.

Rickett (1969) states that V. rigida blooms from April to October and is found "in waste ground and fields on the coastal plain in eastern Texas and inland to the central part of the state; and eastward to Florida and North Carolina......It often forms large, showy colonies". Guillarmod (1971) cites Christol s.n. in the Paris herbarium, Guillarmod 36 in his own herbarium, Dieter 977 at Capetown, Strasbourg, & Zurich, and Jacollet 48 at Zurich. He gives its overall distribution as "E. Cape, Orange Free State, Transvaal" in South Africa.

The corollas are described as "violet-purple" by Hay & Synge (1969), "lavender" by Withamfogg (1959, 1968) and G. W. Park (1971) and on Webster & Wilbur 3352, "bright dark-mauve" on Bayliss BS. 3603, "purple" on Anway 465 and D'Arcy 1619, "blue" on Mueller-Dombois 68051848 and Guillaumin 8495, and "violet" on Hatschbach 14511 & 15492 and S. McDaniel 2165.

Schnack and his associates (1959) report that the species is apomictic in its reproduction. Junell (1934), Dermen (1936), Noack (1937), Schnack, Fehleisen, & Cocucci (1959), Lewis & Oliver (1961), and Bolkhovskikh & his associates (1969) all report the chromosome number as 2n = 42. Stachyose is reported from the plant by Cheymol (1937). Hirata (1966) records the fungus, Oidium sp. (a powdery mildew) as parasitizing Verbena rigida in Ceylon.

Priszter (1971) offers seeds to the horticultural trade as his seed number 1671. Hay & Synge (1969) describe the species as follows: "Summer...Fl. violet-purple borne on erect, rigid stems. 1 1/2 — 2 ft. L[eaves] oblong, rigid and toothed. Roots tuberous. Effective when planted in bold groups in a sunny border in well-drained garden soil. In exposed gardens the tubers should be lifted and stored in the same manner as dahlias. Propagate in spring by removing young shoots with a small piece of tuber attached. This is best done from tubers in boxes in a warm house."

Material has been misidentified and distributed in some herbaria as V. stricta Vent. On the other hand, the Legg s.n. [4-6-64], distributed as V. rigida, is actually V. bipinnatifida Nutt., Amano 7373 is V. bonariensis L., and Pedersen 1307 is V. rigida var. obovata (Hayek) Moldenke. Iltis & Univ. Wisc. Pl. Geogr. Field Trip 25126 is a mixture with something non-verbenaceous and C. Ritchie 57 is also a mixture.

Additional citations: NORTH CAROLINA: Sampson Co.: Ahles & Laing 24480 (N, Se—199419). SOUTH CAROLINA: Richland Co.: Logue 976 (Au—257342). GEORGIA: Fulton Co.: P. O. Schallert 1961 (Go). FLORIDA: Alachua Co.: D'Arcy 1619 (N, W—2567475). ALABAMA: Sumter Co.: Iltis & Univ. Wisc. Pl. Geogr. Field Trip 25126, in part (Ws). MISSISSIPPI: Adams Co.: Jones & Hudson 11612 (Au—260932). Forrest Co.: K. E. Rogers 2231 (N). Lowndes Co.: S. McDaniel 2165 (N). Rankin Co.: Webster & Wilbur 3352 (N). Wilkinson Co.: Jones, Hudson, & Noble 13486 (N). LOUISIANA: East Baton Rouge Par.: Joor s.n. [June 11, 1874] (W—2607111). Saint Tammany Par.: R. J. Lemaire 660 (W—2587416a); K. E. Rogers 2247 (N). West Feliciana Par.: R. D. Thomas & al. 11418 (N). TEXAS: Harris Co.: L. C. Higgins 3930 (N); E. J. Palmer 12001 (Au—122626). Jefferson Co.: H. Gentry 53-229 (Au—122625). San Jacinto Co.: Gould & Reeves 8230 (Lk). Travis Co.: Tharp s.n. [Austin, 5/2/35] (Lk). Walker Co.: E. J. Palmer 12038 (Au—122627). BRAZIL: Paraná: Hatschbach 14511 (W—2563891), 15492 (W—2564723), 20479 (Ac); Reitz & Klein 17672 (N, W—2548337); Stellfeld 1521 (W—2527780). URUGUAY: Rosengurtt B.5301 (Se—126973). ARGENTINA: Corrientes: Ibarrola 3869 (Se—130307). Misiones: G. J. Schwarz 6433 (N). SWEDEN: C. Blom s.n. [21/9/1958] (Go). SOUTH AFRICA: Cape Province: Bayliss BS.3603 (W—2564567). Transvaal: Dahlstrand 176 (Go). 177 (Go). INDIA: Madras: Prain s.n. [Coonoon, Feb. 11, 1899] (Ed). State undetermined: C. Ritchie 57, in part (Ed). CEYLON: Mueller-Dombois 68051848 (W—2612115). RYUKYU ISLAND ARCHIPELAGO: Okinawa: Kanasiro 5828 (Ta). NEW CALEDONIAN ISLANDS: New Caledonia: Guillaumin 8495 (N). AUSTRALIA: New South Wales: Tilden 610 (W—2510092). Western Australia: Anway 465 (N). NEW ZEALAND: South: Healy 58/655 (Nz—121457), 60/40 (Nz—122788), 66/249 (Nz—172667). CULTIVATED: California: H. Evans s.n. [Santa Monica] (Sd—36459); Jerabek s.n. [Naval Hospital grounds, June 1945] (Sd—26458), s.n. [Franceschi Park, July 1945] (Sd—36694); W. R. Russell s.n. [June 21, 1965] (Se—229959). New York: A. L. Moldenke s.n. [September 15, 1969] (Ps—1021). North Carolina: W. C. Coker s.n. [10/2/36] (Se—162928).

VERBENA RIGIDA var. ALBA (Trivetts) Moldenke
Additional bibliography: Moldenke, Phytologia 11: 95. 1964; Moldenke, Fifth Summ. 1: 372 (1971) and 2: 919. 1971.

VERBENA RIGIDA var. GLANDULIFERA Moldenke
Additional synonymy: Verbena rigida f. glandulifera Moldenke, Phytologia 13: 260. 1966.
Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 573. 1965; Moldenke, Phytologia 13: 260. 1966; Moldenke, Fifth Summ. 1: 178 (1971) and 2: 693 & 919. 1971.

VERBENA RIGIDA var. LILACINA (Benary & Bodger) Moldenke
Additional bibliography: Moldenke, Résumé Suppl. 16: 28. 1968; Moldenke, Phytologia 16: 199. 1968; Moldenke, Fifth Summ. 1: 372 (1971) and 2: 693 & 919. 1971.

VERBENA RIGIDA var. OBOVATA (Hayek) Moldenke
Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 573. 1965; Moldenke, Phytologia 13: 260. 1966; Moldenke, Fifth Summ. 1: 178, 188, 190, & 202 (1971) and 2: 693 & 919. 1971.
In addition to the months previously reported by me, this plant has been collected in anthesis in November and in fruit from February to April, July, and September to November. Pedersen reports that it is fairly common on moist soils of not too dry grasslands in Corrientes, Argentina. Vernacular names reported for it are "margarita" and "margarita azul". The corollas are described as having been "blue" on Montes 665, "heavenly blue" on Montes 14735, and "violet" on G. J. Schwarz 1204, 4989, & 5063. Montes 665 appears to be a mixture with typical V. rigida Spreng.

Additional citations: BRAZIL: Rio Grande do Sul: Palacios & Cuezzo 592 (N), 1452 (N). PARAGUAY: Hassler 8911 (Ca—950522). ARGENTINA: Corrientes: Pedersen 1307 (N); Pierotti 6652 (N). Formosa: I. Morel 6407 (N). Misiones: Bertoni 1513 (N); Krapovickas, Cristóbal, Maruñak, Pire, & Tressens 15329 (Rf); Montes 665, in part (N), 14735 (Au—271292, N, Rf); G. J. Schwarz 1204 (N), 4989 (N), 5063 (N), 5626 (N); Schwindt 427 (N).

VERBENA RIGIDA var. REINECKII (Briq.) Moldenke

Additional bibliography: Moldenke, Phytologia 11: 479. 1965; Moldenke, Fifth Summ. 1: 178, 188, & 202 (1971) and 2: 655, 693, 706, & 919. 1971.

VERBENA RINCONENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 13: 260. 1966; G. Taylor, Ind. Kew. Suppl. 14: 142. 1970; Moldenke, Fifth Summ. 1: 76 (1971) and 2: 919. 1971.

García Saucedo encountered this plant in "bosque cerrado de Pinus-Quercus", flowering and fruiting in July. The corolla is described as having been "purple" on García Saucedo 173.

Additional citations: MEXICO: México: García Saucedo 173 (Ip); Hinton 8011 (Se—117443—isotype).

VERBENA RIPARIA Raf.

Additional bibliography: Radford, Ahles, & Bell, Guide Vasc. Fl. Carol. 282. 1964; Moldenke, Phytologia 16: 199. 1968; Moldenke, Fifth Summ. 1: 21 (1971) and 2: 704, 705, 793, & 919. 1971.

Radford, Ahles, & Bell (1964) report this species as rare on riverbanks in Caldwell and Stanly Counties, North Carolina. Curiously, they fail to include it in their key to the species of the genus. They aver that it blossoms in June and July.

Additional citations: VIRGINIA: Smyth Co.: J. K. Small s.n. [July 1, 1892] (Lk).

VERBENA ROBUSTA Greene

Additional bibliography: Howell, Marin Fl., ed. 1, 233. 1949; Abrams, Illustr. Fl. Pacif. States, pr. 1, 3: 610--612 & 616, fig. 4345. 1951; Ferris in Abrams & Ferris, Illustr. Fl. Pacif. States, pr. 1, 4: 651 & 730. 1960; J. H. Thomas, Fl. Santa Cruz Mtns., pr. 1, 294 & 434. 1961; Ferris in Abrams & Ferris, Illustr. Fl. Pacif. States, pr. 2, 4: 651 & 730. 1965; Boivin, Natur. Canad. 94: 642. 1967; Abrams, Illustr. Fl. Pacif. States, pr. 2, 3: 610--612 & 616, fig. 4345. 1967; Boughey, Mus. Syst. Bio. Univ. Calif. Irvine Res. Ser. 1: 82. 1968; Moldenke, Phytologia 16: 200 & 201. 1968; Moldenke, Résumé Suppl. 16: 1. 1968; Munz & Keck, Calif. Fl. 687, 688, & 1679. 1968; Munz, Suppl. Calif. Fl. 101. 1968; J. H. Thomas, Fl. Santa Cruz Mtns., pr. 2, 294 & 434. 1968; Howell, Marin Fl., ed. 2, 233. 1970; Rickett, Wild Fls. U. S. 4 (3): 540, [543], & 799, pl. 177 (1970) and 5 (2): [455], 456, & 666, pl. 152. 1971; Moldenke, Fifth Summ. 1: 66, 76, & 372 (1971) and 2: 686, 691, 693, & 919. 1971; Moldenke, Phytologia 23: 192 & 285--287. 1972.

Illustrations: Abrams, Illustr. Fl. Pacif. States, pr. 1, 3: 616, fig. 4345 (1951) and pr. 2, 3: 616, fig. 4345. 1967; Rickett, Wild Fls. U. S. 4 (3): [543], pl. 177 [in color] (1970) and 5 (2): [455], pl. 152 [in color]. 1971.

Recent collectors have found this plant growing in stream beds and in wet seepage areas underlain by serpentine rocks. Howell (1970) states that it is "occasional among seepages or along course of ephemeral vernal brooks" in Marin County, California; Boughey (1968) found it "occasional in wet places", while Thomas (1961), in the Santa Cruz Mountains area, found it at the "margins of ponds, riverbeds, low moist ground where water has stood during the winter, mainly on the eastern side of the Santa Cruz Mountains," flowering there from June to October. Hoover describes it as "erect and to 2 m. tall or even longer and bending over". The corollas are said to have been "lilac" on Hoover 9218. Boughey (1968) cites Boughey & Pembrook 1000 from Orange County, California. A common name recorded for the species is "robust vervain".

Boivin (1967) is of the opinion that the Née 90 specimen preserved in the Madrid herbarium and labeled as having been collected on Nootka Island, is mis-labeled, since the species is not otherwise known from that island. This opinion is very probably correct, since so many others of Née's specimens have been shown to be accompanied by erroneous locality notations in the Madrid herbarium.

The D. F. Howe s.n. [17 July 1964], distributed as V. robusta, is actually V. bracteata Lag. & Rodr.

Additional citations: CALIFORNIA: San Diego Co.: Cleveland s.n. [Sweetwater Valley] (Sd--6786). San Luis Obispo Co.: Hoover 8029 (Au--297804), 9218 (Au--297792). San Mateo Co.: A. R. Moldenke 2748 (Rf). Santa Clara Co.: L. S. Rose 65098 (Au--272832, N). Tuolumne Co.: A. R. Moldenke 3412 (Go). CHANNEL ISLANDS: Santa Cruz: C. B. Wolf 4160 (Se--109272).

VERBENA RUGOSA Mill.

Additional bibliography: Moldenke, Phytologia 11: 479. 1965; Moldenke, Fifth Summ. 1: 76 (1971) and 2: 620 & 919. 1971.

VERBENA RUNYONI Moldenke

Additional bibliography: Moldenke, Phytologia 14: 296. 1967; Rickett, Wild Fls. U. S. 3 (2): 365. 1969; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1315 & 1320. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke, Fifth Summ. 1: 60, 64, 76, & 372 (1971) and 2: 694 & 919. 1971; Moldenke, Phytologia 23: 242. 1972.

Runyon describes this plant on his labels as follows: "annual erect herb, tall; roots fibrous; stems hollow; bark green or dark-green; leaves dark-green, largest at base, oblong in outline, incised, toothed, or lobed; flowers in terminal spikes, no odor or with faint odor; fruit a small pubescent capsule; occasional in moist situations, open moist ground, ditches, in clay or clay-loam soil, in open fields, along roadsides, on banks and reseca bottoms, occasional in semi-dry fields, frequent or abundant in open ground, town lots, etc., scarce in damp situations, occasional along bank of Arroyo Colorado near La Feria bridge" in Cameron County, Texas. The fruits, of course, are not capsules. The corollas are described as having been "blue" on R. Runyon 2588, 2691, 2692, & 4187.

Additional citations: TEXAS: Cameron Co.: R. Runyon 2588 (Au--268737), 2691 (Au--266163), 2692 (Au--266147), 4187 (Au--266142), 4871 (Au--266165), 6011 (Au--269649).

VERBENA RUNYONI f. ROSIFLORA L. I. Davis

Emended synonymy: Verbena runyonii f. rosiflora L. I. Davis ex Moldenke, Alph. List Invalid Names 26, in syn. 1947; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1315 & 1320. 1970. Verbena runyonii rosiflora L. I. Davis ex Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970.

Additional bibliography: Moldenke, Phytologia 11: 111--112. 1964; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1315 & 1320. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke, Fifth Summ. 1: 60 (1971) and 2: 694 & 919. 1971.

VERBENA RUSSELLII Moldenke

Additional bibliography: Moldenke, Phytologia 11: 479. 1965; Moldenke, Fifth Summ. 1: 77 (1971) and 2: 919. 1971.

xVERBENA RYDBERGII Moldenke

Additional & emended bibliography: Rydb., Fl. Rocky Mtns., ed. 1, 740. 1922; Hitchc., Cronq., & Ownbey, Vasc. Pl. Pacif. Northwest 4: 244. 1959; Poindexter, Trans. Kans. Acad. Sci. 65: 409--411, 413, 415, & 417. 1962; Rydb., Fl. Rocky Mtns., ed. 2, 740. 1969; Swink, Pl. Chicago Reg. 427. 1969; Moldenke, Phytologia 16: 200. 1968; Cochrane, Rice, & Rice, Mich. Bot. 10: 183. 1971; Moldenke, Fifth Summ. 1: 14, 15, 35--37, 41, 44, 45, 52, & 53 (1971) and 2: 656, 673, 674, 688, 694, 697, 698, 704, & 919. 1971.

Hitchcock and his associates (1959) point out that the accepted binomial designation for this common natural hybrid is "a strictly synonymous nomenclatural substitute for the apparently quite legitimate name V. paniculato-stricta Engelm. Am. Journ. Sci. 46: 100. 1844, which, in turn was based on Geyer, banks of the Mississippi opposite St. Louis". My own view is that Engelmann's designation was not formally proposed as a binomial name, but merely as a description of what he supposed the constitution of the plant to be. It is probable that the Engelmann s.n. [St. Louis, July 1843], cited below, is part of the type collection, but the label is not identical, therefore I am not so considering it.

Cochrane and his associates (1971) found this plant growing in low weedy fields in Rock County, Michigan, and call it "Rydberg's vervain". Swink (1969) reports it from Cook and DeKalb Counties, Illinois. Poindexter gathered material of the hybrid in a small clearing, a broad ravine, and an overgrazed pasture in Kansas, flowering and fruiting in July and August. According to notations on the labels, he found the chromosome count to be n = 7 in Poindexter 229-11, where the pollen fertility was 92 percent; in his 201-53 the pollen fertility was 39 percent, in 201-52 it was 32 percent, and in 191-66 it was only 24 percent. In his 1962 work he compares the hybrid with its two parents. My son, Dr. Andrew R. Moldenke, of the University of California, Santa Cruz, informs me that 99 percent of the seeds of xV. rydbergii sent to him by me from freshly gathered material for growing in the experimental greenhouses at Stanford University proved to be aborted and infertile, even though originally collected from healthy and vigorous plants of the same season.

The W. H. Horr E.33, distributed as this hybrid, appears to be V. stricta Vent.

Additional citations: ILLINOIS: Henderson Co.: H. N. Patterson s.n. [Oquawka, July] (Pa). IOWA: Dickinson Co.: Shimek s.n. [Aug. 8, 1916] (Au—122736). KANSAS: Barber Co.: Poindexter 201-52 (N), 201-53 (N). Douglas Co.: Poindexter 191-66 (N), 229-11 (N). MISSOURI: Saint Louis: Eggert s.n. [Prairies, 19 August 1877] (Pa); Engelmann s.n. [banks of Mississippi, St. Louis, July 1842] (Au—122288), s.n. [St. Louis, July 1843] (Au—122286).

VERBENA SAGITTALIS Cham.

Additional bibliography: Moldenke, Phytologia 11: 120—121. 1964; Moldenke, Fifth Summ. 1: 178 (1971) and 2: 694 & 919. 1971.

VERBENA SALVIAEFOLIA Schrad. ex Steud., Nom. Bot. Phan., ed. 1, 874, nom. nud. 1821.

Bibliography: Steud., Nom. Bot. Phan., ed. 1, 874. 1821; Moldenke, Fifth Summ. 1: 375 (1971) and 2: 919. 1971.

Nothing is known to me about this supposed taxon except that it is listed by Steudel as a valid species, accredited to Schrader, with no literature citation of any sort. It is not listed in the "Index Kewensis" nor any of its supplements. It does not seem probable that it is conspecific with the later V. salviaefolia Hook. & Arn., which is a member of the genus Aloysia, or with Lippia salviaefolia Cham., also proposed much later.

VERBENA SANTIAGUENSIS (Covas & Schnack) Moldenke

Additional synonymy: Verbena santiaguensis Darlington & Wylie, Chrom. Atl., pr. 1, 323, nom. nud. 1955. Glandularia santiaguenensis Covas & Schnack ex Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715, sphalm. 1969.

Additional & emended bibliography: Schnack & Covas, Darwiniana 7: [71], 73--75, & 77--79, fig. 2 A & B, pl. 1 A & D & 5 A--G. 1945; Covas & Schnack, Darwiniana 7: 86 & 88. 1945; J. A. Clark, Card Ind. Gen. Sp. Var. issue 191. 1945; Moldenke, Phytologia 16: 200. 1968; Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1238 & 1239. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715. 1969; Moldenke, Biol. Abstr. 50: 12950. 1969; Hocking, Excerpt. Bot. A.15: 422. 1970; Solbrig, Princ. & Meth. Biosystem. 75, 76, 157, & 158, fig. 5-1. 1970; Moldenke, Fifth Summ. 1: 190, 202, & 372 (1971) and 2: 522, 683, 694, 700, & 919--920. 1971; Moldenke, Phytologia 23: 194, 284, 427, 431, & 436 (1972) and 24: 47--49. 1972.

Additional & emended illustrations: Schnack & Covas, Darwiniana 7: 78, fig. 2 A, pl. 1 A & 5 B. 1945; Solbrig, Princ. & Meth. Biosystem. 76, fig. 5-1. 1970.

Recent collectors have found this plant in anthesis in March and November, and in fruit in March, April, November, and December. The corollas are described as having been "violet" on P. Garcia 920 and as "lilac" on Rodriguez Vaquero 667. The chromosome number is given as 2n = 10 by Covas & Schnack (1944), Schnack & Covas (1945), Schnack & Gonzalez (1945), and Bolkhovskikh & his associates (1969). The Troncoso 353, cited below, was previously identified by other herbarium workers as Glandularia pulchella and then as Verbena erinoides.

Solbrig (1970) says of V. santiaguensis that it occupies open dry and semidry grassland in northern and central Argentina along with V. peruviana (L.) Britton and V. pulchella Sweet, that V. pulchella and V. santiaguensis "replace each other geographically, with the former growing in the cooler southern and eastern areas and the latter in the more subtropical northern and western areas". He continues "G. santiaguensis.....is larger than G. pulchella, with large leaves and flowers and less divided leaves."

Additional citations: ARGENTINA: Buenos Aires: Rodriguez Vaquero 667 (N); Troncoso 353 (W--2595182). Chaco: M. R. Malvárez 1268 (N). Córdoba: M. Ruíz Huidobro 407 (N). Santiago del Estero: P. Garcia 920 (N); T. Meyer 12730 (N).

VERBENA SANTIAGUENSIS (Covas & Schnack) Moldenke x V. PERUVIANA (L.) Britton

Synonymy: Glandularia santiaguensis x G. peruviana Schnack & Covas, Darwiniana 7: 73 & 75, in textu. 1945.

Bibliography: Schnack & Covas, Darwiniana 7: 73 & 75. 1945; Solbrig, Princ. & Meth. Pl. Biosystem. 157. 1970; Moldenke, Phytologia 23: 427 & 431. 1972.

Solbrig (1970) refers to a hybrid between these two species when he says "Hybrids between Glandularia santiaguensis and Glandularia peruviana are 50 % pollen sterile (Solbrig, 1968)". He does not formally describe the hybrid nor cite authenticating herbarium vouchers so that the identity of the putative parents can be verified, so I have refrained from assigning a binomial name to the hybrid.

VERBENA SANTIAGUENSIS (Covas & Schnack) Moldenke x V. PHLOGIFLORA Cham.

Synonymy: Glandularia santiaguensis x G. phlogiphlora Schnack & Covas, Darwiniana 7: 73 & 75, in textu. 1945.

Bibliography: Schnack & Covas, Darwiniana 7: 73 & 75. 1945; Moldenke, Phytologia 23: 427. 1972.

Nothing is known to me of this hybrid, presumably produced artificially in Argentina, except that it is referred to by Schnack & Covas in the above-mentioned reference.

VERBENA SANTIAGUENSIS (Covas & Schnack) Moldenke x V. PULCHELLA Sweet ex Solbrig, Princ. & Meth. Pl. Biosystem. 157--158. 1970.

Bibliography: Solbrig in Heywood, Mod. Meth. Pl. Tax. 1968; Solbrig, Princ. & Meth. Pl. Biosystem. 75 & 158. 1970; Moldenke, Fifth Summ. 2: 920 & 970. 1971; Moldenke, Phytologia 24: 48--49. 1972.

Solbrig (1970) refers to a natural hybrid between what he calls Glandularia santiaguensis and G. pulchella, but does not formally describe it or name it, nor does he cite any specimens that could be used as authentication. He refers to a work by himself in Heywood, Mod. Meth. Pl. Tax. (1968), not as yet seen by me. It is not at all certain to me just what the actual plants are to which he is referring as the parents, since it seems that his concept of at least one of these putative parental species differs from mine. I have therefore not assigned a binomial name as yet to the hybrid.

VERBENA SANTIAGUENSIS f. ALBIFLORA Moldenke

Bibliography: Moldenke, Phytologia 18: 295. 1969; Moldenke, Biol. Abstr. 50: 12950. 1969; Hocking, Excetpt. Bot. A.15: 422. 1970; Moldenke, Fifth Summ. 1: 202 (1971) and 2: 920. 1971.

Citations: ARGENTINA: Buenos Aires: Rodriguez Vaquero 666 (N--type).

VERBENA SCABRA Vahl

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 1, 874. 1821; Voigt, Hort. Suburb. Calc. 473. 1845; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1179. 1895; Abrams, Illustr. Fl. Pacif. States, pr. 1, 3: 610, 611, & 616, fig. 4342. 1951; Ferris in Abrams & Ferris, Illustr. Fl. Pacif. States, pr. 1, 4: 651 & 730. 1960; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 726 & 727. 1960; Radford, Ahles, & Bell, Guide Vasc. Fl. Carol. 281 & 282. 1964; Ferris in Abrams & Ferris, Illustr. Fl. Pacif. States, pr. 2, 4: 651 & 730. 1965; J. E. Moore, Castanea 30: 26. 1965; Abrams, Illustr. Fl. Pacif. States, pr. 2, 3: 610, 611, & 616, fig. 4342. 1967; Anon., Biol. Abstr. 49 (3): B.A.S.I.C. S.185. 1968; Moldenke, Biol. Abstr. 49: 1325. 1968; Moldenke, Phytologia 16: 200--201. 1968; Munz & Keck, Calif. Fl. 686, 687, &

1679. 1968; H. L. Mason, Fl. Marshes Calif., pr. 2, 677 & 877. 1969; Rickett, Wild Fls. U. S. 3 (2): 364--365 (1969) and 4 (3): 540 & 799. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1314 & 1319. 1970; Long & Lakela, Fl. Trop. Fla. 741, 742, & 961. 1971; Moldenke, Fifth Summ. 1: 21, 23, 25, 27, 31, 33, 47, 49, 60, 63, 66, 77, 92, 98, 99, 101, 106, & 396 (1971) and 2: 575, 690, 691, 694, 704, & 920. 1971; C. D. Adams, Flow. Pl. Jam. 627--628 & 846. 1972; Moldenke, Phytologia 22: 501 (1972) and 23: 192 & 229. 1972.

Additional illustrations: Abrams, Illustr. Fl. Pacif. States, pr. 1, 3: 616, fig. 4342 (1951) and pr. 2, 3: 616, fig. 4342. 1967.

Recent collectors have found this plant growing at the edge of streams, in marshy spots and seeps, in moist gravel in shaded canyons, on damp sandy flats, and on everglade prairies. The corollas are described as "pinkish-white" on Crutchfield 1976 and the common name "rough verbena" has been reported. Rickett (1969) describes the species as follows: "V. scabra may grow to be over 3 feet tall, with a single stem which may be unbranched. The leaves are toothed but not lobed or cleft, and rough ('scabrous'). There are several spikes. The blue corolla is about 1/3 inch long and its lobes spread less than 1/10 inch". He avers that in Texas it blooms from "March to December: in moist soil by water and in swamps from eastern, southern, and western Texas to California and Mexico, and eastward to Florida and North Carolina."

Radford, Ahles, & Bell (1964) report the species from the margins of marshes, frequently brackish, and often in shell deposits in the outer parts of the central portions of North Carolina and South Carolina, flowering there from May to October. Moore (1965) reports it from Yell County, Arkansas. Adams (1972) gives its overall distribution as Bermuda, the southeastern United States, Mexico, and the Greater Antilles, and cites Adams 10967, Harris 9937, and Howard & Proctor 14546 from Jamaica.

Material of V. scabra has been misidentified and distributed in some herbaria as V. macdougalii Heller. On the other hand, the Abrigo s.n. [April 12, 1963], distributed as V. scabra, is actually V. cloverae Moldenke, while L. C. Crawford 1053 is V. simplex Lehm.

Additional citations: NORTH CAROLINA: Chowan Co.: Ahles & Duke 47840 (N). SOUTH CAROLINA: Beaufort Co.: Ahles & Bell 15630 (Se--194381, Se--194382, Se--195466). FLORIDA: Dade Co.: Craighead s.n. [11 April 1961] (Ft--10925); Gillis 7058 (Rf); J. K. Small 8090 (N). Lee Co.: J. K. Small s.n. [Punta Rassa, May 1928] (N). ARIZONA: Pima Co.: Pringle s.n. [July 18, 1884] (Pa). Yavapai Co.: Crutchfield 1976 (Ld). CALIFORNIA: Los Angeles Co.: S. F. Blake 632 [Herb. Blake 1590] (Ld), 676 [Herb. Blake 1637] (Ld), 788 [Herb Blake 1750] (Ld), 855 [Herb. Blake 1820] (Ld). San Bernardino Co.: Parish & Parish 1043 (Pa); Roos & Roos 5307 (W--2567361). Santa Barbara Co.: H. M. Pollard s.n. [Aug. 9, 1964] (Au--273433). MEXICO: Coahuila: Johnston & Muller 877 (Au--301657, Mi). JAMAICA:

Barkley & Bouthillette 38711 (Ac).

VERBENA SCABRA f. ANGUSTIFOLIA Moldenke

Synonymy: Verbena scabra angustifolia Moldenke ex Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970.

Additional bibliography: Anon., Biol. Abstr. 49 (3): B.A.S.I.C. S.185. 1968; Moldenke, Biol. Abstr. 49: 1325. 1968; Moldenke, Phytologia 16: 201. 1968; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1314 & 1319. 1970; Moldenke, Fifth Summ. 1: 60 (1971) and 2: 691, 694, & 920. 1971.

VERBENA SCABRELLA Sessé & Moc.

Additional bibliography: Moldenke, Phytologia 11: 133. 1964; Moldenke, Fifth Summ. 1: 77 (1971) and 2: 645 & 920. 1971.

xVERBENA SCHNACKII Moldenke

Additional synonymy: Glandularia peruviana x megapotámica Schnack & Covas, Revist. Argent. Agron. 12: 224. 1945.

Additional bibliography: Moldenke, Phytologia 11: 134. 1964; Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1239. 1968; Solbrig, Princ. & Meth. Pl. Biosystem. 76. 1970; Moldenke, Fifth Summ. 1: 372 (1971) and 2: 522, 683, 689, & 920. 1971; Moldenke, Phytologia 23: 373. 1972.

Solbrig (1970) says that "The cross between G. peruviana and G. megapotamica, for example, was approximately 65 %. pollen fertile."

VERBENA SCHULZII Moldenke

Additional bibliography: Moldenke, Phytologia 11: 135—136. 1964; Moldenke, Fifth Summ. 1: 202 (1971) and 2: 920. 1971.

xVERBENA SCORTA Moldenke

Additional bibliography: Moldenke, Phytologia 11: 136. 1964; Moldenke, Fifth Summ. 1: 372 (1971) and 2: 672, 679, & 920. 1971.

VERBENA SCROBICULATA Griseb.

Additional bibliography: Moldenke, Phytologia 13: 261. 1966; Moldenke, Fifth Summ. 1: 190, 202, & 372 (1971) and 2: 675, 695, & 920. 1971.

Recent collectors have found this plant in flower in January and in fruit in January and July. The corollas are described as having been "whitish" on Willink 159.

The Rodrigues Villegas 907, distributed as V. scrobiculata, is actually V. incisa Hook.

Additional citations: ARGENTINA: Salta: Pierotti 1236 (N), "h" [Herb. Inst. Miguel Lillo 7] (N), "h" [Herb. Inst. Miguel Lillo 115] (N); Schulz & Varela 5267 (N); Willink 159 (N), s.n. [Herb.

Inst. Miguel Lillo 106867] (N).

VERBENA SEDULA Moldenke

Synonymy: Verbena sedula var. sedula Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 506. 1971.

Additional bibliography: Hocking, Excerpt. Bot. A.7: 206. 1964; Moldenke, Résumé Suppl. 16: 5 & 28. 1968; Moldenke, Phytologia 16: 201 & 340—342 (1968) and 18: 211. 1969; Anon., Biol. Abstr. 50 (1): B.A.S.I.C. S.194. 1969; Moldenke, Biol. Abstr. 50: 418 & 7999. 1969; Hocking, Excerpt. Bot. A.14: 206 (1969) and A.18: 444. 1971; Moldenke, Fifth Summ. 1: 138 (1971) and 2: 695 & 920. 1971; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 504, 506, & 508. 1971; Wiggins & Porter, Fl. Galáp. Isls. 997. 1971; Moldenke, Phytologia 23: 185. 1972.

VERBENA SEDULA var. DARWINII Moldenke, Phytologia 16: 341. 1968.

Synonymy: Verbena polystachya var. foliis incisis segmentis grossè serratis Hook., Trans. Linn. Soc. Lond. Bot. 20: 195. 1847. Verbena polystachya var. foliis incisis, laciniis grosse serratis Hook. apud N. J. Anderss., Galap. Veg. 81, in syn. 1859. Verbena sedula darwinii Moldenke ex Anon., Biol. Abstr. 50 (1): B.A.S.I.C. S.194. 1969.

Bibliography: Hook., Trans. Linn. Soc. Lond. Bot. 20: 195. 1847; N. J. Anderss., Vet. Akad. Handl. Stockh. 1853: 199—200. 1853; N. J. Anderss., Galap. Veg. 81. 1859; Hocking, Excerpt. Bot. A.7: 206. 1964; Moldenke, Phytologia 16: 340—341. 1968; Moldenke, Résumé Suppl. 16: 5 & 28. 1968; Anon., Biol. Abstr. 50 (1): B.A.S.I.C. S.194. 1969; Hocking, Excerpt. Bot. A.14: 206. 1969; Moldenke, Biol. Abstr. 50: 418. 1969; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 506 & 508. 1971; Wiggins & Porter, Fl. Galáp. Isls. 997. 1971; Moldenke, Fifth Summ. 1: 138 (1971) and 2: 690, 695, & 920. 1971; Moldenke, Phytologia 23: 185. 1972.

This variety is known thus far only from the type collection.

Citations: GALAPAGOS ISLANDS: James: C. Darwin s.n. [beginning of October, 1835] (Cu—type).

VERBENA SEDULA var. FOURNIERI Moldenke, Phytologia 18: 211. 1969.

Bibliography: Moldenke, Phytologia 18: 211. 1969; Moldenke, Biol. Abstr. 50: 7999. 1969; Hocking, Excerpt. Bot. A.18: 444. 1971; Moldenke, Fifth Summ. 1: 138 (1971) and 2: 920. 1971; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 506 & 508. 1971; Wiggins & Porter, Fl. Galáp. Isls. 997. 1971.

This variety, known only from two collections, has been found growing along roadsides and beside a small pond, at altitudes of 200 to 500 meters, flowering in February. The corollas are said to have been "white" on L. A. Fournier 276.

Citations: GALAPAGOS ISLANDS: Chatham: L. A. Fournier 269 (Z—type), 276 (Rf).

VERBENA SELLOI Spreng.

Additional synonymy: Verbena pulchella gracilior (Troncoso)

Shinners apud Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970.

Additional & emended bibliography: Troncoso, Darwiniana 13: 468--470, 476, & 481--484, fig. 6. 1964; J. A. Clark, Card Ind. Gen. Sp. Var. issue 248 (1964) and issue 251. 1965; Solbrig, Castanea 30: 173--174. 1965; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 137 & 139. 1965; Solbrig, Biol. Abstr. 47: 2870. 1966; Hocking, Excerpt. Bot. A.11: 123. 1967; Moldenke, Phytologia 16: 201. 1968; Moldenke, Résumé Suppl. 16: 6, 22, 26, & 28. 1968; G. Taylor, Ind. Kew. Suppl. 14: 63. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1323. 1970; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 207. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke, Fifth Summ. 1: 178, 190, 202, & 372 (1971) and 2: 522, 619, 691, & 920. 1971.

Hunziker describes this plant as decumbent. It has been collected in fruit in February, April, and November. The vernacular names, "margarita morada" and "yerba meona", have been recorded for it. The corollas are described as having been "lilac" on J. H. Hunziker 384 & 1990, "blue" on Ruíz Huidobro 1176 & 1271, "violet" on Hatschbach 13674, and "intense lilac" on Hatschbach 14968 & 14984. The Herter 181a [Herb. Herter 68181], cited below, was previously erroneously cited by me as V. tenera Spreng.

Additional citations: BRAZIL: Paraná: Hatschbach 13674 (W--2563852), 14968 (W--2564571), 14984 (W--2563951). Rio Grande do Sul: Palacios & Cuezzo 976 (N). Santa Catarina: J. Dias s.n. [Herb. Fac. Farmácia 5780] (W--2527807). URUGUAY: Herter 181a [Herb. Herter 68181] (Ca--278518). ARGENTINA: Buenos Aires: J. H. Hunziker 384 (N), 1990 (N); Ruíz Huidobro 1176 (N), 1271 (N). Salta: Garolera & Romero s.n. [21-I-1947] (N).

VERBENA SESSILIS (Cham.) Kuntze

Additional synonymy: Glandularia sessilis Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 205. 1970. Glandularia sessilis (Cham.) Tronc. ex Moldenke, Phytologia 23: 431. 1972.

Additional bibliography: Moldenke, Phytologia 16: 201. 1968; Moldenke, Résumé Suppl. 17: 3. 1968; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 205. 1970; Moldenke, Fifth Summ. 1: 178, 188, 190, & 202 (1971) and 2: 695, 697, & 920. 1971; Moldenke, Phytologia 23: 228 & 431. 1972.

In addition to the months previously reported by me, recent collectors have found this plant in anthesis in October and in fruit from September to November and in January, growing in low generally more or less flooded land. Schnack & Rubens (1970) record it from Corrientes, Argentina.

Verbena sessilis is certainly very closely related to V. stellarioides Cham. and I am not at all certain that it is worthy of specific distinction.

Additional citations: ARGENTINA: Corrientes: Pedersen 9627 (N);

Pierotti 6692 (N). Formosa: I. Morel 3655 (N), 3940 (N), 4085 (N).

VERBENA SETACEA Perry

Additional bibliography: Moldenke, Phytologia 16: 201--202. 1968; Moldenke, Fifth Summ. 1: 77 (1971) and 2: 920. 1971.

Additional citations: MEXICO: Baja California: Wiggins & Thomas 187 (Mi).

VERBENA SHREVEI Moldenke

Additional bibliography: Moldenke, Phytologia 11: 479--480. 1965; Moldenke, Fifth Summ. 1: 77 (1971) and 2: 920. 1971.

VERBENA SIMPLEX Lehm.

Additional synonymy: Verbena simplex Michx. ex Moldenke, Fifth Summ. 2: 695, in syn. 1971. Verbena simplex Vent. ex Moldenke, Fifth Summ. 2: 695, in syn. 1971.

Additional & emended bibliography: Balbis, Cat. Stirp. Hort. Acad. Taur. 80. 1813; Pers., Sp. Pl. 3: 347. 1819; Steud., Nom. Bot. Phan., ed. 1, 873 & 874. 1821; Beck, Bot., ed. 1, 284. 1833; A. Wood, Class-book, ed. 1, 269 (1845), ed. 2, pr. 1, 412 (1847), ed. 2, pr. 2, 412 (1848), and ed. 10, pr. 1, 412. 1848; Beck, Bot., ed. 2, pr. 1, 285. 1848; A. Gray, Man. Bot., ed. 1, 312. 1848; A. Wood, Class-book, ed. 10, pr. 2, 412 (1849), ed. 10, pr. 3, 412 (1850), ed. 17, 412 (1851), ed. 23, 412 (1851), ed. 29, 412 (1853), ed. 35, 412 (1854), ed. 41, pr. 1, 412 (1855), and ed. 41, pr. 2, 412. 1856; Beck, Bot., ed. 2, pr. 2, 285. 1856; A. Gray, Man. Bot., ed. 2, pr. 1, 298 (1856), ed. 2, pr. 2, 298 (1858), and ed. 2, pr. 3, 298. 1859; A. Wood, Class-book, [ed. 42], pr. 1, 537. 1861; A. Gray, Man. Bot., ed. 3, 298 (1862) and ed. 4, pr. 1, 298. 1863; A. Wood, Class-book, [ed. 42], pr. 2, 537. 1863; A. Gray, Man. Bot., ed. 4, pr. 2, 298. 1864; A. Wood, Class-book, [ed. 42], pr. 3, 537 (1865) and [ed. 42], pr. 4, 537. 1867; A. Gray, Man. Bot., ed. 5, pr. 1, 340 (1867) and ed. 5, pr. 2, 340. 1868; A. Wood, Class-book, [ed. 42], pr. 5, 537. 1868; Beck, Bot., ed. 2, pr. 3, 285. 1868; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 1, 241--242 (1868) and ed. 1, pr. 2, 241--242. 1869; A. Wood, Class-book, [ed. 42], pr. 6, 537 (1869) and [ed. 42], pr. 7, 537. 1870; A. Gray, Man. Bot., ed. 4, pr. 3, 298. 1870; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1, 236 (1870), ed. 1, pr. 2, 236 (1871), and ed. 1, pr. 3, 236. 1872; A. Wood, Class-book, [ed. 42], pr. 8, 537. 1872; A. Wood, Am. Bot. & Flor., ed. 1, pr. 4, 236 (1873), ed. 1, pr. 5, 236 (1874), and ed. 1, pr. 6, 236. 1875; A. Wood, Class-book, [ed. 42], pr. 9, 537. 1876; A. Gray, Man. Bot., ed. 5, pr. 8, 340. 1878; A. Gray, Field For & Gard. Bot., ed. 1, pr. 3, 241--242. 1880; A. Gray, Man. Bot., ed. 5, pr. 8 [9], 340. 1880; A. Wood, Class-book, [ed. 42], pr. 10, 537. 1881; Meyncke, Bull. Brooksville Soc. Nat. Hist. 1: [Fl. Franklin Co.] 31. 1885; O. R. Willis in A. Wood, Am. Bot. & Flor., ed. 2, 236. 1889; S. Wats. & Coult. in A. Gray, Man. Bot., ed. 6, pr. 1, 402 (1889) and ed. 6, pr. 2, 402. 1890; Gattinger, Med. Fl. Tenn. 63--64. 1894; L. H. Bailey in A. Gray, Field For. & Gard. Bot., ed. 2, 341. 1895;

Graves, Eames, Bissell, Andrews, Harger, & Weatherby, Bull. Conn. Geol. & Nat. Hist. Surv. 14: [Cat. Flow. Pl.] 331. 1910; Britton & Br., Illustr. Fl., ed. 2, pr. 1, 3: 94 & 96, fig. 3555. 1913; Harshberger, Veg. N. J. Pine Barrens, pr. 1, 206, 254, & 257. 1916; Lowe, Miss. State Geol. Surv. Bull. 17: 237. 1921; Schnarf, Öst. Bot. Zeit. 74: 40--50. 1925; Tischler, Tabul. Biol. 4: 24. 1927; Harger, Bull. Conn. Geol. & Nat. Hist. Surv. 48: 74. 1930; Britton & Br., Illustr. Fl., ed. 2, pr. 2, 3: 94 & 96, fig. 3555. 1936; Noack, Biol. Zentralbl. 57: [383]--386, fig. 5. 1937; Britton & Br., Illustr. Fl., ed. 2, pr. 3, 3: 94 & 96, fig. 3555. 1943; Tatnall, Fl. Del. 218. 1946; Britton & Br., Illustr. Fl., ed. 2, pr. 4, 3: 94 & 96, fig. 3555. 1947; R. McVaugh, Bull. N. Y. State Mus. 360: 195. 1958; F. Bartley in J. C. Bartley, Bull. Ohio Biol. Surv., new ser., 1: 181. 1959; Dobbs, Fl. Henry Co. 230. 1963; Padmanabhan, Phytomorph. 14: 449. 1964; Radford, Ahles, & Bell, Guide Vasc. Fl. Carol. 281 & 282. 1964; Rouleau in Marie-Victorin, Fl. Laurent., ed. 2, 490. 1964; Hocking, Excerpt. Bot. A.9: 366 & 367. 1965; Hirata, Host Range & Geogr. Distrib. Powd. Mild. 276 & 277. 1966; Mohlenbrock, Castanea 31: 224 & 235. 1966; Bostick, Castanea 32: 150. 1967; Rickett, Wild Fls. U. S. 2 (2): 464, [465], & 686, pl. 171. 1967; Wherry, Bartonia 37: 13. 1967; Gunn, Castanea 33: 102. 1968; Lehr, Bull. Torrey Bot. Club 94: 544. 1968; Mohlenbrock, Trans. Ill. Acad. Sci. 61: 71. 1968; Moldenke, Phytologia 16: 202--203. 1968; Moldenke, Résumé Suppl. 16: 1 (1968) and 17: [1]. 1968; Peterson & McKenny, Field Guide Wildfls. 286, [287], & 418. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 716 & 717. 1969; W. E. Hopkins, Castanea 34: 46. 1969; Jervis, Castanea 34: 115. 1969; F. C. Seymour, Fl. New Eng. 456. 1969; Swink, Pl. Chicago Reg. 428. 1969; Britton & Br., Illustr. Fl., ed. 2, pr. 5, 3: 94 & 96, fig. 3555. 1970; Domville & Dunbar, John Burroughs Nat. Hist. Soc. Bull. 8: 94. 1970; El-Gazzar & Wats., New Phytol. 69: 456, 483, & 485. 1970; Harshberger, Veg. N. J. Pine Barrens, pr. 2, 206, 254, & 257. 1970; Joyal, Natural. Canad. 97: 564, 577, & 582, fig. 2 f. 1970; Anon., Biol. Abstr. 52: 3081. 1971; Anon., Biol. Abstr. 52 (6): B.A.S.I.C. S.245. 1971; Br. & Wherry, Bartonia 40: 13. 1971; Cochrane, W. E. Rice, & M. M. Rice, Mich. Bot. 10: 183. 1971; Moldenke, Fifth Summ. 1: 14--23, 25, 27, 31--36, 38--41, 44, 45, 47, 52, 53, & 372 (1971) and 2: 651, 652, 665, 672--675, 678, 679, 694, 695, 698, 769, & 920. 1971; Moldenke, Phytologia 23: 413 & 414. 1972.

Additional & emended illustrations: Britton & Br., Illustr. Fl., ed. 2, pr. 1, 3: 96, fig. 3555 (1913) and ed. 2, pr. 2, 3: 96, fig. 3555. 1936; Noack, Biol. Zentralbl. 57: 386, fig. 5. 1937; Britton & Br., Illustr. Fl., ed. 2, pr. 3, 3: 96, fig. 3555 (1943) and ed. 2, pr. 4, 3: 96, fig. 3555. 1947; Peterson & McKenny, Field Guide Wildfls. 287. 1968; Rickett, Wild Fls. U. S. 2 (2): [465], pl. 171 (in color). 1967; Britton & Br., Illustr. Fl., ed. 2, pr. 5, 3: 96, fig. 3555. 1970.

Recent collectors have found this plant growing in dry sunny or open ground, limestone or calcareous clay soil, open woods, poor soil, along black rocky limestone roadsides or roadsides over diabase soil, on tallgrass prairies, rocky bottoms, low ridges in marl regions, and chalk barrens, at altitudes of 320 to 2000 feet. McDaniel reports it as "occasional in open prairie on chalk" in Mississippi and Sudworth as "common in dry fields" in the District of Columbia. Cochrane & Rice (1971) report it from Rock County, Wisconsin, Brown & Wherry (1971) from Cape May County, New Jersey, Meyncke (1885) from Franklin County, Indiana, Lowe (1921) from Oktibbeha County, Mississippi, Gunn (1968) from Bullitt County, Kentucky, Mohlenbrock (1968) from Pope County, Illinois, Wherry (1967) from Delaware County, Pennsylvania, Bostick (1967) from Saint Clair County, Alabama, and Bartley (1959) from Jackson County, Ohio.

Domville & Dunbar (1970) report the species as "rare in dry or sandy soil" in Ulster County, New York, where they say it blooms in the summer; Harger (1930) cites M. Hitchcock s.n. [Cromwell, 1881] from Middlesex County, Connecticut, in the Wesleyan University herbarium; Hopkins (1969) cites W. E. Hopkins 356 from Pope County, Illinois; while McVaugh (1958) cites R. McVaugh 2239 and Hoysradt s.n. from Columbia County, New York, where he found it "appearing as if adventive". Rouleau (1964) records it from St. Hélène Island, Quebec, while Joyal (1970) cites Rouleau 1124 from nearby Soeur Island, where he says it was collected in 1943 and 1944 but is apparently extinct now due to urbanization of the area. Swink (1969) notes that in the Chicago region it is "Locally frequent in open ground, especially where limestone is near the surface, here associating with Amorpha canescens, Asclepias verticillata, Echinacea pallida, Petalostemon purpureum, Psoralea tenuiflora, and Verbena stricta. It sometimes grows on exposed limestone with Arenaria patula, Isanthus brachiatus, Satureja arkansana, and Scutellaria parvula. It also grows on the shoulders of gravel roads, often associating with Sporobolus vaginiflorus."

Tatnall (1946) avers that it is still "rather frequent" in the Piedmont of New Castle County, Delaware, and in the sandy fields and roadsides of the Coastal Plain southward to Sussex County, Delaware, and Dorchester County, Maryland, flowering from late May to July. Radford, Ahles, & Bell (1964) record the species from roadsides, meadows, and thickets, usually associated with basic soils, infrequent in the Piedmont in North Carolina south into Abbeville and York Counties, South Carolina, flowering there from May to September. Dobbs (1963) states that in Henry County, Illinois, it is "Infrequent to rare along railroad tracks where I have found it only in Sections 17 and 22, Geneseo Township. I also once found specimens on the high terrace border of the Illinois and Mississippi Canal in Section 15 of the same township."

Gattinger (1894) tells us that Verbena simplex is "A common weed along roadsides in the limestone regions of Middle Tennessee", flowering there from May to August, and that it "has locally gained some reputation used in infusion as a remedy in chronic dysentery". Hausman (1948) describes it as "Similar to Blue Vervain. Flowers pale bluish-violet, 1/4" across; clusters 2—4" long. Leaves 1 1/2 -- 3" long. Plant 1--2' high, rough-hairy; stems simple or branched, 4-sided above. Dry sandy fields. Massachusetts south to Florida; west to Minnesota, Kansas, Arkansas", flowering from June to August.

The corollas are described as having been "purple" on S. McDaniel 2597 and "pale blue-lavender" on Cronquist 5280. Dermen (1936), Noack (1937) and Bolkhovskikh & his associates (1969) report the chromosome number as 2n = 14. Hirata (1966) records the powdery mildew, Erysiphe cichoracearum P. DC., as parasitizing Verbena simplex in various parts of the United States.

The Tischler (1927) reference in the bibliography of this species is sometimes cited as "Pflanzliche Chromosomenzahlen".

Material of V. simplex has been misidentified and distributed in some herbaria as V. scabra Vahl.

Additional citations: NEW YORK: Queens Co.: A. Brown s.n. [Richmond Hill] (N). NEW JERSEY: Bergen Co.: Denslow s.n. [Lodi, July 1850] (Pa). Hudson Co.: A. Brown s.n. [Homestead] (N). PENNSYLVANIA: Delaware Co.: Canby s.n. [June 25, 1878] (Pa). Lehigh Co.: R. L. Schaeffer Jr. 35931 (W--2388866). DISTRICT OF COLUMBIA: Chickering s.n. [9-25-1873] (W--254982); Sudworth 538 (Mi), 750 (Mi). VIRGINIA: Amherst Co.: Canby s.n. [Monroe, Aug. 1858] (Pa). NORTH CAROLINA: Durham Co.: A. E. Radford 44754 (Au--250912, W--2499508). Granville Co.: A. E. Radford 43888 (Se--212829); Radford & O'Briant 45472 (Au--272510, N). SOUTH CAROLINA: Aiken Co.: Canby s.n. [Aiken, May 1869] (Pa). GEORGIA: Walker Co.: Cronquist 5280 (Mi). ALABAMA: Dallas Co.: Small & Wherry 12584 (N). Hale Co.: L. C. Crawford 1053 (Au--122684). MISSISSIPPI: Noxubee Co.: S. McDaniel 2597 (N). ILLINOIS: Marion Co.: M. S. Bebb s.n. [Salem, 1860] (Pa, W--2549483). Marshall Co.: V. H. Chase 10660 (N). INDIANA: Porter Co.: H. R. Bennett s.n. [August 18, 1957] (Se--178916). Warren Co.: R. C. Friesner 22854 (Au--122683). KENTUCKY: Boyle Co.: M. E. Wharton 1002 (Mi). Henry Co.: J. L. Gentry Jr. 200 (N). Madison Co.: Fothergill s.n. [May 30, 1937] (Mi). Nelson Co.: M. E. Wharton 2058 (Mi). Rockcastle Co.: M. E. Wharton 2595 (Mi). County undetermined: Engelmann s.n. [Central Kentucky, Aug. 1876] (Pa). WISCONSIN: Sauk Co.: T. J. Hale s.n. [Baraboo, 1861] (Pa). KANSAS: Coffey Co.: Birkholz 2419 (N). Douglas Co.: W. H. Horr E.76 (N, Se--183522). Labette Co.: S. Stephens 11037 (N). ARKANSAS: Clark Co.: Demaree 58441 (Rf). Stone Co.: Demaree 58201 (Ac). OKLAHOMA: Cherokee Co.: C. S. Walker 535 (Au--122685). Rogers Co.: Stratton 7004 (Lk). LOCALITY OF COLLECTION UNDETERMINED: J. Macoun s.n. [Dry rocky ground, June 1865] (Pa).

VERBENA SIMPLEX f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 264. 1966;

Moldenke, Fifth Summ. 1: 44 (1971) and 2: 920. 1971.

VERBENA SIMPLEX var. EGGERTI Moldenke
Additional bibliography: Moldenke, Phytologia 11: 480. 1965; Moldenke, Fifth Summ. 1: 18, 38, 44, & 46 (1971) and 2: 695 & 920. 1971.
Lehr found this plant in flower and fruit in August.
Additional citations: NEW YORK: Rockland Co.: Lehr 1203 (N).

VERBENA SINUATA Grieve & Leyal
Additional bibliography: Moldenke, Phytologia 16: 203. 1968; Moldenke, Résumé Suppl. 16: 13. 1968; Moldenke, Fifth Summ. 1: 375 (1971) and 2: 920. 1971.

xVERBENA SOLBRIGII Moldenke
Emended synonymy: Glandularia laciniata x peruviana Schnack & Solbrig, Revist. Fac. Agron. La Plata 29: [255]—266, fig. 1—4. 1953.
Additional & emended bibliography: Schnack & Solbrig, Revist. Fac. Agron. La Plata 29: [255]—266, fig. 1—4. 1953; Schnack, Fahleisen, & Cocucci, Revist. Argent. Agron. 24: 135. 1957; Moldenke, Phytologia 14: 297. 1967; Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1239. 1968; Moldenke, Fifth Summ. 1: 372 (1971) and 2: 521, 689, 700, & 920. 1971.
Emended illustrations: Schnack & Solbrig, Revist. Fac. Agron. La Plata 29: 257, 259, & 261, fig. 1—4. 1953.

VERBENA SPECTABILIS Moldenke
Additional bibliography: Moldenke, Phytologia 11: 181—182. 1964; Moldenke, Fifth Summ. 1: 202 (1971) and 2: 920. 1971.
In addition to months previously reported by me, this species has been collected in anthesis in March. The corollas are described as having been "purple" on Pedersen 4484 and "red" on Krapovickas, Cristóbal, Maruñak, Pire, & Tressens 14985.
Additional citations: ARGENTINA: Corrientes: Pedersen 4484 (Au—246077). Misiones: Krapovickas, Cristóbal, Maruñak, Pire, & Tressens 14985 (Z); G. J. Schwarz 789 (N).

VERBENA SPHAEROCARPA Perry
Additional bibliography: Moldenke, Phytologia 11: 182—183. 1964; Moldenke, Fifth Summ. 1: 78 (1971) and 2: 920. 1971; Moldenke, Phytologia 23: 293. 1972.
This species has been found growing on rocky slopes, at altitudes of 900—1030 meters, flowering and fruiting in March. The corolla is described as having been "light-pink" on R. V. Moran 5793.
Additional citations: MEXICAN OCEANIC ISLANDS: Socorro: R. V. Moran 5793 (Sd—49484), 5817 (Sd—49485).

VERBENA STACHYS Raimondi
Additional bibliography: Moldenke, Phytologia 11: 183—184.

1964; Moldenke, Fifth Summ. 1: 144 (1971) and 2: 920. 1971.

VERBENA STELLARIOIDES Cham.

Additional & emended synonymy: Verbena decurrens (Cham.) Kuntze, Rev. Gen. Pl. 3 (2): 257. 1898 [not V. decurrens Moench, 1821, nor Steud., 1968]. Glandularia stellaroides Covas & Schnack ex Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1235. 1968. Glandularia stellatioides (Cham.) Schnack & Covas ex Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715, sphalm. 1969.

Additional bibliography: Steud., Nom. Bot. Phan., ed. 1, 807 & 873 (1821) and ed. 2, 2: 629. 1841; Moldenke, Phytologia 16: 203. 1968; Moldenke, Résumé Suppl. 17: 3. 1968; Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1235—1237. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715. 1969; Solbrig, Passani, & Glass, Biol. Abstr. 50: 4151. 1969; Moldenke, Fifth Summ. 1: 179, 188, 190, & 202 (1971) and 2: 522, 665, 684, 695, 697, & 920. 1971; Moldenke, Phytologia 23: 226—228 & 431. 1972.

Steudel (1821, p. 873) lists a "Verbena decurrens" without authority or description and says of it "vid. Stachytarpheta mexicana" (also without authority). He fails to list the latter binomial in his treatment of the genus Stachytarpheta on page 807 of the same work. In his second edition (1841) he omits the binomial from his treatment of Verbena (page 750), and, again, lists no Stachytarpheta mexicana in his treatment of Stachytarpheta on page 629. The "Index Kewensis" accounts for neither binomial either in its original edition or any supplement (although the much later Stachytarpheta mexicana Moldenke is duly recorded). I am assuming that Steudel's two binomials refer to the Verbena decurrens Moench, which is a synonym of Stachytarpheta jamaicensis (L.) Vahl and so I have reduced them to the synonymy of that taxon. I am making this assumption because of Steudel's reference of the Verbena name to the genus Stachytarpheta. If he had been referring to Chamisso's plant he would hardly have referred it to the very different genus Stachytarpheta, which it does not resemble.

Verbena stellarioides has been found growing on swampy campos, flowering in August and in both flower and fruit in July and September. The corollas are described as "lilac-purple" on Woolston 306. According to Solbrig and his associates (1968), V. stellarioides has been crossed artificially with V. elegans H.B.K. [see under "Verbena elegans H.B.K. x V. stellarioides Cham." in this series of notes]. The Morel 4200, cited below, was previously misidentified and cited by me as V. sessilis (Cham.) Kuntze.

Additional citations: PARAGUAY: Woolston 306 (N). ARGENTINA: Formosa: I. Morel 3623 (N), 4200 (N), 5935 (N, N).

VERBENA STEWARTII Moldenke

Additional bibliography: Moldenke, Phytologia 11: 187—188

(1964) and 16: 342. 1968; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 503, 506, & 508. 1971; Moldenke, Fifth Summ. 1: 138 (1971) and 2: 920. 1971; Wiggins & Porter, Fl. Galáp. Isls. 997. 1971.

VERBENA STOREOCLADA Briq.

Additional synonymy: Verbena soreoclada Briq. ex Moldenke, Fifth Summ. 2: 696, in syn. 1971.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 573. 1965; Moldenke, Phytologia 13: 265. 1966; Moldenke, Fifth Summ. 1: 179, 188, 190, & 202 (1971) and 2: 667, 675, 696, & 920. 1971; Moldenke, Phytologia 22: 491. 1972.

The Lourteig 2041, distributed as V. storeoclada, is actually V. calliantha Briq.

VERBENA STRICTA Vent.

Additional & emended bibliography: Balbis, Cat. Pl. Hort. Bot. Taur. 48. 1804; Balbis, Cat. Stirp. Hort. Acad. Taur. 80. 1813; Pers., Sp. Pl. 3: 347—348. 1819; Steud., Nom. Bot. Phan., ed. 1, 873 & 874. 1821; Jan, Elench. Pl. 1. 1824; A. Wood, Class-book, ed. 2, pr. 1, 412 (1847), ed. 2, pr. 2, 412 (1848), and ed. 10, pr. 1, 412. 1848; A. Gray, Man. Bot., ed. 1, 312. 1848; A. Wood, Class-book, ed. 10, pr. 2, 412 (1849), ed. 10, pr. 3, 412 (1850), ed. 17, 412 (1851), ed. 23, 412 (1851), ed. 29, 412 (1853), ed. 35, 412 (1854), ed. 41, pr. 1, 412 (1855), and ed. 41, pr. 2, 412. 1856; A. Gray, Man. Bot., ed. 2, pr. 1, 298 (1856), ed. 2, pr. 2, 298 (1858), and ed. 2, pr. 3, 298. 1859; A. Wood, Class-book, [ed. 42], pr. 1, 537. 1861; A. Gray, Man. Bot., ed. 3, 298 (1862), and ed. 4, pr. 1, 298. 1863; A. Wood, Class-book, [ed. 42], pr. 2, 537. 1863; A. Gray, Man. Bot., ed. 4, pr. 2, 298. 1864; A. Wood, Class-book, [ed. 42], pr. 3, 537 (1865) and [ed. 42], pr. 4, 537. 1867; A. Gray, Man. Bot., ed. 5, pr. 1, 340 (1867) and ed. 5, pr. 2, 340. 1868; A. Wood, Class-book, [ed. 42], pr. 5, 537. 1868; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 1, 242 (1868) and ed. 1, pr. 2, 242. 1869; A. Wood, Class-book, [ed. 42], pr. 6, 537 (1869) and [ed. 42], pr. 7, 537. 1870; A. Gray, Man. Bot., ed. 4, pr. 3, 298. 1870; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1, 236 (1870), ed. 1, pr. 2, 236 (1871), and ed. 1, pr. 3, 236. 1872; A. Wood, Class-book, [ed. 42], pr. 8, 537. 1872; A. Wood, Am. Bot. & Flor., ed. 1, pr. 4, 236 (1873), ed. 1, pr. 5, 236 (1874), and ed. 1, pr. 6, 236. 1875; A. Wood, Class-book, [ed. 42], pr. 9, 537. 1876; A. Gray, Man. Bot., ed. 5, pr. 8, 340 (1878) and ed. 5, pr. 8 [9], 340. 1880; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 3, 242. 1880; A. Wood, Class-book, [ed. 42], pr. 10, 537. 1881; Meyncke, Bull. Brooksville Soc. Nat. Hist. 1: [Fl. Franklin Co.] 31. 1885; O. R. Willis in A. Wood, Am. Bot. & Flor., ed. 2, 236. 1889; S. Wats. & Coult. in A. Gray, Man. Bot., ed. 6, pr. 1, 402 (1889) and ed. 6, pr. 2, 402. 1890; Gattinger, Med. Pl. Tenn. 64. 1894; L. H. Bailey in A. Gray, Field For. & Gard. Bot., ed. 2, 341. 1895; W. A. Wheeler, Minn. Bot. Stud. 2: 403. 1900; Graves, Eames, Bissell, Andrews, Harger, & Weatherby, Bull. Conn. Geol. & Nat. Hist. Surv. 14: [Cat. Flow. Pl.] 331. 1910; Britton & Br., Illustr. Fl., ed. 2, pr. 1, 3: 94—96, fig.

3556. 1913; Lowe, Miss. State Geol. Surv. Bull. 17: 237. 1921; Rydb., Fl. Rocky Mtns., ed. 1, 739 & 740. 1922; Pammel & King, Iowa Geol. Surv. Bull. 4 (rev.): 269--271, fig. 153, 153A, & 153B. 1926; Tischler, Tabul. Biol. 4: 24. 1927; Harger, Bull. Conn. Geol. & Nat. Hist. Surv. 48: 74. 1930; Pellett, Nat. Mag. 18: 185. 1931; Britton & Br., Illustr. Fl., ed. 2, pr. 2, 3: 94--96, fig. 3556. 1936; Noack, Biol. Zentralbl. 57: 384--386, fig. 7. 1937; Cheymol, Bull. Soc. Chim. Biol. 19: 1647--1653. 1937; F. H. & H. H. Hilman, Seed Trade Buyers Guide 1938: 137, pl. 12, fig. 7. 1938; Cheymol, Chem. Abstr. 32: 2977. 1938; Britton & Br., Illustr. Fl., ed. 2, pr. 3, 3: 94--96, fig. 3556. 1943; Zufall & Richtm., Pharm. Arch. 15: 1--9. 1944; Zufall & Richtm., Chem. Abstr. 38: 4092. 1944; Harvey, Erickson, & Larson, Seed Trade Buyers Guide 1945: 86. 1945; Britton & Br., Illustr. Fl., ed. 2, pr. 4, 3: 94--96, fig. 3556. 1947; King & al., Journ. Am. Pharm. Assoc., Sci. Ed., 39: 595--596. 1950; King & al., Chem. Abstr. 44: 11028--11029. 1950; Abrams, Illustr. Fl. Pacif. States, pr. 1, 3: 611. 1951; R.J.Davis, Fl. Ida. 596. 1952; Hitchc., Cronq., & Ownbey, Vasc.Pl.Pacif.Northwest 4: 244, 245, & 247. 1959;Winter,Winter, & VanBruggen, CheckList Vasc. Pl. S.D.124. 1959; Ferris in Abrams, Illustr. Fl. Pacif. States, pr. 1, 4: 730. 1960; H. H. Iltis, Prelim. Check List Ferns Seed Pl. Upham Woods, ed. 1, 12. 1960; Rattenbury, Madroño 15: 220. 1960; Martin & Barkley, Seed Ident. Man. 37, pl. 236. 1961; Dobbs, Fl. Henry Co. 230. 1963; Radford, Ahles, & Bell, Guide Vasc. Fl. Carol. 281 & 282. 1964; Ferris in Abrams, Illustr. Fl. Pacif. States, pr. 2, 4: 730. 1965; H. S. Fitch, Univ. Kans. Nat. Hist. Reserv. 49. 1965; Hocking, Excerpt. Bot. A.8: 537. 1965; Lakela, Fl. Northeast. Minn. 110. 1965; Hirata, Host Range & Geogr. Distrib. Powd. Mild. 277. 1966; Mohlenbrock, Castanea 31: 224. 1966; F. H. Montgomery, Plants from Sea to Sea 262. 1966; Thornberry, U. S. Dept. Agr. Agric. Handb. 165: 479. 1966; Abrams, Illustr. Fl. Pacif. States, pr. 2, 3: 611. 1967; Shinn, Univ. Kans. Sci. Bull. 46: 790, 791, 881, 886, & 887. 1967; W. A. Weber, Rocky Mtn. Fl. 306. 1967; Beebe & Hoffm., Am. Midl. Nat. 80: 96, 99, 101, & 103. 1968; Burlage, Ind. Pl. Tex. 184, 206, 221, 224, & 238. 1968; W. C. Grimm, Recog. Flow. Wild Pl. 228. 1968; H. H. Iltis, Prelim. Check List Ferns Seed Pl. Upham Woods, ed. 2, 12. 1968; Mohlenbrock, Trans. Ill. Acad. Sci. 61: 71. 1968; Moldenke, Phytologia 16: 203--205. 1968; Moldenke, Résumé Suppl. 16: 1 & 2. 1968; Peterson & McKenny, Field Guide Wildfls. 286, [287], & 418. 1968; J. E. Weaver, Prairie Pl. 204, 206, & 275. 1968; Beebe & Hoffm., Biol. Abstr. 50: 1653. 1969; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 267. 1969; McCarthy & Morrow, Proc. 24th N. Cent. Weed Control Conf. 64. 1969; A. L. Moldenke, Phytologia 18: 127. 1969; Nicholson & Hulett, Journ. Ecol. Brit. 57: 607. 1969; Rickett, Wild Fls. U. S. 3 (2): [363] & 365, pl. 110. 1969; Rydb., Fl. Rocky Mtns., ed. 2, 739 & 740. 1969; F. C. Seymour, Fl. New Eng. 456. 1969; O. A. Stevens, Castanea 34: 196. 1969; Swink, Pl. Chicago Reg. 427 & 428. 1969. [to be continued]

WIKSTROEMIA PULCHERRIMA var. PETERSONII Deg. & Deg., From Hawaii

Otto & Isa Degener

"The genus Wikstroemia in the Hawaiian Islands," released by the printer April 25, 1972 and published posthumously by Dr. Bo Peterson for the late Dr. Carl Skottsberg in Acta Soc. Sci. et Litt. Gothob., is a most meticulous monograph. It stimulated the kane and wahine writers to renewed field observations.

The kane writer's first glimpse of Dr. Skottsberg was many years ago. Studying for an advanced degree, the former was engrossed working up his earliest collections of Wikstroemia and other Hawaiian plants in the herbarium room of the New York Botanical Garden. Artist Mary E. Eaton had a high stool and high slanting drawing table facing the old Lorilard Snuff Mill, Dr. Per Axel Rydberg (1860-1931) had a large table at right angles to it and facing the window, and the kane student had a similar table next to that of Dr. Rydberg, one of his instructors. Dr. Rydberg stuttered a bit when dictating letters to Miss Nash, daughter of the agrostologist, recently deceased. When excited, his stuttering was severe and loud.

Carl Skottsberg of Sweden, with ruddy face, came to the Garden at that time with a formal letter of introduction to Director Britton (1859-1934). He was lifted upstairs by the elevator operator, and then ushered into the herbarium room where Dr. Britton was wont to work. Before Skottsberg spied Britton, he came face to face with Rydberg. We are not sure what happens when Greek meets Greek; but when Swede met Swede an excited, loud stuttering conversation in the native tongue reverberated throughout the hallowed herbarium. All boanical research ended on the top floor as all but one of the workers were fascinated by the conversation so replete with umlauts and other sounds not pronounceable in English. Finally exasperated, Dr. Britton stuck his head from behind a herbarium cabinet and shouted "Shut up or get out." Funereal silence followed.

More auspicious New York visits followed, in which the kane writer became well acquainted with Skottsberg. Such friendship was renewed and firmly cemented on Skottsberg's collecting trips in the Hawaiian Islands. He visited the kane's home on the north shore of Oahu. Although the latter already had had an assistant draw a Pupukea novelty for describing in his Flora Hawaiiensis, he abandoned all further work on the genus, resolving henceforth to siphon all representatives to Göteborg. Many years later, with Dr. Olof Selling, he visited Skottsberg's laboratory in Göteborg where Hawaiian Wikstromiae were growing out in the open!

Wikstroemia pulcherrima Skottsb., at the time unnamed, had been observed by the kane writer as early as 1922, on the tawny volcanic ash plain at about 2,500 feet elevation. It grew almost gregariously on both sides of the "Belt Road," now officially named Mamalahoa Highway, on the southeastern flanks of Mauna Kea and Hualalai, Island of Hawaii. It is a xerophytic, single-stemmed "shrub" more or less prostrate or to about 7 dm., tall. It is strikingly ornamental when the wahine plant bears its abundant orange-red fruit. Having occasion to visit the general area November 27, 1971, the kane and wahine writers were distressed to note how these Wikstroemia plains had been devastated. It was not by the browsing of herds of Hereford cattle, which avoid eating the plant - the genus is rich in a poison that can be crystalized - but by their trampling. Luckily the road now has unusually ample shoulders. With the cattle fenced away, the Wikstreomia can be most conveniently studied here. Anticipating the extinction of this splendid species, the only one thus far studied with a chromosome count of N = 18, the writers resolved to collect material for herbaria of the World.

During our collecting we noted two taxa, one with small leaves and the other with larger ones. We found also a few transitional plants. Not able to distinguish from the monograph to what taxon Dr. Skottsberg's type specimen belongs, we wrote for information to Dr. Peterson, Botaniska Museet, Carl Skottsbergs Gata 22, Göteborg, Sweden. Receiving a brief analysis of the salient features of the type, we are convinced W. pulcherrima s.s., - more properly but awkwardly called W. pulcherrima var. pulcherrima - is the large leaved taxon. Armed with this knowledge, we herewith name the other:

WIKSTROEMIA PULCHERRIMA var. PETERSONII Deg. & Deg., var. nov. A specie foliis circa 2 cm. longis et 1 cm. latis.

Leaves elliptic to broadly elliptic, varying from 12-25 mm. long and 4-13 mm. wide but mostly 20 mm. X 10 mm. Flowers, as in the species itself, are abundant and greenish yellow. Whether the chromosome count applies to it, to the new variety or to both is presently unknown. All types, as we have mentioned before, are deposited in the New York Botanical Garden herbarium unless distinctly stated otherwise.

Type Locality: Degener & Degener 32,754. Along Mamalahoa Highway at Saddle Road Junction, Hawaii. On yellow Pahala ash plain at 2,600 feet; being exterminated by trampling cattle except between roadside fences. Nov. 27, 1971.


Flowers greenish yellow. Type
PLANTS OF HAWAII
EX HERBARIUM OTTO DEGENER
No. 32,754
Wikstroemia pulcherrima var. petersonii
Deg. & Deg.
Mamalahoa Highway at
Saddle Road Junction, Hawaii.
On yellow
being exterminated
by trampling cattle ex-
cept between roadside fences.

# SOME NOMENCLATURAL CHANGES IN THE SECTIONS OF BEGONIA L.

A. I. Baranov and Fred A. Barkley
Botanical Research Station, Greenhouses & Herbaria
Department of Biology
Northeastern University
Woburn and Boston, Massachusetts

Recently the sections of the genus Begonia L. have been receiving some much needed study. Among others who have been reviewing them are A. Brade, L. B. Smith and B. G. Schubert, E. Irmscher, R. Wilczeck, J. Doorenbos and R. Ziesenhenne. Mr. Ziesenhenne (personal communication) feels that besides those already published, several others should be described. A study of the sections by the present writers showed three nomenclatural changes which seem desirable and one sectional name which is frequently misspelled.

Section Gireoudia Klotzsch, Begoniaceen-Gattungen und Arten, 41. 1855, as genus; A. DC., Ann. Sci. Nat. Ser. 4, 11: 41. 1859, as section.

The spelling of the name of this section, and its original publication as a genus, has been questioned recently. The above spelling is that used by both Klotzsch and Alphonse de Candolle, and therefore is the spelling which should be used.

Section Begonia nom. nov.

Begonia Klotzsch, loc. cit., 20, as genus.

Begoniastrum A. DC., loc. cit., 31. 1859; Prodromus 15, 1: 292. 1864, as section.

The type species of this section would of course be Begonia obliqua L., Species Plantarum, 1056. 1753, except that Linnaeus placed three previously published species in his typical variety, leaving the identity of the species questionable. Begonia acutifolia Jacq., Collect. 1: 122. 1786, is considered by the writers as the type species of the genus.

Since the International Rules (Article 22) decrees that the section including the type species of the correct name of the genus to which it is assigned, bears the (generic) name unaltered as its epithet, the correct sectional epithed must be Begonia.

Section Tetraphila A. DC., Prodromus 15, 1: 517. 1864, emend. A. Baranov.

Fusibegonia Warburg in Engler und Prantl, Die Natürlichen Pflanzenfamilien 3, 6a: 140. 1895, as section.

The following is the amended and revised description of the section Tetraphila:

Herbae epiphytae vel scandentes saepe valde ramosae, glabrae vel trichomatibus stellatis obtectae. Nodi caulorum interdum radicati. Folia penninervia; stipulae magnae, caducae. Cymae laterales, axillares, breves, plerumque oligoflorae. Flores masculini quadritepali, filamentis vulgo plus minus in fasciculum conoideum coalitis, rarior liberis; antherae oblongae, connectivo non producto, sessiles vel saltem filamentis longiores. Flores feminei quadritepali, tepalis interioribus duobus interdum plus minus reductis vel vestigialibus; stylis 3 caducis, apice bifurcatis, interne lineis papillosis instructis; placentae divisae. Fructus longus, cylindricus vel fusiformis, exalatus, 4-locularis, post maturitatem tenuiter membranaceus vel carnosus.

Typus sectionis: Begonia mannii Hooker f., Bot. Mag. 90: t. 5434. 1864.

Epiphytic and climbing, often richly branched herbs, glabrous or covered with stellate trichomes; stem nodes sometimes producing roots; leaves pinnately-veined; inflorescence lateral, axillary, cymose, in most cases few-flowered, short; stipules large, deciduous; staminate flowers with 4 tepals, filaments more or less united in a conical cluster, seldom free; anthers oblong, sessile or at least longer than the filaments, connective short; pistillate flowers with tepals 4, the inner two sometimes smaller or even vestigial, styles 3 (more, or rarely only 2), not persistent, sometimes connate at the base, at the apex two-parted, stigmatic papillae make up a continuous band on the inner surface, placentae divided; fruit long, cylindrical or spindle-shaped (fusiform), wingless, typically 4-locular, thin-membranous or fleshy at maturity.

The type is Begonia mannii Hooker f., loc. cit. 90: t. 5434. 1864.

Section Peltaugustia Barkley, grad. nov.

Peltaugustia Warburg in Engler und Prantl, loc. cit. 3, 6a: 140. 1895, as subsection.

The only member of the section is Begonia socotrana Hooker f, Gard. Chron. 8, f. 1. 1881; Bot. Mag. 107, t. 6555. 1881, a species of the island of Socotra. This is a white-flowered, peltate-leafed plant, with one-winged fruit. It has a short growing season and a long dormant period. It is exceptional in the genus as being the only species producing a bulb.

References

Barkley, Fred A. Begoniaceae: The genera, sections, and known species of each. Boston 1972.

Barkley, Fred A. Begoniaceae to 1763. Providence. (1968)

Barkley, Fred A. & Beverly Hozid. Leaf Anatomy of Begonia. The Begonian 38: 135-142. 1971.

De Candolle, Alphonse. Memoire sur la Famille Bégoniacées. Ann. Sc. Nat., Bot. Ser. 4, 11: 1-57. 1859. (Another printing has the pagination 93-149.)

De Candolle, Alphonse. Begoniaceae. Prodromus Syst. Nat. Reg. Veg. 15, 1: 266-408. 1864.

Doorenbos, J. Check List of Begonia Species. Wageningen. 1971.

Irmscher, E. Begoniaceae. Engler und Prantl, Die natürlichen Pflanzenfamilien (ed. 2) 21: 548-588. 1925.

Klotzsch, J. F. Begoniaceen-Gattungen und Arten. Abh. Kön. Akad. Wiss. zu Berlin. 121-255. 1854; 350-372. 1855.

Linnaeus, Carl. Species Plantarum, ..... 2: 1056. 1753.

Warburg, O. Begoniaceae. Engler und Prantl, Die natürlichen Pflanzenfamilien 3, 6a: 121-150. 1895.

SYMPHYSIA FROM PANAMA

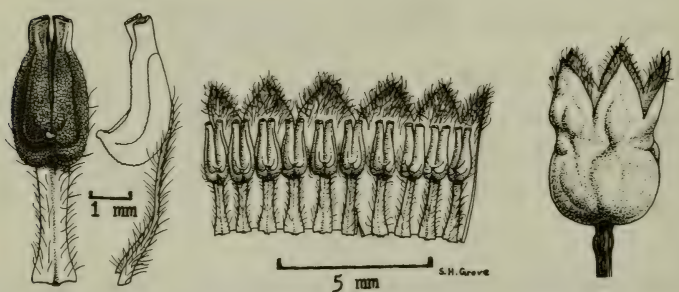
Louis O. Williams

Field Museum of Natural History

Dr. William T. Stearn has just reviewed "The generic name Hornemannia and its diverse applications."* The use of the name Hornemannia Vahl (non Willdenow) for a member of the Ericaceae is shown to be invalid and that the name Symphysia Presl (1837) must be taken up even though it is an unfortunate name based on an error of observation.

In addition to the much described Symphysia racemosa (Vahl) Stearn, which is quite widely distributed through the Caribbean and was the only species known to Dr. Stearn, there is another quite distinctive species from Panama which I described several years ago. The combination to Symphysia follows:

SYMPHYSIA FLOCCOSA (L. Wms.) L. Wms. comb. nov. Hornemannia floccosa L. Wms. in Brittonia 18: 248, fig. 1966.




Symphysia floccosa. Anthers in front and outlined side views; corolla opened out to show anthers and floccose pubescence; the calyx in natural position. Scales in mm.

*Taxon 21: 105-111. 1972.

RANDIAS FROM CENTRAL AMERICA

Louis O. Williams

Field Museum of Natural History

The preparation of the manuscript for the genus Randia for the Flora of Guatemala presented some special problems. The type species of Randia is R. aculeata L., a species assumed to have come from the Caribbean basin and credited by Standley in his account of the genus in North American Flora (32: 174. 1934) to the lowlands around and in this basin from Florida and Mexico south to northern South America. Since that time a great many specimens from the Pacific side of Mexico and Central America as well as collections from montane forests and cloud forests at elevations up to 2,000 meters have been determined as R. aculeata L.

Randias of the subgenus Randia are difficult to work with for more than half of the specimens that we have from Guatemala lack flowers and flowers seem to be essential in the differentiation of the species. My studies for this group of Randias seem to indicate that the lowland species from the Pacific and Atlantic slopes of southern Mexico and Central America are closely related, perhaps sibling species. The montane species, especially those of the montane forests or cloud forests, are part of the closely-knit subgenus Randia. There are several species in the high, often isolated, mountains between the Isthmus of Tehuantepec and the Honduras Depression that seem to be closely related one to another. When flowers are available on the collections there seem to be characters to separate them into species units. The collections are far too few from the high mountains of this old core area of the Central American region to really understand what is happening. The montane endemism seems to be high in Randia as has been observed here with many other genera of plants. The ecological niches which are often isolated mountains apparently have been separated for a great enough period of time for considerable speciation to have taken place.

The subgenus* Basanacantha presents some very special problems. The plants have larger flowers and occasionally very

---

*Randia subg. Basanacantha (Hook. f.) L. Wms. comb. nov. Basanacantha Hooker f. in Benth. & Hook. Gen. Pl. 2: 82. 1873. LECTOTYPE: Randia monantha Benth. Pl. Hartw. 84. 1841; Basanacantha monantha Hook. f. ex Hemsl. Biol. Cent.-Am. Bot. 2: 39. 1881. The type specimen from Guatemala.

large fruits. The flowers are probably always unisexual and the plants may be dioecious. Approximately half of the tropical North American Randias belong in this subgenus, as do five of the ten recognized species to appear in the Flora of Guatemala.

The work for this paper and for the preparation of manuscript for the Flora of Guatemala has been assisted by continuing grants from the National Science Foundation, GB7254, GB19071, and GB27385.

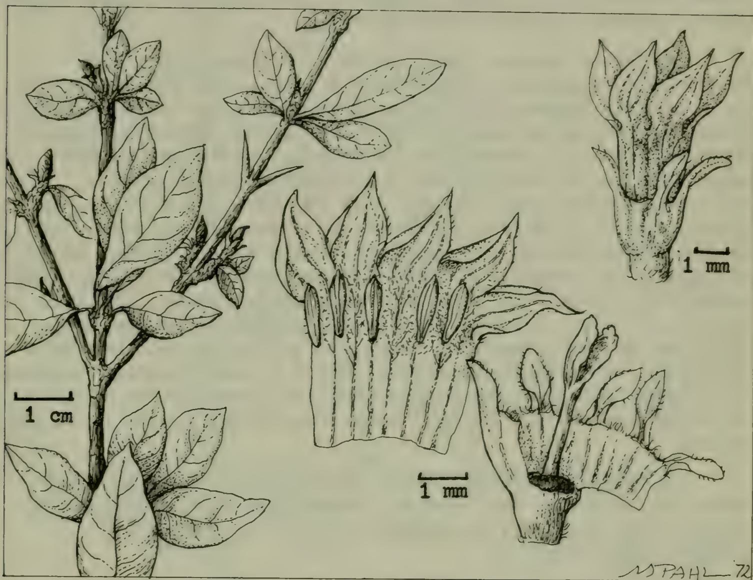
RANDIA MONTANA L. Wms. sp. nov.

Subg. Randia. Frutices monticolae usque ad 2 m. alti spinosi. Folia breviter petiolata submembranacea elliptica vel oblanceolato-elliptica acuta glabra; inflorescentia uniflora; calyx turbinatus 5-lobatus, lobi oblanceolati acuminati ciliati; corolla alba parva, tubus intus pubescens, lobi subaequales ovato-lanceolati acuminati; fructus desideratur.

Montane shrubs 1-2 m. tall, branchlets slender, glabrous, with scattered, paired, slender spines; the leaves a pair at each node, or usually borne on inconspicuous short-shoots and 2-4 on each short-shoot, with intrapetiolar stipules, the petioles 2-5 mm. long, slender, the blades submembranaceous, elliptic or oblanceolate-elliptic, acute, glabrous, (2-) 3-6 cm. long and 1-2 cm. broad, 8-10 pairs of lateral nerves inconspicuous; inflorescence a single flower terminal on the short-shoots; ovary glabrous, or hirsute at juncture of pedicel, about 15 mm. long; calyx turbinate, the calyx tube about 2 mm. long, the lobes 5, oblanceolate, acuminate, ciliate, about 2 mm. long and 0.5-0.7 mm. broad above the middle, slightly unequal; corolla hypercrateriform, about 7-8 mm. long, pubescent within in the throat and tube, the tube about 4 mm. long, the lobes a little shorter, the lobes unequally ovate-lanceolate, acuminate, about 3 mm. long; style about as long as the corolla tube, bifid; anthers inserted in throat of corolla, sessile, about 2.5 mm. long; fruits unknown.

Honduras: flowers white, shrub 1-2 m., common, cut-over cloud forest between Calaveras and El Duraznillo, on Cordillera Opalaca, Dept. Intibucá, alt. 1,800 m., March 12, 1970, Molina & Molina 25550 (type, F; EAP); "crucito," flowers white, shrub 1-2 m., common, mixed forest along Huise River, 9 km. east of La Esperanza, Dept. Intibucá, alt. 1,600 m., March 13, 1970, Molina & Molina 25570 (F; EAP).

A montane species allied to the group around R. cookii and R. standleyana. It is distinguished by the oblanceolate acuminate calyx lobes which are about as long as the tube, by the thin, oblanceolate or elliptic leaves, and by the ovate-lanceolate acuminate corolla lobes.




Randia montana. Habit, a flower at anthesis, and dissections of a flower with appropriate scales. Drawn from the type by Marion Pahl, July 1972.

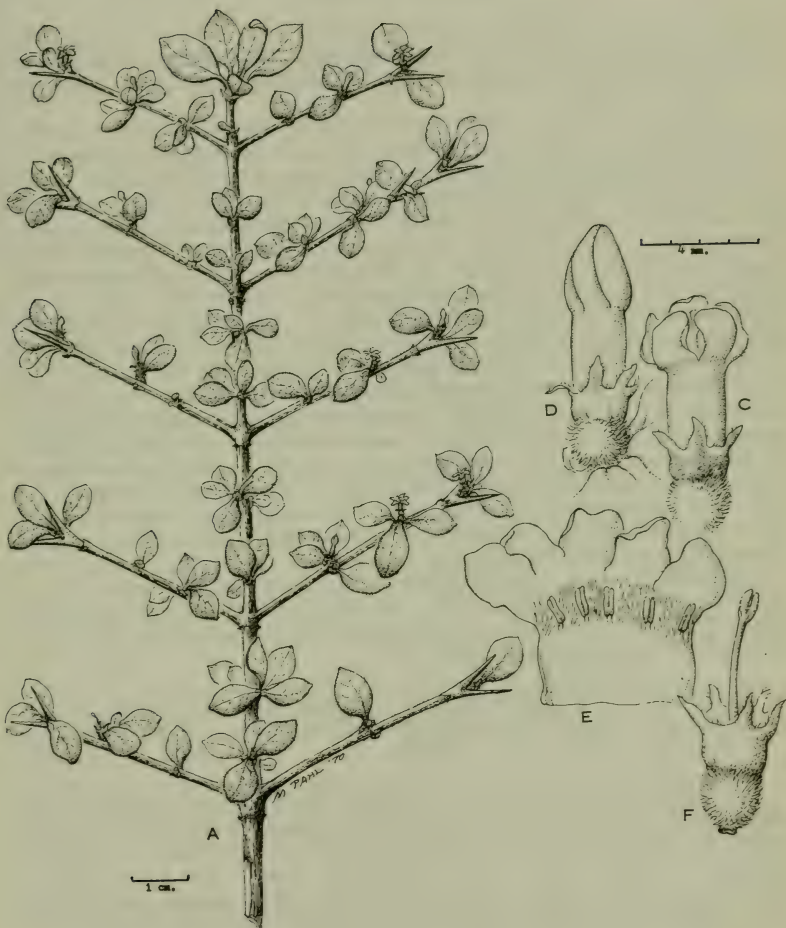
RANDIA STANDLEYANA L. Wms. sp. nov.

Subg. Randia. Frutices aut arbores. Folia sessilia obscure pubescentia, laminae obovatae aut late obovatae obtusae ad basem attenuatum; inflorescentia sessiles, fasciculi terminales uni-pauciflorae; flores perparvi; calyx campanulatus 5-lobatus lobi lanceolati acuti ciliati; corolla hypercrateriformis, tubus angustus, lobi ovati vel suborbiculares patentes; fructus desideratur.

Shrubs or perhaps small trees of unknown size; the branchlets opposite, mostly about 4-5 cm. long and terminated by a pair of spines 6-10 mm. long, sparsely pilose or glabrescent; the leaves usually 4 on very short opposite short-shoots, sessile or nearly so, obscurely puberulent on both surfaces, the blades obovate to broadly obovate, obtuse, attenuate to the base, mostly 7-15 mm. long and 3-10 mm. broad; inflorescence a sessile 1-few-flowered fascicle terminal on short-shoots; flowers very small, mostly 4-5 mm. long; ovary densely white pubescent; calyx campanulate, 5-lobate, glabrous, about 1-1.5 mm. long, the lobes lanceolate, acute, ciliate, to 0.8 mm. long; corolla salverform, 3-4 mm. long, 5-lobate, glabrous outside, sparsely pubescent in the throat, the tube 2-2.5 mm. long, lobes spreading, ovate or suborbicular, obtuse, 1.5-2 mm. long; stamens nearly sessile in the throat of corolla; style as long as the corolla tube, the stigma bifid; fruit not known.

Guatemala: Chimah, Petén, May 23, 1933, Lundell 3417; occupied clearing, La Libertad, Petén, May 29, 1933, Lundell 3474 (type, F; MICH); La Libertad, Petén, May 30, 1933, Lundell 3496.

These specimens and at least two other Central American Randias have been called *R. malacocarpa* to which this species is somewhat related. The most closely related of the Central American species is *R. cookii*, possibly a sibling species from the Pacific side of Chiapas and Guatemala. This is the smallest-flowered of the Randias known to me from Central America. It is named for Dr. Standley who was the specialist on Rubiaceae.




<u>Randia</u> <u>standleyana</u>. A branch, a bud, a flower and dissections of a flower, with appropriate scales. Drawn from the type by Marion Pahl, 1971.

BOOK REVIEWS

Alma L. Moldenke

"HORTICULTURAL SCIENCE" by Jules Janick, 2nd edition, x & 586 pp., illus., W. H. Freeman & Co., San Francisco, California 94104. 1972. $12.00.

This author's bent toward offering the scientific explanation(s) or pinpointing the scientific question(s) involved in the field of horticulture — as shown here and in the previous edition of this book, in "Plant Science: An Introduction to World Crops" and in "Plant Agriculture, Readings from Scientific American" — leads this whole profession out of the cook book and green thumb school into a truly scientific approach.

The book is divided into three parts. The biology of horticulture discusses effectively the classification and basic structure of horticultural plants and their growth and development. The technology of horticulture discusses controlling the plant environment, directing plant growth, biological competition, propagation, plant improvement, and marketing. The industry of horticulture discusses geography world-wide, production systems, major crops and esthetics. The whole is excellently enhanced with 348 appropriate illustrations that would have been even more valuable if all -- instead of just most -- had the plants identified and recorded in the index.

Because the text has been completely updated, it can be of great value to those practicing in the field as well as to students from the high school -- by judicious selection -- to the university and institute level.

"A NATURALIST IN SOUTHERN FLORIDA" by Charlotte Orr Gantz, xiv & 256 pp., illus., University of Miami Press, Coral Gables, Florida 33124. 1971. $7.95.

This is a delightful book to peruse before, during and/or after a trip to the southern half of Florida. It describes pleasantly and accurately life along the beaches, the roads, the parks, the inland trails through cypress swamps and everglades, and the natural and man-made wild areas. The unique emphasis of this book is its correlation of present-day life and earth form with that known back 26 million years ago.

There are many commendable features in this book. Useful but purposely limited bibliography is given at the end of each chapter. Scientific names are also provided there to supplement the common names used in the text. For the black mangrove Avicennia nitida is given, but the accepted name now is A. germinans. The print is neat. The word "mastodons" is misspelled on p. 178. The illustrations consist of a few fine black/white photographs of animals and habitat areas.

This book should have a wide appeal since there are now so many tourists, residents and students in this area interested in its wild life and special ecological features.

"ARMY ANTS - A Study in Social Organization" by T. C. Schneirla & edited by Howard R. Topoff, xx & 349 pp., illus., W. H. Freeman & Co., San Francisco, California 94104. 1971. $12.00.

Next to entomologists themselves, the persons most interested in insects have always been botanists who cannot help being fascinated by these creatures that dwell in so many different complex associations with "their" plants. This book will also appeal to the many students and professionals interested in the growing field of ethology.

Readers owe a debt of gratitude to Dr. Topoff, Dr. Schneirla's last student, for making the final arrangements for publishing this valuable work after the death of the author. It is excellently illustrated with charts, black/white photographs and colored plates. The study covers over three decades of field and laboratory research of the few New World and Old World genera of the subfamily Dorylinae behaviorally characterized by massive predatory raids, great nomadic movements, and almost rhythmic coordinated and reversible change from states of high metabolic rates to low level ones. The following topics are carefully considered: the colony, bivouacs, raiding, emigrations, broods, functional cycles and nomadism, the queen, males and young queens, colony divisions and new establishments, the tiny simple Aenictus, and the Doryline colony as an adaptive system. There are included a useful glossary, bibliography and index.

Dr. Schneirla concludes: "I consider the complex behavior patterns I have described as resulting from species-typical developmental processes, to which all types of individuals in the colony contribute......To denote the major causal factor dominating colony behavior, my theory employs the concept of brood-stimulating effects.....

"Army ant adaptive systems have evolved through the reduction of individuals and of their functions to just the ones that contribute in one way or another to efficiency in collective operations."

"AUSTRALIAN INSECTS IN COLOUR" by Anthony Healy & Courtenay Smithers, 112 pp., illus., Charles E. Tuttle Co., Tokyo, Japan & Rutland, Vermont 05701. 1971. $7.50.

Some of the most spectacular and most important of the 50,000 already described insect species of this "Down Under" continent are grouped by orders, described briefly with items of special interest, and illustrated so very impressively and so beautifully in 19 black/white and 126 color photographs.

The first author did the superb photography (so maintained in fine printing); the second author did the accurate and interesting text.

This book will surely interest amateur and professional entomologists, amateur and professional photographers, nature lovers and those folks most interested in Australia.

"A COMPUTER-MAPPED FLORA - A Study of the County of Warwickshire" by D. A. Cadbury, J. G. Hawkes & R. C. Readett, ix & 768 pp., illus., published for the Birmingham Natural History Society by Academic Press, London & New York, N. Y. 10003. 1971. $31.50.

Over 175,000 field observations were made by amateur and professional botanists from 1950 to 1965 on a randomly selected 1 km. square from each block of four, recorded on "Map-Index" Species Cards, and fed into a computer. With an "Incremental Plotter" and a "Line Printer" it was then possible to provide computer maps of the flowering plants, vascular cryptogams and bryophytes with ease and precision.

Far beyond the limited study satisfactions for the people of the County of Warwickshire with its 50 by 30 miles area and of the Birmingham Natural History Society, and the academic asset of having Bagnall's 1891 flora of this area brought up to date, is the very much greater value of presenting for the first time methods and recordings of study techniques applicable to much more than the fields of botany or even science. And from the stored data much further use can be made of it in many different ways.

Among the contents of this book are the physical background, geology and soils, historical geography with neolithic cultivation records, some Warwickshire botanists including John Ray, methods of recording and processing data, habitat studies, the vascular plants and their graphs, plotted or line printed distribution maps, and bryophytes and their maps. In the back pocket there are 13 overlay maps of 2- or 4-page size for relief and drainage, rivers and canals and lakes, surface geology, rainfall, temperature, well wooded areas, parks and woods and plantations and heaths and commons, bryophytes, and geology.

This book presents a vast amount of carefully executed study that is of interest in itself and as a guide for future studies.

"INFRASPECIFIC CHEMICAL TAXA OF MEDICINAL PLANTS" by Péter Tétényi, 225 pp., illus., Chemical Publishing Company, New York, N. Y. 10003. 1970. $15.00.

Much valuable material has been presented in this study which considers polychemism in 750 species in 106 families of plants for their terpenes and terpenoids, their acetate metabolism derivatives, their flavenoids and phenylpropane derivatives, their alkaloids, and their isorhodanidogenes. There is a plant-genera index and a bibliography of over 2,000 references. The general part of the text gives an in-depth analysis of infraspecific differentiation and its role in classification and nomenclature.

"Infraspecific chemical taxa are generally universal. Moreover, they can be found ubiquitously, from the primitive species to those of the highest organization.....[and are] a general aspect of the phylogeny of the plant kingdom thus far studied.....

"We can see from the data reviewed in this book that polychemism very often occurs without any morphological differences..... [and so] metabolism prevails.......

"Since morphological properties are fortuitous because they are not in close correlation with chemism, the chemical ones are more suitable for taxonomic purposes. On the basis of our present knowledge, this must be taken into account in classification [and] systematization, mainly within the species itself."

The pendulum swings wide.

"THE ILLUSTRATED FLORA OF ILLINOIS: GRASSES - BROMUS TO PASPALUM" by Robert H. Mohlenbrock, xvii & 332 pp., illus., Southern Illinois University Press, Edwardsville & Carbondale, Illinois 62901. 1972. $10.00.

It is good that this fourth volume has been published so promptly and so well. The remainder of the grasses (144 species) is slated for another volume due next year. In the present volume 286 species in 86 genera and 49 lesser taxa are carefully treated. The systematics follow Gould's modification (1968) of the Hitchcock system (1950) mainly. The Poaceae are placed as the highest development in Order Commelinales à la Thorne (1968).

There are 263 accurate line drawings, as well as geographic distribution maps, glossary, bibliography, and index. In the introduction there is a lucid, well illustrated explanation of grass structure. The keys to genera and species are workable and not so difficult as to frighten off the amateur and beginning student.

"Grasses are the most valuable plants on earth." Illinois has many of them in its moist and dry natural areas, its cultivated areas, and its waste areas.

"FLORA OF THE AUSTRALIAN CAPITAL TERRITORY" by Nancy T. Burbidge & Max Gray, vii & 447 pp., illus., Australian National University Press, Canberra. Also available through the International Scholarly Book Services, Inc., Portland, Oregon 97208. 1970. $15.60.

This phanerogamic flora simply keys out and carefully describes 1035 species in 412 genera and 92 families, with 289 of the species being naturalized, and with 409 line drawings by the senior author. Since very few species are wholly restricted to the area associated with this National Capital and lying in the Tablelands region of New South Wales, "its flora is related to that of other Tablelands areas and of the ranges of eastern Australia with their extension into Victoria......To increase the general applicability of the book references to distribution in other parts of Aústralia have been included." We note, however, that even though Verbena bonariensis grows in Queensland, it is not so credited in this flora.

This in general very good work should be of much use in schools and universities, as well as to botanists and to people interested in the countryside of the Australian Capital Territory and surrounding areas.

"ARZNEIPFLANZEN DER POLYNESIER" by Bernard Lepernick, 307 pp., illus., Baessler-Archiv Beiheft 8, Dietrich Reimer, Berlin 45, West Germany. 1972. 69 DM paperback.

Much valuable botanical, cultural and medical (if not modernly curative) material has been carefully collated in this book. "The more than 600 prescriptions discussed.....show the use of plants for medicinal purposes by the Polynesians. We find prescriptions for the treatment of many scores of diseases and accidents, for medical assistance in pregnancy and childbirth, and for hygienic preparations.

"For these remedies more than 400 species of plants belonging to more than 300 genera [in 117 families] are used. It is possible to identify most of them botanically, some of them have been tentatively identified on a linguistic basis....., others are known to us only by their Polynesian names.....

"55 of the species used in Polynesian medicine are also used in Western medicine, 16 of them in ancient Chinese-Tibetan medicine, and 72 of them in Melanesian medicine," as stated in part of the English summary.

This study is divided into the following sections: Einleitung, Arzneipflanzen, Therapie (in considerable detail according to types of illnesses), Ergebnisse, Zusammenfassung (with an English translation of it), Vulgärnamen, Schrifttum, Geographisches Register, Botanisches Register, and Kartenskizze.

"CHRYSOBALANACEAE", Monograph No. 9, by Ghillean T. Prance, 410 pp., illus., 1972. $26.50 paperback.
"DICHAPETALACEAE", Monograph No. 10, by Ghillean T. Prance.
"RHABDODENDRACEAE", Monograph No. 11 (bound with No. 10) by Ghillean T. Prance, 84 & 23 pp., illus. 1972. Paper-bound.
All published for the Organization for Flora Neotropica by Hafner Publishing Company, New York, N. Y. 10022.

In standard excellent taxonomic form, including careful drawings, distribution maps, detailed pollen information, and pictorialized scatter diagrams for several species, all the New World tropical members of these three botanical families are treated.

# PHYTOLOGIA



*Designed to expedite botanical publication*



Vol. 24 | October, 1972 | No. 3

CONTENTS



Published by Harold N. Moldenke and Alma L. Moldenke

303 Parkside Road
Plainfield, New Jersey 07060
U.S.A.

Price of this number, $1.50; per volume, $8 in advance, or $8.50 at close of volume, 50 cents extra to foreign addresses

To
Dr. Henry Allan Gleason
in commemoration of his ninetieth birthday,
January 2, 1972,
this issue is affectionately and gratefully dedicated.

Dr. Gleason was one of the two co-founders of PHYTOLOGIA and served as one of its two co-editors and publishers from its inception in December, 1933, until December, 1950. During these 18 years he contributed no less than 23 scientific papers to its pages. Including the present issue, we have now published a total of 12,056 pages, on which have appeared 1021 papers by 137 botanical authors. The journal continues to offer the most prompt publication service available to botanists anywhere — which was the purpose in Dr. Gleason's mind at its founding.

We offer our most sincere congratulations, albeit belated, to Dr. Gleason on the occasion of this milestone in life's journey and we wish him continued health and happiness and many more anniversaries to come!

The Editors

- - - - - - - - - - - - - - -

# A NEW AQUATIC PIPEWORT

Harold N. Moldenke

TONINA FLUVIATILIS f. PARVIFOLIA Moldenke, f. nov.

Haec forma a forma typica speciei recedit foliis 5—9 mm. longis 2—3 mm. latis ad apicem abrupte acutis 3—7 parallelonervatis et nodis caulorum distincte albido-hispidis, pilis patento-reflexis.

This form differs from the typical form of the species in having its leaves much smaller, only 5—9 mm. long and 2—3 mm. wide, 3—7-veined with rather conspicuous parallel veins extending from the base to the apex, the apex abruptly acute, the lowest 1/4 more or less clasping the stem, and the nodes of the stem conspicuously whitish-hispid with wide-spreading or somewhat reflexed hairs.

The type of this form was collected by E. Foldats (no. 3780) in the Alto Río Atacavi, Amazonas, Venezuela, on September 8, 1960, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collector notes "Hierbe poco abundante, formando colonias bastante grandes, sumergidas en el agua negra, dispuestas a la acción del corriente del río". The type is sterile and so the correct disposition of the plant is a matter of question, yet its general aspect seems to point clearly to Tonina. Furthermore, it is strikingly similar to the type of T. fluviatilis f. obtusifolia Moldenke identified as a Tonina by the late N. Y. Sandwith at Kew.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). XC.

## THE GENUS, CAMPULOCLINIUM.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

The critical review of the Eupatorieae has shown Campuloclinium to be one of the most distinctive genera of the tribe. The distinctive habit resulted in generic status at an early date. It is the more recent attempts to apply broad concepts in the Eupatorieae that have reduced Campuloclinium to a section of Eupatorium. The sectional characteristic seems to have been the large size of the floral heads, and a wide variety of species such as the Colombian Ageratina zinnifolia (B.L.Robinson) R.M.King & H.Robinson have been included. B.L.Robinson did seem to regard the conical receptacle as important also. The present concept is still more restricted.

Two features are particularly distinctive of the genus Campuloclinium, the carpopodium and the receptacle. The carpopodium can be seen at even low magnification as an expanded narrow basal ring with a sharply demarcated straight upper margin. Under higher magnification the carpopodial cells are quadrate or wider than high with thin but firm walls. The receptacle is conical with only small scars at each floral insertion. Equally distinctive but less defineable are the appearance of the elongate, usually strongly setiferous achenes, and the breadth of the coarsely mamillose style branches. Features that are useful in recognizing the genus but which are found in some relatives include the large heads with broad phyllaries, the hairy style base which is slightly to greatly enlarged, and the large usually mamillose cells of the corolla lobes. There is some variation in the genus in the size of the heads, being larger in the less branched inflorescences of most of the species and somewhat smaller in the much branched inflorescence of C. purpurascens. The corolla lobes also vary, being essentially smooth in C. tubaracense.

The genus is almost entirely restricted to eastern South America but the original description is based on Mexican material of the widely distributed type species, C. macrocephalum

Campuloclinium A.P.Decandolle, Prodr. 5: 136. 1836.

Coarse erect herbs or subshrubs with few branches. Stems terete usually hirsute. Leaves opposite or alternate sessile or on narrowly winged petioles, laminae ovate to narrowly oblong. Inflorescence monocephalic to broadly corymbose; heads medium sized to large. Phyllaries subimbricate in 2-3 series, 15-30 narrowly to broadly oblong-elliptical with hairs and glands externally; receptacle highly rounded to conical with small scars. Flowers 30-100 per head; corollas narrowly funnelform, lobes broadly triangular usually mamillose to papillose inside and outside with glands and often hairs on the outer surface; collars of anther filaments very thick with mostly quadrate cells, walls of cells with distinct horizontal oblique or vertical thickenings; exothecial cells subquadrate or slightly longer; anther appendage rather oblong 2/3 -1 times as long as wide; style base not or scarcely enlarged with few to many hairs; style branches flat, broadly linear strongly mamillose to papillose; achenes elongate prismatic with narrow base, 5-costate, strongly setiferous with few to many glands; carpopodium short cylindrical, very enlarged with large cells quadrate or wider than high, walls slightly thickened; pappus of 25-40 setae in one series, scabrellous, apical cells subacute to acute.

Lectotype species: Eupatorium macrocephalum Less.

Our studies of the genus indicate that it contains the following ten species.

Campuloclinium burchellii (Baker) R.M.King & H.Robinson, comb. nov. Eupatorium burchellii Baker, Mart. Fl. Bras. 6(2): 356. 1876. Argentina, Brasil.

Campuloclinium chlorolepis (Baker) R.M.King & H.Robinson, comb. nov. Eupatorium chlorolepis Baker, Mart. Fl. Bras. 6(2): 357. 1876. Brasil.

Campuloclinium hickenii (Cabrera & Vittet) R.M.King & H.Robinson, comb. nov. Eupatorium hickenii Cabrera & Vittet, Revist. Mus. Univ. Eva Peron (n.s.) Secc. Bot. 8: 246. 1954. N. Argentina.

Campuloclinium hirsutum Gardner, Hook. Lond. Journ. 6: 438. 1847. Brasil.

Campuloclinium macrocephalum (Lessing) A.P.Decandolle, Prodr. 5: 137. 1836. Bolivia, Colombia, Honduras, Mexico, Paraguay.

Campuloclinium megacephalum (Mart. ex Baker) R.M.King & H.Robinson, comb. nov. Eupatorium megacephalum Mart. ex Baker, Mart. Fl. Bras. 6(2): 354. 1876.

Campuloclinium parvulum (Glaziou) R.M.King & H.Robinson, comb. nov. Eupatorium parvulum Glaziou, Bull. Soc. Bot. Fr. 56. mem. 3: 390. 1909. Brasil.

Campuloclinium purpurascens(Schultz-Bip. ex Baker) R. M.King & H.Robinson, comb. nov. Eupatorium purpurascens Schultz-Bip. ex Baker, Mart. Fl. Bras. 6(2): 356. 1876. Brasil.

Campuloclinium riedelii (Baker) R.M.King & H.Robinson, comb. nov. Eupatorium riedelii Baker, Mart. Fl. Bras. 6(2): 355. 1876. Brasil.

Campuloclinium tubaracense (Hieron.) R.M.King & H. Robinson, comb. nov. Eupatorium tubaracense Hieron., Engl. Bot. Jahrb. 22: 784. 1897. Brasil.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB- 20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). XCI.

## A NEW GENUS, MACROPODINA.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

Three species from southern Brazil and adjacent Argentina are placed here in a new genus, Macropodina characterized by elongate achenes, long narrow corolla lobes and by unenlarged pubescent style bases. The genus seems closest to Campuloclinium but differs clearly by the achenes, corolla lobes, and by having a flat receptacle. Other groups that have been confused with species of Macropodina in the past lack the hairs on the base of the style and have different carpopodial structure.

The most commonly known species of Macropodina has unfortunately been recognized for the last hundred years under the wrong name and therefore has to be redescribed here as a new species. The 40-50 flowers per head commonly cited for members of this genus is apparently borrowed from the original description of Eupatorium adenanthum DC. which is not congeneric. The flower number in Macropodina actually rarely exceeds 40 and is usually near 25.

Macropodina R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Suffrutices erecti laxe ramosi. Caules teretes puberuli vel glanduliferi. Folia plerumque opposita distincte petiolata, laminis ovatis acutis vel acuminatis serrulatis base truncatis vel breviter cuneatis, trinervatis. Inflorescentiae laxe cymosae, pedicellis elongatis; involucri squamae 18-40 subimbricatae inaequilongae 2-4-seriatae anguste oblongae vel lineares; receptacula plana vel leniter convexa glabra. Flores 20-45 in capitulo; corollae anguste infundibulares, lobis triplo longioribus quam latioribus extus glanduliferis, cellulis elongatis, parietibus valde sinuosis; filamenta antherarum in parte superiore aliquantum lata, cellulis plerumque quadratis vel breviter oblongis, parietibus annulate ornatis; styli inferne non vel leniter nodulosi pauce vel dense hirsuti, appendicibus linearibus superne vix latioribus sublaevibus; achaenia prismatica longe stipitata 5-costata in costis glandulifera vel minute scabra; carpopodia breviter cylindrica, cellulis subquadratis, parietibus parum incrassatis; pappus setiformis uniseriatus, setis 25-30 tenuibus scabrellis, cellulis apicalibus subacutis vel acutis.

Species typica: Eupatorium blumenavii Hieron.

The three species of the genus are as follows:

Macropodina blumenavii (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium blumenavii Hieron., Engl.Bot. Jahrb. 22: 784. 1897. Brazil.

Macropodina bradei R.M.King & H.Robinson, sp. nov.

Suffrutices usque ad 2.5 m alti. Caules puberuli. Folia inferiora majora, superiora saepe alterna, petiolis 1.0-3.5 cm longis, laminis 4-13 cm longis 2-8 cm latis ovatis vel late ovatis breviter anguste acuminatis, margine crenato-serrulatis base rotundatis vel abrupte anguste cuneatis. Pedicellae rectae 1-5 cm longae puberulae. Capitula ca. 1 cm alta; involucri squamae 30-40 valde inaequilongae 3-4-seriatae 3-7 mm longae extus puberulae et glanduliferae. Flores ca. 25-45 in capitulo; corollae 5.0-5.5 mm longae; styli inferne pauce breviter hirsuti; achaenia usque ad 6 mm longa; pappi setae ca. 30. Grana pollinis 20-22μ diam.

Type: BRAZIL: Rio de Janeiro: Itatiaia, picada nova a 1000 m p.m. February 16, 1948, Brade 18853 (Holotype US !). Additional specimens examined: BRAZIL: Rio de Janeiro: Serra dos Orgaos, Pedra do Frade a 1300 m p.m. July 19, 1940, Brade 16424 (US!), Organ Mountains, Capt. Wilkes sn (US!), Petropolis, Oct. 20, 1921, Holway & Holway 1236 (US!), F. Didrichsen 4027 (US!), Parana: Serra do Mar, Banhado, ad marginem silvae primaevae 860 m s.m. , January 30, 1914, P. Dusen 14379 (US!).

The new species includes most of the material seen in herbaria under the name Eupatorium adenanthum DC. Photographs of the type of E. adenanthum show a plant of entirely different structure having shorter petioles, more clustered heads, more nearly equal phyllaries and shorter lobes on the corollas. We believe true E. adenanthum was interpreted most properly by Gardner in his no. 1723 which is a Trichogoniopsis.

The most important distinctions of the new species are the non glandular pubescence of the pedicels, the simple glandular punctations of the phyllaries and the weak short pubescence on the base of the style.

*Macropodina reitzii* R.M.King & H.Robinson, sp. nov.

Suffrutices usque ad 2 m alti ? Caules puberuli. Folia superiora minora saepe alterna, petiolis 0.8-4.0 cm longis, laminis 3-10 cm longis 1.5-8.0 cm latis ovatis vel late ovatis vix acuminatis margine valde serratis base rotundatis vel abrupte anguste cuneatis. Pedicellae tenues 0.5-2.0 cm longae puberulae. Capitula 8-9 cm alta; involucri squamae ca. 18-20 aliquantum inaequilongae 2-3-seriatae 3.0-5.5 mm longae extus puberulae. Flores ca. 20-25 in capitulo; corollae ca. 4.5 mm longae; styli inferne dense hirsuti; achaenia usque ad 4 mm longa; pappi setae ca. 30. Grana pollinis 20-22μ diam.

Type: BRAZIL: Santa Catarina: Bom Retiro: Shady ravine of Agua Boa, Riozinho, alt. 1000 m., January 27, 1957. *L.B.Smith* & *R.Reitz* *10501* (Holotype US!).

The new species is most distinctive in the rather small heads with 18-20 phyllaries and 20-25 flowers. The species is like *M. blumenavii* (Hieron.) R.M.King & H.Robinson in the densely hirsute style base and like *M. bradei* in the lack of stalked glands on the pedicels and phyllaries. Actually there seem to be no glands whatsoever on the phyllaries which would be a further distinction from *M. bradei*. On the basis of the one specimen the leaves seem less acuminate than in the other two species.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB-20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). XCII.

## THE GENUS, TRICHOGONIA.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

Plumose pappus setae have been recognized as a primary characteristic of *Trichogonia* since the establishment of the group as a section of *Kuhnia* by Decandolle (1836). Gardner (1846) raised the group to generic rank and called attention to the hairy outer surface of the corollas, the subequal phyllaries, and in one case the long slender base of the achene. Asa Gray (1851) seems to have been the first to include species in *Trichogonia* that lacked hairs on the corolla, and Mattfeld included species having glabrous corollas and conical receptacles. B.L.Robinson (1913 p 438) called attention to related species lacking a pappus which he placed in the genus *Alomia*. In addition to these, our studies have encountered two species of "Eupatorium" having characters of *Trichogonia*. Certain adjustments in these concepts have been necessary to derive a natural and workable delimitation of *Trichogonia*.

Two features most prominent in the genus *Trichogonia* have been studied critically for our revision, the pappus and the hairs on the corolla. B.L.Robinson summarized the problem of the pappus when he monographed the genus *Alomia*. He knew that two of his species were really *Trichogonia* and not *Alomia*, and he knew that the pappus character did not work since some *Trichogonia* species were known to lack pappus on some achenes. Unfortunately, B.L.Robinson also knew the ramifications of any generic revisions in the Eupatorieae and he saved his energies for other efforts.

The species lacking hairs on the corolla are in no way so closely bound to the genus *Trichogonia*. In fact, these species form two very distinct groups, each differing by additional characters. The species once called *Ageratum melissaefolium* A.P.Decandolle differs not only by corolla pubescence but by a conical receptacle and by more wedge-shaped shortly fringed pappus setae, and we have placed it in a separate genus, *Platypodanthera*. The remaining species that we have seen which lack hairs on the corolla have totally cleft anther appendages and smooth or only faintly ridged stems. We consider the last element to be more closely related to Trichogonia but best placed in a distinct genus Trichogoniopsis.

The resulting concept of Trichogonia is most like the earlier concept of Gardner, being sharply delimited by the presence of dense pilosity on the outer surface of the corolla lobes. The long bases of the achenes and plumose pappus setae are less definitive being absent in some Trichogonia species and present in some related genera. More definitive are the slightly to strongly papillose style branches and the usually very strong ribbing of the stems. Excluded are all species with conical receptacles and papillose inner surfaces of the corolla lobes. As defined the genus is "Gyptoid" in relationship but not as close to Ageratum as assumed in most previous studies.

Trichogonia (A.P.Decandolle) G.Gardner, Lond. Jour. Bot. 5: 459. 1846.

Erect herbs or subshrubs, sparsely branched stems terete with prominent longitudinal ridges, short pubescent with gland tipped hairs. Lower leaves often opposite, at least upper leaves usually alternate; petioles very short to very long, blades linear to broadly cordate, short pilose and densely glanduliferous below. Inflorescence laxely to densely cymose or corymbose; heads medium sized; phyllaries subimbricate, in 2-3 series, 13-25, oblong to spathulate with hairs and glands externally; receptacle plane to slightly convex. Flowers ca. 30-60 per head; corollas tubular below, variously expanded above, lobes broadly triangular, inner surface smooth with elongate cells and sinuose walls, outer surface densely hirsute with few glands; filaments inserted above middle of tube, collars usually rather narrow, cells with prominent annular thickenings, appendage slightly shorter to slightly longer than broad with rounded to retuse tip; style with base not thickened, glabrous; style branches linear or clubbed at tip, densely papillose or mamillose; achene prismatic usually with long slender base, 5-costate with many sharp setae on ribs and faces; carpopodium a very small rim with 1-3 rows of small quadrate rather thick-walled cells; pappus with ca. 14-30 plumose setae or sometimes lacking.

Type species: Kuhnia arguta H.B.K.

Our present studies indicate that the genus contains the following 22 species.

Trichogonia arguta (H.B.K.) Benth. & Hook.f. ex Klatt, Engl. Bot. Jahrb. 8: 33. 1886. Colombia, Venezeula.

Trichogonia attenuata Barroso, Arquiv. Jard. Bot. Rio de Janeiro 11: 14. 1951. Brazil.

Trichogonia campestris Gardn., Hook., Lond. Journ. Bot. 5: 459. 1846. Brazil.

Trichogonia capitata (Rusby) B.L.Robinson, Proc. Amer. Acad. 47: 193. 1911. Bolivia.

Trichogonia chodatii (Hass.) R.M.King & H.Robinson, comb. nov. Eupatorium chodatii Hass., Fedde Rep. Spec. Nov. 11: 169. 1912. Paraguay.

Trichogonia cinerea (Benth. ex Baker) R.M.King & H. Robinson, comb. nov. Alomia cinerea Benth. ex Baker, Mart. Fl. Bras. 6(2): 191. 1876. Brazil.

Trichogonia dubia (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Alomia dubia B.L.Robinson, Proc. Amer. Acad. 42: 33. 1906. Brazil.

Trichogonia fiebrigii Mattf., Notizbl. Bot. Gart. Berlin 8: 450. 1923. Brazil, Paraguay.

Trichogonia hassleri Mattf., Notizbl. Bot. Gart. Berlin 8: 449. 1923. Paraguay.

Trichogonia hirtiflora Schultz-Bip. ex Baker, Mart. Fl. Bras. 6(2): 215. 1876. Brazil.

Trichogonia laxa Gardn., Hook., Lond. Journ. Bot. 6: 435. 1847. Brazil.

Trichogonia martii Baker, Mart. Fl. Bras. 6(2): 216. 1876. Brazil.

Trichogonia menthaefolia Gardn., Hook., Lond. Journ. Bot. 6: 434. 1847. Brazil.

Trichogonia phlebodes (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium phlebodes B.L.Robinson, Contr. Gray Herb. n.s. 100: 16. 1932. Paraguay.

Trichogonia podocarpa Schultz-Bip. ex Baker, Mart. Fl. Bras. 6(2): 216. 1876. Brazil.

Trichogonia rhadinocarpa B.L.Robinson, Proc. Amer. Acad. 42: 36. 1906. Colombia, Venezeula.

Trichogonia rhodotricha Malme, Svensk. Vet.-Akad.Handl. Ser. III. 12(2): 30. 1933. Brazil.

Trichogonia salviaefolia Gardn., Hook., Lond. Journ. Bot. 5: 460. 1846. Brazil, Paraguay.

Trichogonia scabra Klatt, Arbeit Bot. Mus. Hamb. 3. 1890. Brazil.

Trichogonia spathulaefolia Mattf., Notizbl. Bot. Gart. Berlin 8: 445. 1923. Brazil.

Trichogonia villosa Schultz-Bip. ex Baker, Mart., Fl. Bras. 6(2): 213. 1876. Brazil.

Trichogonia zehntneri Mattf., Notizbl. Bot. Gart. Berlin 8: 446. 1923. Brazil.

## References

Decandolle, A.P. 1836. Ordo CII. Compositae. Prodr. Syst. Nat. 5: 4-695.

Gardner, G. 1846. Contributions towards a flora of Brazil, being the characters of several new species of Compositae, belonging to the tribe Eupatorieae. Hook., Lond. Journ. Bot. 5: 455-491.

Gray, Asa. 1851. Characters of a new genus of Compositae-Eupatorieae, with remarks of some other genera of the same tribe. Hook., Lond. Journ. Bot. 3: 223-225.

Robinson, B.L. 1913. Revisions of Alomia, Ageratum, and Oxylobus.Contr. Gray Herb. n.s. 42: 438-451.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB-20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). XCIII.

## A NEW GENUS, TRICHOGONIOPSIS.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

Trichogoniopsis is established for two species which are related to Trichogonia and which have plumose pappus setae and long slender bases on the achenes, but which lack hairs on the corolla lobes, have completely cleft anther appendages, and lack distinct ribs on the stems. As such the new genus is sharply distinct from Trichogonia but obviously closely related to it in the extensive Eupatorian series we refer to as "Gyptoid". The two genera are distinct from all others in the series by the pappus setae which are plumose when present.

Within Trichogoniopsis some confusion has been caused by an unfortunate error of identification. Asa Gray (1851) revised the concept of Eupatorium adenanthum DC. and renamed material distributed by Gardner as Trichogonia gardneri Gray. In this, Asa Gray was misled partly by the variable leaf base of the species and partly by misplaced trust in the observations of DeCandolle. Photographs of the type specimen of Eupatorium adenanthum in the DeCandolle herbarium leave no doubt that it is the species placed here in Trichogoniopsis and not the species usually found in herbaria under that name, Macropodina bradei R.M.King & H.Robinson.

Trichogoniopsis R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Herbae vel suffrutices erecti pauce ramosi. Caules teretes sublaeves hirsuti. Folia plerumque alterna distincte petiolata, petiolis superne anguste alatis, laminis ovatis base cuneatis vel cordatis subtus dense glanduliferis. Inflorescentiae laxe cymosae vel corymbosae; involucri squamae subimbricatae ca. 20 biseriatae subaequilongae anguste lanceolatae extus piliferae et glanduliferae; receptacula plana vel leniter convexa glabra. Flores 40-50 in capitulo; corollae anguste infundibulares, lobis late triangularibus intus laevibus extus laevibus glanduliferis; filamenta antherarum in parte superiore aliquantum angusta, cellulis plerumque oblongis vel longioribus, parietibus valde annulate ornatis, appendices profunde fissae; styli base glabri non nodulosi, appendicibus linearibus sublaevibus. Achaenia fusiformia multsetifera 5-costata base anguste prolongata; carpopodia minuta, cellulis 1-2-seriatis quadratis, parietibus aliquantum incrassatis; pappus setiformis uniseriatus, setis ca. 30 plumosae.

Species typica: Eupatorium adenanthum DC.

The genus contains the following two species.

**Trichogoniopsis adenantha** (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. *Eupatorium adenanthum* A.P. Decandolle, Prodr. 5: 164. 1836. Brazil.

**Trichogoniopsis macrolepis** (Baker) R.M.King & H.Robinson, comb. nov. *Trichogonia macrolepis* Baker, Mart. Fl. Bras. 6(2): 215. 1876. Brazil.

## Reference

Gray, Asa. 1851. Characters of a new genus of Compositae-Eupatoriaceae, with remarks on some other genera of the same tribe. Hook. Journn. Bot. 3: 223-225.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB-20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). XCIV.

## A NEW GENUS, PLATYPODANTHERA.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

The genus Platypodanthera is described for a single species originally described as Ageratum melissaefolium DC. and later transferred to Trichogonia by Mattfeld. The species has presented problems in each of the genera and recent redefinations of Ageratum and Trichogonia have served to emphasize the distinctive nature of the species.

Platypodanthera differs from Ageratum by the short broad fimbriate setae of the pappus, by the long slender base on the achene, and by the lack of sunken glandular punctations on the leaves. The base of the achene and the more setose pappus are more like Trichogonia but Platypodanthera differs by the conical receptacle, the broader fimbriate rather than plumose pappus setae, the smooth stems, and the glabrous corolla. One feature of the new genus seems totally distinctive, the anther collar is usually very short and becomes very broad in the lower part, often being as wide as long. It is after this feature that the name Platypodanthera is taken.

A possible second species of the genus has been described from Brazil as Trichogonia barrosoana Barroso having conical receptacles, short non plumose pappus setae and glabrous corollas. The latter species differs from P. melissaefolia by being tomentose, having short-petiolate leaves, and having setae on the achenes.

Platypodanthera R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Herbae vel suffrutices erecti vel procumbentes basin versus ramosi. Caules teretes sublaeves glabri. Folia plerumque alterna distincte petiolata, laminis ovatis vel late lanceolatis base subtruncatis vel cordatis. Inflorescentiae laxe cymosae vel corymbosae; pedicelli superne latiores fistulosi; involucri squamae subimbricatae ca. 35 biseriatae subaequilongae oblongo-lanceolatae extus glabrae; receptacula alte conica glabra. Flores ca. 100 in capitulo; corollae anguste infundibulares breves, lobis late triangularibus laevibus glabris;

filamenta antherarum in parte superiore perlata saepe breviora, cellulis plerumque quadratis, parietibus valde annulate ornatis, appendices parum breviores quam latiores; styli base glabri non nodulosi, appendicibus longe clavatis laevibus. Achaenia prismatica multisetifera 5-costata base anguste prolongata; carpopodia minuta, cellulis 2-3-seriatis quadratis, parietibus aliquantum incrassatis; pappus breviter setiformis uniseriatus, setae 15-20 anguste lanceolatae margine dense longe fimbriatae.

Species typica: Ageratum melissaefolium DC.

The genus is monotypic.

Platypodanthera melissaefolia (A.P.Decandolle) R.M. King & H.Robinson, comb. nov. Ageratum melissaefolium A.P.Decandolle, Prodr. 5: 109. 1836. Brazil.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB-20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). XCV.

## ADDITIONS TO THE GENUS *BARROSOA*.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

Since the original description of the genus *Barrosoa* (King & Robinson, 1971) we have found four additional species that need to be transferred to the genus. A total of ten species are now known for the genus. Two of the additional species are from Colombia increasing the known representation of the genus at its northern limits. The one Colombian species for which we have collection data is from low elevation which conforms to the pattern already noted.

With the 5 combinations listed below is a correction for one species improperly transferred in the previous paper.

***Barrosoa apiculata*** (Gardn.) R.M.King & H.Robinson, comb. nov. *Eupatorium apiculatum* Gardn., Hook. Lond. Jour. Bot. 5: 476. 1846. Brazil.

***Barrosoa metensis*** (B.L.Robinson) R.M.King & H.Robinson, comb. nov. *Eupatorium metense* B.L.Robinson, Proc. Amer. Acad. 55: 24. 1919. Colombia.

***Barrosoa organensis*** (Gardn.) R.M.King & H.Robinson, comb. nov. *Eupatorium organense* Gardn., Hook. Lond. Journ. Bot. 4: 117. 1845. Brazil.

***Barrosoa trianae*** (B.L.Robinson) R.M.King & H.Robinson, comb. nov. *Eupatorium trianae* B.L.Robinson, Proc. Amer. Acad. 54: 260. 1918. Colombia.

***Barrosoa viridiflora*** (Baker) R.M.King & H.Robinson, comb. nov. *Eupatorium viridiflorum* Baker, Mart. Fl. Bras. 6(2): 309. 1876. Brazil.

### Reference

King, R.M. & H.Robinson. 1971. Studies in the Eupatorieae (Compositae). XXXIV. A new genus, *Barrosoa*. Phytologia 21:26-27.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). XCVI.

## A NEW GENUS, LASIOLAENA.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

The distinctive eupatorian flora of the state of Bahia in Brazil is primarily notable for the many gyptoid genera. Among these, some of the most distincive ones are with spirally inserted leaves, with large carpopodial cells and conical receptacles. To this series we add here a new genus *Lasiolaena* represented by two known species.

The relationships of *Lasiolaena* can be given with unusual precision. Related genera include the more widely distributed *Barrosoa* with its low conical glabrous receptacle, scarcely setiferous achenes; and mostly opposite to subopposite leaves; *Dasycondylus* with its opposite leaves and enlarged hairy style base, *Agrianthus* with its imbricated scalelike leaves and broad style branches; and *Bahianthus* with its glabrous stems and leaves, ridged pedicels and low conical receptacle. Closest relationship actually seems to be either to the widely distributed *Conocliniopsis* which has the receptacle similarly high conical but glabrous and the pappus setae narrowed at the tip, or to *Stylotrichum* which has a very similar habit to *Lasiolaena* but has numerous hairs on the shaft of the style. The most singularly distinctive feature of *Lasiolaena* is the pubescence of the stems, leaves and involucres after which the genus is named. The scattered hairs on the receptacle also seem rather distinctive.

*Lasiolaena* R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae suffruticentes erectae pauce vel multo ramosae; caules, folia, pedicelli et paginae exteriores involucrorum tomentosae. Caules teretes. Folia alterna breviter petiolata, laminis ellipticis subintegris. Inflorescentiae corymbosae; pedicelli ultimi breves. Involucri squamae ca. 20 subimbricatae 2-3-seriatae plerumque oblongo-lanceolatae; receptacula alte conica parce pilosa, maculis magnis. Flores 20-25 in capitulo; corollae anguste infundibulares, lobis aequilateraliter triangularibus utrinque papillosis extus glanduliferis; filamenta antherarum in parte superiore aliquantum angustata, cellulis oblongis vel longioribus, appendices parum longiores quam latiores; styli inferne glabri non nodulosi, appendicibus linearibus leniter mamillosis; achaenia prismatica 5-costata setifera et glandulifera inferne parum angustiora; carpopodia cylindrica, cellulis magnis quadratis multi-seriatis, parietibus parum incrassatis; pappus setiformis uniseriatus, setis 20-25 scabris inferne latioribus extus sublaevibus, cellulis apicalibus distinctis subacutis vel obtusis.

Species typica: Eupatorium blanchetii Schultz-Bip.

Our studies of the genus indicate that it contains the following two species.

Lasiolaena blanchetii (Schultz-Bip.ex Baker) R.M.King & H.Robinson, comb. nov. Eupatorium blanchetii Schultz-Bip. ex Baker, Mart. Fl. Bras. 6(2): 351. 1876. Brazil.

Lasiolaena duartei R.M.King & H.Robinson, sp. nov.

Plantae erectae minimum 4 dm altae pauce ramosae. Folia plerumque quinquefaria supra omnino glabra subtus omnino tomentosa, petiolis ca. 5 mm longis, laminis 2.0-2.5 cm longis 1.0-1.5 cm latis ellipticis obtuse acutis margine serrulatis base cuneatis. Inflorescentiae late corymbosae, pedicelli 2-8 mm longi. Involucri squamae 17-20 acutae 2-4 mm longae. Corollae ca. 3 mm longae, lobis non setiferis, intus leniter papillosis; appendices antherarum vix crenulatae; achaenia sparse setifera, setis obtusis; pappi setae ad apicem plerumque aliquantum dilatatae, parietibus apicalibus tenuibus. Grana pollinis ca. 20 μ diam.

Type: Brazil: Bahia: Lencoes, September 24, 1965, Duarte 9366 (Holotype US!).

The new species is most distinct from L. blanchetii in the broad less compact corymbose inflorescence and in the leaves completely glabrous on the upper surface even on the petiole. Other more microscopic differences are the complete absence of setae on the corolla lobes, the more sparse and blunt-tipped setae on the achene, and the broader more thin-walled apical cells of the pappus setae.

This study was supported in part by the National Science Foundation Grant GB-20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). XCVII.

## A NEW GENUS, *DASYCONDYLUS*.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

Within the broad concept of *Eupatorium* the section *Campuloclinium* has been maintained for many mostly South American species with large heads and often conical receptacles. The concept of the section usually included many species in addition to those now placed in the resurrected genus *Campuloclinium*, and particularly notable among these were the group placed here in a new genus, *Dasycondylus*.

The species of *Dasycondylus* show the often large heads, the conical receptacles and the enlarged hairy stylar nodes that mark *Campuloclinium* and various relatives of *Ayapana*. Still, relationship of *Dasycondylus* seems to be elsewhere. The conical receptacle is marked by large scars and the carpopodia are very enlarged with large thin-walled cells, two features that seem to relate the genus to *Barrosoa* of the Gyptoid series. The differences from *Barrosoa* include the more highly conical receptacles, the enlarged densely hirsute stylar node, the smoother corolla lobes and the more setiferous achenes. In the present interpretation the stylar node is given less significance than some other characteristics. At present, it seems that *Campuloclinium*, *Dasycondylus* and the relatives of *Ayapana* may form three completely different series. The presence of a stylar node in a Gyptoid genus such as *Dasycondylus* is unfortunate for purposes of concise definition but no more so than in the case of the distinct stylar node in *Praxeliopsis* which is in the otherwise non-nodular *Chromolaena* series. Actually the stylar nodes of *Dasycondylus* and the related genus *Diacranthera* seem subtly different from those of the Ayapanoid series by the consistancy with which they are hirsute.

Certain problems at the species level have been noted in the study. It should be observed that by error the name *Eupatorium sordescens* has been widely applied to members of this group. Most material in herbaria and the illustration in Flora Brasilensis (1876) by that name are *Dasycondylus resinosus*, but photographs of the type indicate a totally different species which awaits examination before proper placement. The species concepts are complicated further by the reversion to the species name resinosus for what has been known as Eupatorium lundianum and E. schlechtendalii. A final complication has been the variation in the complex which we interpret here to include three previously undescribed species.

Dasycondylus R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae suffrutescentes erectae pauce ramosae. Folia opposita distincte petiolata, laminis ovatis vel oblongis base cuneatis vel cordatis. Inflorescentieae corymboso-paniculatae, ramis plerumque in glomerulis terminantibus; pedicelli breves. Involucri squamae ca. 15-25 parum inaequilongae 3-4-seriatae interiores lanceolatae exteriores saepe late oblongae vel obovatae; receptacula conica valde maculata. Flores ca. 20-60 in capitulo; corollae anguste infundibulares, lobis triangularibus non vel duplo longioribus quam latioribus laevibus extus glanduliferis interdum setiferis; filamenta antherarum in parte superiore non incrassata, cellulis oblongis vel longioribus, parietibus valde transverse annulate ornatis, appendicibus plerumque parum longioribus quam latioribus oblongis vel ovatis; styli inferne valde incrassati dense hirsuti, appendicibus linearibus superne vix latioribus laevibus vel leniter mamillatis; achaenia prismatica 5-costata superiore sparse setifera; carpopodia incrassata, cellulis plerumque magnis, parietibus non incrassatis; pappus setiformis uniseriatus, setis ca. 30-40 scabris superne sensim parum angustioribus, cellulis apicalibus anguste obtusis vel acutis.

Species typica: Eupatorium lobbii Klatt

Key to the species of Dasycondylus

1. Leaves with broadly truncate or cordate bases; achenes with long flexuous setae; corolla lobes with many slender hairs externally D. platylepis

1. Leaves with cuneate bases; achenes with short stiff setae or nearly glabrous; corolla lobes with few or no short stout hairs 2

2. Heads usually with 45-60 flowers 3

2. Heads with 20-40 flowers 4

3. Outer phyllaries about 3 times as long as wide, obtusely pointed, heads with ca. 60 flowers: leaves sparsely puberulous below D. debeauxii

3. Outer phyllaries scarcely twice as long as wide, broadly rounded apically; heads with ca. 45-50 flowers; leaves distinctly tomentose below D. lobbii

4. Corolla lobes $1\frac{1}{2}$ to 2 times as long as wide, with a few short stout setae on the outer surface 5

4. Corolla lobes scarcely longer than wide, with only glands on the outer surface 6

5. Leaves nearly glabrous, with slightly crenulate margins, outer phyllaries obtusely pointed D. riedelii

5. Leaves densely tomentose below with distinctly toothed margins, outer phyllaries with usually broadly rounded tips D. regnellii

6. Outer phyllaries very broadly rounded apically, heads with 27-40 flowers; leaves ovate-lanceolate D. dusenii

6. Outer phyllaries acute, heads with 20-30 flowers; leaves usually oblong-ovate D. resinosus

The seven species of Dasycondylus are as follows:

Dasycondylus debeauxii (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium debeauxii B.L.Robinson, Contr. Gray Herb. n.s. 68: 13. 1923. Brazil.

Dasycondylus dusenii R.M.King & H.Robinson, sp. nov.
Plantae pauce ramosae. Folia supra puberula, subtus puberula vel tomentosa, petiolis 6-10 mm longis, laminis ovatis 4.0-9.5 cm longis 1.5-4.0 cm latis subserrulatis vel integris ad apicem acutis base breviter cuneatis. Capitula 7-9 mm alta; involucri squamae ca. 25-30 exteriores oblongae obtusae vel truncatae 3-4 mm longae 1.5-2.0 mm latae dense hirsutae interiores lanceolatae ca.6 mm longae; flores ca. 27-40 in capitulo; corollae 5.5-6.0 mm longae, lobis vix longioribus quam latioribus extus solum

glanduliferis, appendicibus antherarum ovato-oblongis non longioribus quam latioribus; achaenia 2.0-2.2 mm longa superne pauce setifera, setis brevibus rectis; setae pappi ca. 35-40, cellulis apicalibus acutis vel subacutis. Grana pollinis 20-25μ diam.

Type: BRAZIL: Parana: Jacarehy ad marginum silvilas August 27, 1915, P. Dusen 17214 (Holotype US!). Additional specimens: BRAZIL: Parana: Jacarehy, August 21, 1914, P.Dusen 15526 (US!), Pirahy, August 30, 1908, P.Dusen 6555 (US!)

The species is distinct from *D. resinosus* in the broader blunter outer phyllaries. The number of flowers also tends to be greater and the species seems to be rather intermediate between *D. resinosus* and *D. lobbii*.

*Dasycondylus lobbii*(Klatt) R.M.King & H.Robinson, comb. nov. *Eupatorium lobbii* Klatt, Ann. Naturh. Hofmus. Wien 9: 355. 1894. Bolivia, Brazil. Peru.

*Dasycondylus platylepis* (Baker) R.M.King & H.Robinson, comb. nov. *Eupatorium platylepis* Baker, Mart. Fl. Bras. 6(2): 355. 1876. Brazil.

*Dasycondylus regnellii* R.M.King & H.Robinson, sp. nov. Plantae multae ramosae. Folia subtus dense tomentosa, petiolis 4-10 mm longis, laminis ovatis 2.5-6.5 cm longis 1.0-3.0 cm latis distincte serratis ad apicem breviter acuminatis base breviter cuneatis. Capitula ca. 8 mm alta; involucri squamae ca. 20 exteriores obovatae obtusae ca. 3 mm longae 1.0-1.5 mm latae dense hirsutae, interiores lanceolatae ca. 5 mm longae; flores ca. 25-30 in capitulo; corollae 4.5 mm longae, lobis ca. 1½ longioribus quam latioribus extus glanduliferis plerumque uni- vel bi-setiferis, appendicibus antherarum late ovatis ca. 1¼ longioribus quam latioribus; achaenia ca. 2.2 mm longa superne multo setifera, setis aliquantum rectis; setae pappi ca. 40, cellulis apicalibus acutis vel subacutis. Grana pollinis ca. 23μ diam.

Type: BRAZIL: Minas Gerais: Caldas, August 24, 1862, Regnell III 715 (Holotype US!)

The species is notable for the strongly serrate leaves with dense tomentum on the under surface. The outer phyllaries are generally blunt, a condition not seen in D. resinosus. The corollas have narrower lobes with a few hairs on the outer surface, characters more like D. riedelii.

Dasycondylus resinosus (Spreng.) R.M.King & H.Robinson, comb. nov. Mikania resinosa Spreng., Neue Entdeck. 2: 134. 1820. Brazil.

Dasycondylus riedelii R.M.King & H.Robinson, sp. nov.
Plantae pauce ramosae. Folia utrinque subglabra, laminis ovatis leniter crenulatis vel subintegris breviter anguste acuminatis base breviter cuneatis; folia inferiora magna, petiolis usque ad 5 cm longis; laminis ca. 19 cm longis 10 cm latis; folia superiora minora, petiolis ca. 1 cm longis, laminis 6-8 cm longis 2-3 cm latis. Capitula ca. 8 mm alta; involucri squamae ca. 20 exteriores oblongae breviter acutae 2.5-3.0 mm longae; flores ca. 25 in capitulo; corollae 5.5 mm longae, lobis duplo longioribus quam latioribus extus glanduliferis uni- vel bi-setiferis, appendicibus antherarum oblongis ca. 1½ longioribus quam latioribus; achaenia 1.8 mm longa parce setifera, setis brevibus rectis; setae pappi ca. 40, cellulis apicalibus acutis vel subacutis. Grana pollinis 20-23µ diam.

Type: BRAZIL: without precise locality, Riedel sn (HOLOTYPE GH!)

The new species is based on material included by B.L.Robinson in his concept of Eupatorium carnosifolium though the specimen lacks the flat receptacle, the larger number of flowers and the divided anther appendages of the latter. The specimen of the new species does show a much larger leaf which was apparently from the lower part of the plant. Such leaves are not mentioned in descriptions of related species. The corolla lobes are most like those of D. regnellii being even narrower in comparison to their length and having similar hairs. The leaves are very different from D. regnellii in having only small teeth and in being only sparsely pubescent. The outer phyllaries of D. riedelii are also different from D. regnellii by being more pointed.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB-20502 A #1 and A #2 to the senior author.

STUDIES IN THE EUPATORIEAE (ASTERACEAE) XCVIII.

A NEW GENUS, DIACRANTHERA.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

There seem to be two genera in the Gyptoid series of the Eupatorieae which possess enlarged hirsute style bases. One of these genera having conical receptacles and fully developed anther appendages is the rather widely distributed *Dasycondylus* with seven known species. The other genus, *Diacranthera*, with plane receptacles and cleft anthers is described here as new on the basis of two species from eastern Brazil. The two genera are like *Barrosoa* and others of the Gyptoid series and are different from other groups having enlarged style bases by the large thin-walled cells of the carpopodium.

The material placed here in *Diacranthera* is the larger part of what B.L.Robinson placed in his species *Eupatorium carnosifolium* described in 1928. A review of Robinson isotype and paratype duplicates has revealed three entities including one *Dasycondylus* and both species of *Diacranthera*. Since paratype series may include more than one species, the identity of specimens of all the numbers cited by B.L.Robinson should be checked individually. The actual type of *Eupatorium carnosifolium* is the same as *Campuloclinium crenatum* Schlecht ex Mart., a name cited in synonymy by B.L. Robinson. The older name takes priority again as the species is transferred from *Eupatorium*.

*Diacranthera* R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Frutices erecti pauce ramosi. Caules, folia, pedicelli et involucri squamae breviter puberulae. Folia opposita breviter petiolata, laminis ovatis. Inflorescentiae breviter cymosae, pedicellis brevibus. Involucri squamae ca. 25 biseriatae subaequilongae ovatae vel oblongo-lanceolatae; receptacula late convexa. Flores 50-65 in capitulo; corollae anguste infundibulares, lobis laevibus vix longioribus quam latioribus extus setiferis pauce glanduliferis; filamenta antherarum in parte superiore incrassata, cellulis plerumque quadratis superne elongatis, parietibus valde noduliferis, appendices distincte bilobatae; styli inferne valde incrassati dense hirsuti, appendicibus linearibus superne vix latioribus leniter mamillatis; achaenia prismatica 5-costata glabra; carpopodia incrassata, cellulis plerumque magnis, parietibus non incrassatis; pappus setiformis uniseriatus, setis ca. 35 scabris superne tenuibus, cellulis apicalibus acutis.

Species typica: *Diacranthera ulei* R.M.King & H. Robinson.

Key to species of *Diacranthera*.

Anther appendages as long as wide, bilobed to middle; corolla lobes without setae on outer surface, corollas reddish; carpopodium with 1-2 rows of smaller cells at base; leaves with numerous distinctly raised glands ... *D. crenata*

Anther appendages about ½ as long as wide, bilobed to base; corolla lobes with numerous short setae on outer surface, corollas greenish-white; carpopodium without distinct rows of smaller cells at base; leaves with only sessile glands ... *D. ulei*

**Diacranthera crenata** (Schlect. in Mart.) R.M.King & H.Robinson, comb. nov. *Campuloclinium crenatum* Schlecht. in Mart., *Flora 24 Beibl. 2(7): 105.* 1841. Brazil.

**Diacranthera ulei** R.M.King & H.Robinson, sp. nov.

Caules teretes dense puberuli. Folia opposita, petiolis 5-10 mm longis, laminis late ovatis 5-10 cm longis 3-6 cm latis acutis vel breviter acuminatis base acutis vel breviter acuminatis margine subserrulatis subtus pallidis supra et subtus puberulis et glanduliferis, glandulis sessilibus. Capitula 6-7 mm alta. Involucri squamae 3.5-4.5 mm longae ca. 1 mm latae oblongo-lanceolatae anguste acuminatae exteriores extus dense velutinae. Corollae viridi-albae ca. 3 mm longae; appendices antherarum breves bilobatae, lobis ca. 125µ longis ca. 75µ latis; achaenia ca. 2 mm longa; carpopodia ca. 0.4 mm lata et alta. Grana pollinis ca. 20µ diam.

Type: BRASIL: Ceara: Serra de Maranguape, October 1910, E. Ule 9119 (Holotype US!).

The type specimen was distributed as *Eupatorium carnosifolium* B.L.Robinson and the now destroyed duplicate in the Berlin Herbarium is listed as a paratype by B.L.Robinson. The species is distinct by its shorter anther appendages, sessile glands, greenish-white setiferous corollas.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB-20502 A #1 and A #2 to the senior author.

CERTAMEN MELASTOMATACEIS XX.

John J. Wurdack
U. S. National Herbarium, Smithsonian Institution

Most of the current miscellany is based upon recent collections of G. T. Prance, D. R. Simpson, and J. Schunke from Brazil and Peru, plus a few long-pending novelties from elsewhere in Latin America. Included also are some additional results from the Andean fieldwork of E. Asplund; more will be published later on the extensive Ecuadorian collections of Asplund and other Scandinavian botanists.

ADELOBOTRYS ACREANA Wurdack, sp. nov.

A. macrophyllae Pilger affinis, foliis trinervatis ad basim nec rotundatis nec cordulatis differt.

Ramuli sicut petioli foliorum venae primariae subtus inflorescentiaque densiuscule pilis malpighiaceis 0.8-1 mm longis appressis vel subappressis induti. Petioli 0.7-1 cm longi; lamina 8-13 X 4-6 cm elliptica apice acuto vel paullulo acuminato basi acuta vel anguste obtusa, tenuiter coriacea et integra, densiuscule appresso-ciliata, supra primum sparsissime strigulosa mox glabrescens, subtus in superficie sparsiuscule pilis malpighiaceis appressis gracillimis 1.5-2 mm longis obsita, 3-nervata (pari tenui ca. 0.5-1 mm inframarginali neglecto) nervis secundariis supra invisis subtus tenuibus ca. 0.5-1 cm inter se distantibus nervulis non vel vix evolutis. Panicula ca. 5 cm longa lataque submultiflora; flores 5-meri, pedicellis 3.5-4 mm longis. Hypanthium (ad torum) 4.3 X 2.8 mm extus sparse pilis malpighiaceis appressis demum caducis armatum; calycis tubus 1.5 mm longus, lobis interioribus oblatis ca. 0.3 mm altis sparsissime glandulis 0.1 mm longis ciliolatis intus glabris, dentibus exterioribus modice setulosis inframarginalibus. Petala 9-9.5 X 5.5-5.9 mm obovato-oblonga glabra. Stamina paulo dimorphica glabra; filamenta 8-8.5 mm longa; antherarum thecae declinatae subulatae 8.2 mm vel 5 mm longae, poro 0.1-0.15 mm diam. paulo dorsaliter inclinato, appendice ascendenti 2.3 vel 1.8 X 0.3 mm apice hebeti et paullulo (0.05-0.1 mm) emarginato, dente ca. 0.3 mm longo acuto. Stigma truncatum 0.5 mm diam.; stylus 8 X 0.35-0.45 mm glaber; ovarium 5-loculare apice ca. 0.2 mm 5-lobulato.

Type Collection: G. T. Prance, P. J. M. Maas, K. Kubitzki, W. C. Steward, J. F. Ramos, W. S. Pinheiro, & J. F. Lima 12564 (holotype US 2647822; isotype NY), collected in forest on terra firme, Rio Moa 8 km above Cachoeira Grande, Estado Acre, Brazil, 27 April 1971. "Vine. Petals, filaments, and style pink; anthers yellow."

Paratype: José Schunke V. 2070 (US), from "bosque alto carretera Miel de Abeja, a 2 km del Campamento de Iparía," Dto. Honoria, Prov. Pachitea, Depto. Huánuco, Peru, 22 June 1967.

"Liana 7-8 m; flores rosados."

Adelobotrys macrophylla has generally larger 5(-7)-nerved leaf blades rounded to cordulate at the base and generally longer (ca. 1/4) hypanthia, but similar stamens with blunt slightly emarginate apices on the ascending connective tooth; A. rotundifolia Triana (still with topotypical flowering material unknown, but again collected fruiting [Steyermark & Bunting 102773, San Carlos, Amazonas, Venezuela]) differs at least in the relatively broader distinctly 5(-7)-nerved leaf blades with cordulate bases. The Peruvian A. subsessilis Gleason has similar stamens, but relatively much narrower leaf blades cordulate at the base and with petioles only 2-3 mm long. The Peruvian paratype of A. acreana differs slightly from the Brazilian type in the slightly (0.5 mm) projecting external calyx teeth, slightly longer (2.8 mm or 2.4-2.6 mm) ascending connective tooth, and longer (1.3 mm or 0.8 mm) spur, and perhaps will prove subspecifically distinct; the description is based solely on the flowers of the Prance collection. Both the Peruvian and Brazilian collections have indistinct inframarginal (less than 1 mm) fourth and fifth primary veins, rather than (as in A. macrophylla) distinct veins 4-7 mm from the margins.

ADELOBOTRYS KLUGII Wurdack, sp. nov.

A. marginatae Brade affinis, foliorum subtus pilis minoribus erectis floribus minoribus differt.

Ramuli sicut foliorum subtus venae primariae inflorescentiarum ramique dense setulosi pilis castaneis malpighiaceis (stipite 0-0.15 mm longo, ramis singulatim plerumque 0.5-1 mm longis). Petioli 0.7-1.3 X ca. 0.15 cm; lamina (6-)8-12 X (2.5-)4-5.5 cm anguste ovata vel oblongo-ovata apice breviter gradatimque acuminato basi rotundata, subcoriacea et integra, dense appresso-ciliata, supra primum sparse malpigheo-strigulosa mox glabrescens, subtus modice persistenterque setulosa pilis rufidulis malpighiaceis sessilibus vel subsessilibus (ramis singulatim ca. 0.3-0.5 mm longis), 3-nervata (pari tenui ca. 0.5-1 mm inframarginali neglecto) nervis secundariis supra invisis subtus ca. 4 mm inter se distantibus nervulis laxis vix vel non evolutis. Paniculae 4-6 cm longae submultiflorae terminales vel in foliorum superiorum axillis insertae; flores 5-meri in ramulis conferto-umbellati, pedicellis 2-3 mm longis. Hypanthium (ad torum) 3 mm longum extus modice strigulosum pilis malpighiaceis sessilibus (ramis appressis singulatim ca. 0.7 mm longis); calycis tubus 0.7-0.8 mm longus, lobis interioribus 0.5-0.6 mm longis ovatis eciliolatis intus glabris, dentibus exterioribus 0.6-0.7 mm eminentibus dense strigulosis. Petala 5.5-6.6 X 2.7-3.4 mm oblongo-obovata glabra. Stamina dimorphica glabra; filamenta 5-5.5 mm longa; antherarum thecae declinatae subulatae 4.5-5 mm vel 3-3.2 mm poro 0.1-0.15 mm diam. dorsaliter (antherarum maiorum) vel ventraliter (antherarum minorum) inclinato, appendice dorsali ascendenti paullulo (0.1-0.2 mm) hebeti-bilobulata 1.9-2.1 vel 1.6-1.7 X 0.2-0.25 mm, dente dorsali acuto 0.5-0.9 mm longo. Stigma truncatum 0.25 mm diam.;

stylus 5.7-5.8 X 0.2-0.25 mm glaber; ovarium 5-loculare anguste oblongum glabrum.

Type Collection: G. Klug 1914 (holotype US 1456648), collected in forest at Umbria, Com. Putumayo, Colombia, elev. 325 m, Jan.-Feb. 1931. "Vine; petals lilac."

Paratype (topotypical): Klug 1844.

Adelobotrys marginata (cf. Phytologia 20: 373. 1970) has the lower leaf surface malpighian hairs rather appressed and with arms each ca. 0.7-1(-1.5) mm, hypanthia (to the torus) ca. 5 mm long, and petals 8-10 X 4.6-6 mm, as well as stouter leaf petioles 2.5-3 mm diam. Certainly more distantly related are A. spruceana Cogn. (smaller thinner leaves sparsely ciliate with erect simple hairs and more-or-less glabrescent beneath on the actual surfaces, flowers in crowded bracteate heads) and A. fuscescens Triana (serrulate leaves with less dense and caducous lower surface pubescence, interior calyx lobes densely ciliolate and moderately strigulose within, tuberculate inframarginal external calyx teeth, and ascending appendages of the larger stamens caudate-bifid for 0.7 mm). Another species with quite pubescent foliage, A. boissierana Cogn., has non-emergent external calyx teeth, caudate-bifid ascending connective appendages, and (at least as to recent Ecuadorian material, Lugo 2 and 692 from Pastaza) unbranched hairs on the lower leaf surfaces.

GRAFFENRIEDA MOAENSIS Wurdack, sp. nov.

G. intermediae Triana et G. weddellii Naudin affinis, foliis trinervatis ad basim late acutis floribus 6-meris differt.

Ramuli primum paulo compressi demum teretes sicut foliorum venae primariae subtus inflorescentia hypanthiaque primum ravo-puberuli (indumento appresso) demum glabrati. Petioli 0.8-1.4 cm longi; lamina (6-)8-11 X (2.5-)3-4.5 cm elliptica apice breviter (1-1.5 cm) gradatimque acuminato basi acuta, firme membrânacea et integra, supra glabra, subtus indumento amorpho cinereo persistente dense obsita, trinervata nervis secundariis 3-4 mm inter se distantibus nervulis subtus planis laxe reticulatis ob indumentum saepius occultis. Panicula ca. 4 cm longa submultiflora, bracteolis ca. 3-5 X 1-2 mm oblanceatis ad anthesim caducis; flores 6-meri obscure (0.5 mm) crasseque pedicellati. Hypanthium (ad torum) 3 mm longum; calycis tubus ca. 1 mm longus, lobis 2.8 X 1.5-1.7 mm lanceatis. Petala 5.3 X 3.2-3.3 mm obovata apice obtuso et setula unica 0.2 mm longa armato alioqui glabra. Stamina isomorphica glabra; filamenta 3 mm longa; antherarum thecae 3 X 0.5 mm arcuatae subulatae poro 0.1 mm diam. ventraliter inclinato; connectivum 0.3 mm prolongatum, dente dorsali 1-1.1 mm longo acutissimo. Stigma punctiforme; stylus glaber 4.5 X 0.3 mm in ovarii apicem 0.8 mm immersus; ovarium 3-loculare ca. 2 mm longum (collo incluso) apice dense granuloso.

Type Collection: G. T. Prance, P. J. M. Maas, K. Kubitzki, W. C. Steward, J. F. Ramos, W. S. Pinheiro, & J. F. Lima 12634 (holotype US 2647823; isotype NY), collected in forest on hill slopes, Rio Moa between Cachoeira Grande and Serra da Moa, Estado Acre, Brazil, 28 April 1971. "Treelet 4 m. Corolla white; filaments dark yellow, anthers paler."

Both suggested relatives have 5-7-nerved leaf blades rounded to cordulate at the base, predominantly 5-merous flowers, and narrowly acute petal apices.

LEANDRA COLLINA Wurdack, sp. nov.

L. purpurascenti (DC.) Cogn. affinis, ramulis non setosis foliorum superficiebus supra glabris differt.

Ramuli juveniles teretes sicut petioli foliorum venae primariae subtus inflorescentia hypanthiaque dense puberuli pilis stipitato-stellatis (stipite 0.1-0.2 mm longo) vel stellato-pinoideis usque ad 0.3 mm longis. Petioli 0.7-1.5 cm longi; lamina (3.5-)4.5-8 X (1-)1.4-1.8 cm oblongo-lanceata apice gradatim acuminato basi late acuta vel obtusa, firme membranacea et integra, prominenter appresso-ciliata pilis laevibus ca. 1 mm longis, supra in costa modice graciliterque appresso-setulosa alioqui glaberrima, subtus in venis venulisque modice setulosa pilis gracilibus laevibus ca. 0.8 mm longis, 5-nervata vel usque ad 3 mm pseudo-plinervata pari exteriore inframarginali nervis secundariis ca. 2 mm inter se distantibus nervulis supra invisis subtus planis et modice reticulatis (areolis ca. 0.3 mm latis). Panicula 3-5 cm longa terminalis pauciflora interdum paulo refracta, ramulis pilis laevibus ca. 0.8 mm longis sparse setulosis; flores 5-meri subsessiles (pedicellis crassis ca. 0.5 mm longis) plerumque ad ramulorum apices 3-5-glomerati, bracteolis 2-3 X 0.2-0.4 mm sparse setulosis persistentibus. Hypanthium (ad torum) 3.6-3.8 mm longum extus dense setosum pilis gracilibus laevibus 1-1.5 mm longis; calycis tubus 0.3 mm longus, lobis interioribus 2 X 1.2 mm ovato-oblongis intus basim versus et extus sparse stellulato-puberulis, dentibus exterioribus 2 mm eminentibus lineari-subulatis setulosis; torus intus sparse vel modice setulosus pilis 0.2-0.7 mm longis. Petala 4-4.1 X 1.3-1.5 mm oblongo-lanceata acuminata glabra. Filamenta 3-3.2 mm longa glabra; antherarum thecae 3.3-3.5 mm longae oblongo-subulatae poro ca. 0.15 mm diam., connectivo non prolongato dorsaliter ad basim per 0.4-0.5 mm plerumque paulo elevato. Stigma punctiforme; stylus 6.8-7.2 X 0.3-0.4 mm glaber vel interdum basim versus sparsissime glanduloso-setulosus (pilis usque ad 0.7-1 mm longis); ovarium 3-loculare et 1/2 inferum apice setulis paucis caducis 0.25-1.8 mm longis plerumque ornato.

Type Collection: Bassett Maguire & Celia K. Maguire 44562 (holotype US 2444800; isotype NY), collected at the Biological Station at Paranapiacaba, São Paulo, Brazil, elev. 800-900 m, 6 Dec. 1959. "Shrub or small tree. Flowers white."

Paratypes (both São Paulo, Brazil): F. R. Fosberg 43341 (US), from Serra do Moji 0.5-1 km west of Paranapiacaba above Santos, "Alto da Serra," Mun. Riberão Pires, elev. 760-840 m, 28 Oct. 1962; L. B. Smith 1853 (US), from Estacão Biologica, Alto da Serra, elev. 800-900 m, Feb. 1929 (fruiting).

Leandra purpurascens has young branchlets retrorse-strigulose with simple hairs, upper leaf surfaces sparsely to moderately strigulose, and ovary apices generally more abundantly setulose. Another more distant relative is L. kleinii Brade, with pustulate upper leaf surfaces, smaller flowers, and anther connectives attenuate-prolonged at the base. Among other species known to me primarily only by descriptions, L. acuminata Cogn. differs at least in the relatively broader 7-nerved leaf blades, L. diffusa Cogn. (type examined at Paris) has sparsely (1-1.5 mm) setulose branchlets and pedicels 2-5 mm long, L. miconiastrum (Naud.) Cogn. var. parvifolia Cogn. has hirtellous branchlets, smaller flowers, and shorter external calyx teeth, and L. sparsisetulosa Hoehne has broader leaf blades "subglabrous" beneath and hypanthia merely sparsely "stellate-furfuraceous." It is odd that a species collected thrice in the Alto da Serra region was unknown to Hoehne and Brade.

MICONIA PRANCEI Wurdack, sp. nov.

Sect. Adenodesma. M. tomentosae (Rich.) Don affinis, foliis distincte petiolatis non acuminatis differt.

Ramuli novelli inconspicue compressi demum teretes, sicut foliorum subtus venae primariae et secundariae hypanthiaque pilis pinoideis appressis 0.05-0.1 mm altis et 0.1-0.15 mm diam. dense obsiti. Petioli 1.5-2.5 mm longi; lamina (9-)12-18(-21.5) X (5-)6-8(-10) cm elliptica vel paulo obovato-elliptica apice late hebeti-obtuso vel rotundato basi late acuta, firme membranacea et integra vel obscure distanterque crenulata, ubique in superficie glabra, subtus in venulis sparsissime pilis pinoideo-stellulatis 0.05-0.1 mm diam. induta, breviter (0.3-0.8 cm) subalternatimque 3-plinervata (pari 0.5-1 mm inframarginali neglecto) nervis secundariis ca. 0.7 cm inter se distantibus nervulis subtus planis dense reticulatis (areolis 0.2-0.3 mm latis). Panicula 10-19 X 1.5-4 cm (pedunculo 4-7 cm longo incluso) angusta submultiflora; flores 5-meri subsessiles (pedicellis crassis 0.3-0.7 mm longis), bracteolis inconspicuis ca. 0.5 X 0.2 mm valde caducis. Hypanthium (ad torum) 4 mm longum inconspicue 10-costulatum; calyx 2.6-3 mm longus in alabastris clausus ad anthesim in lobos ovatos ca. 1-1.6 mm dehiscens extus modice et intus sparse stellulato-puberulus; torus intus setulis ca. 10 glanduliferis 0.3 mm longis ornatus. Petala glabra 5.7-6 X 2.6-2.7 mm oblongo-obovata apice asymmetrice retuso. Stamina paullulo dimorphica; filamenta 7.6-8 mm vel 7-7.4 mm sparse glanduloso-puberula pilis 0.1-0.15 mm longis; thecae 7.2-7.4 vel 6-6.5 X 0.8 mm subulatae, poro ca. 0.2 mm diam. ventraliter inclinato; connectivum ad basim ventraliter bilobulatum modice glandulosum, glandulis ca. 0.05 mm diam. et 0.2-0.25 mm stipitatis. Stigma paulo expansum 1-1.2 mm diam.; stylus 14 X 0.5-0.6 mm sparsiuscule glanduloso-puberulus (pilis ca. 0.2 mm longis) in ovarii collum 1.2 mm immersus; ovarium 3-loculare et 0.9 superum, collo sparsiuscule glandulis 0.1 mm longis ornato.

Type Collection: G. T. Prance, D. F. Coêlho, & O. P.

Monteiro 14793 (holotype US 2647824; isotype NY), collected in savanna forest on sandy soil, Rio Cuieras just below mouth of Rio Brancinho, Estado Amazonas, Brazil, 24 Sept. 1971. "Tree 8 m X 10 cm diam. Corolla white tinged pink; filaments purple."

Miconia tomentosa has essentially sessile acuminate leaves. Generally, except for the petiolate obtuse leaves, M. prancei resembles the small-flowered element with small trichomes (M. symplectocaulos Pilger) synonymized by Gleason (Bull. Torrey Club 58: 227. 1931) under M. amplexans (Crueg.) Cogn.; this variant probably is at least subspecifically distinct from M. tomentosa-M. amplexans, but the range in flower size of M. tomentosa with typical large vegetative trichomes is great and requires further analysis. Both M. tomentosa and M. prancei have the rather hyaline calyx completely closed in young bud (despite Gleason's key distinctions from M. triangularis, Bull. Torrey Club 59: 366-367. 1932) and rupturing more-or-less regularly into lobes before anthesis.

MICONIA SCHUNKEI Wurdack, sp. nov.

M. fanshawei Wurdack affinis, foliorum trichomatibis minoribus differt.

Ramuli teretes, sicut petioli inflorescentiae hypanthiaque densissime pilis stipitato-stellatis (stipite 1-2.5 mm longo; ramulis ca. 0.2 mm longis) erectis induti. Petioli 1.5-4 cm longi; lamina 12-29 X 4.5-12 cm anguste elliptica apice acuto vel paulo acuminato et 1-3 mm mucronulato basi acuta, subcoriacea et obscure denticulata, supra primum densiuscule pilis stellatis sessilibus vel 0.1-0.2 mm stipitatis induta mox glabrata, subtus modice persistenterque pilis stellatis plerumque stipitatis (stipite 0.2-0.3 mm longo; ramulis ca. 0.2 mm longis) ornata, 5-plinervata (pari tenui inframarginali neglecto) nervis primariis interioribus 1.8-4 cm supra basim divergentibus nervis secundariis ca. 3-5 mm inter se distantibus sicut nervulis supra obscuris nervulis subtus paulo elevatis laxe (areolis ca. 1 mm latis) reticulatis. Inflorescentiae ut videtur primum terminales demum laterales (e basim bifurcatae?) confertiflorae recurvatae 1-2.5 cm longae; flores 5-meri sessiles interrupto-glomerati, bracteolis non visis (ob pilos occultis?). Hypanthium (ad torum) 1.7 mm longum; calycis tubus 0.3-0.4 mm longus, lobis interioribus ovato-oblongis rotundatis 0.6 X 0.3-0.4 mm pilis stipitato-stellatis 0.5 mm longis ciliolatis, dentibus exterioribus subulatis 0.7-0.8 mm eminentibus pilis stipitato-stellulatis ornatis; torus intus minute (0.1 mm) glanduloso-setulosus. Petala 3-3.4 X 1-1.2 mm oblonga apice rotundato et interdum setula glandulifera 0.1 mm longa armato alioqui glabra. Stamina glabra; filamenta 2-2.5 mm longa; antherarum thecae 1.6-1.7 X 0.35 mm oblongo-subulatae uniporosae (poro terminali 0.1 mm diam.), connectivo paulo (0.25-0.3 mm) prolongato dorsaliter ad basim tuberculo 0.1-0.15 mm elevato ornato. Stigma truncatum 0.25 mm diam.; stylus 6 X 0.2-0.25 mm glaber; ovarium 3-loculare et 1/4 inferum, apice collo 0.5 mm alto stellulato-puberulo coronato.

Type Collection: José Schunke 5756 (holotype US 2649576; isotype F), collected at Porongo east of Uchiza, Depto. San Martín, Peru, elev. 450 m, 20 Jan. 1962. "Arbusto 2 m; flores pequeñas, 10Y8/11 (strong greenish yellow)."

The suggested Guyana relative has foliar hairs persistent on the upper surface and with stipe and arms each 0.5-0.7 mm, as well as exappendiculate stamens. In pubescence, M. diaphanea Gleason is closer than M. fanshawei; that species however has a conical calyx (in bud) splitting at anthesis and non-emergent external calyx teeth. The inflorescence pattern in M. schunkei is rather more like that of Clidemia than Miconia, but the pubescence and floral details are like those of the two above-suggested relatives.

MICONIA HUANUCENSIS Wurdack, sp. nov.

Sect. Amblyarrhena. M. baillonianae Macbride affinis, pedicellis brevioribus hypanthiis teretibus differt.

Ramuli quadrangulati non alati paulo infra nodos perforati sicut folia inflorescentia hypanthiaque glabri. Petioli 2-5.5 cm longi; lamina (9.5-)15-23 X (4-)5.5-9.5 cm elliptica vel paulo oblongo-elliptica apice breviter (1.5-2 cm) acuminato basi acuta, membranacea et integra vel obscure ciliolato-serrulata ciliis appressis vix 0.2 mm longis, 5-plinervata (pari interiore 1-3 cm supra basin divergenti) nervis secundariis ca. 7-9 mm inter se distantibus nervulis subtus planis areolis plerumque ca. 0.8-1 mm latis. Panicula 9-26 cm longa (pedunculo 3-6.5 cm longo incluso) ramis primariis oppositis sicut ramulis pedicellisque arcte subalato-quadrangulatis; flores 5-6-meri, pedicellis 1-2 mm longis crassis, bracteolis non visis (mox caducis?). Hypanthium (ad torum) 3.3-3.5 mm longum teres; calycis tubus 0.5 mm longus, lobis in alabastris clausis ad anthesim 2-2.5 X 2-2.2 mm ovatis, dentibus exterioribus obscuris non liberis inframarginalibus. Petala glabra 4.4-5 X 3-4 mm oblonga apice paulo retuso. Stamina paullulo dimorphica; filamenta 3.5-4.5 mm vel 2.6-3 mm longa apicem versus modice glanduloso-puberula pilis ca. 0.1 mm longis; antherarum thecae 3.3-3.5 vel 3.2-3.3 X 1 X 0.7-0.8 mm oblongae paulo curvatae poro 0.3 mm diam. ventraliter inclinato, connectivo non appendiculato. Stigma expansum 1-1.4 mm diam.; stylus 4-5 X 0.5 mm sparse vel modice glandulis 0.05-0.1 mm longis obsitus in ovarii collum 0.2-0.5 mm immersus; ovarium 5-6-loculare et 2/3 inferum collo paullulo (0.05-0.1 mm) lobulato et glandulis paucis 0.05 mm longis ciliolato.

Type Collection: E. Asplund 13173 (holotype S), collected at Tingo Maria, Depto. Huánuco, Peru, 18 Aug. 1940. "About 4 m high; branches of inflorescence lilac; calyx pale greenish yellow; petals white."

Paratype (topotypical): E. Asplund 13175 (S).

Miconia bailloniana has longer (ca. 5 mm) pedicels and somewhat larger winged hypanthia, but is otherwise (vegetatively and in stamens) quite similar. Miconia bangii Cogn. lacks infranodal branchlet perforations and has much smaller flowers (hypanthia ca. 2.2 mm long; petals 2-2.3 X 1.8 mm; anthers

2-2.4 mm long) with setulose (0.3 mm) ovary apices, but is otherwise qualitatively similar in floral structure. In Macbride's key in the Flora of Peru, M. huanucensis would key to ca. M. expansa Gleason, which is probably more distantly related than the two above-suggested relatives (primary inflorescence branches 4-8 per node; glandular-ciliate leaf blades; calyx lobes tipped with caducous glandular setulae; anthers with dorsally deflexed apex). Gleason had indicated in a postscript in his melastome notes that M. expansa might be synonymous with M. bailloniana, but this is certainly not true. In the type collection of M. huanucensis, the visible flowers all seem 5-merous, while in the paratype all three flowers and buds examined were 6-merous; otherwise, there are no differences between the two collections.

MICONIA ASPLUNDII Wurdack, sp. nov.

Sect. Amblyarrhena. M. modicae Macbride et M. coroniferae Wurdack affinis, foliorum apicibus obtusis differt.

Ramuli primum obtuse quadrangulati demum teretes sicut petioli inflorescentia hypanthiaque modice caduceque pinoideo-puberuli pilis ca. 0.1 mm longis latisque; linea interpetiolaris non evoluta. Petioli (1.5-)2-4 cm longi; lamina (8-) 12-18 X (4-)6-9 cm elliptica apice obtuso basi rotundata et cordulata vel paullulo (usque ad 0.3 cm) peltata, tenuiter coriacea et integra vel obscure crenulata, ubique in superficie glabra, subtus in venis secundariis venulisque sparse caduceque pinoideo-puberula, 5(-7)-plinervata pari interiore 0.6-1 cm supra basim divergenti nervis secundariis ca. 3-4 mm inter se distantibus sicut nervulis ubique obscure elevatis areolis subtus ca. 1 mm latis. Panicula 12-15 cm longa submultiflora; flores 5-meri, pedicellis ca. 2 mm longis crassis, bracteolis 3 X 0.3-0.4 mm mox caducis. Hypanthium (ad torum) 4 mm longum intus non costatum; calycis tubus 1 mm longus, lobis interioribus 1 X 2.5 mm oblatis caduce ciliolatis intus basim versus sparse caduceque pinoideo-puberulis, dentibus exterioribus appressis crassis lobos interiores aequantibus vel paulo brevioribus; torus intus sparsiuscule glanduloso-ciliolatus pilis 0.15-0.3 mm longis. Petala 6.2-7 X 4-6 mm minutissime granulosa obovata vel oblongo-ovata apice paulo emarginato. Stamina isomorphica; filamenta 3.5-4 mm longa sparsiuscule glanduloso-puberula pilis 0.1 mm longis; antherarum thecae 2.8-3 X 0.8-0.9 X 0.9 mm oblongae poro 0.1 mm diam. dorsaliter inclinato, connectivo nec prolongato nec appendiculato. Stigma capitellatum 1 mm diam.; stylus 8-8.5 X 0.6-0.7 mm modice glanduloso-puberulus (pilis ca. 0.2 mm longis) in ovarii apicem 0.8 mm immersus; ovarium 4-loculare et 1/2 inferum, apice conico 2 mm alto (styli collo 0.8 mm alto incluso) sparsissime glandulis 0.05 mm longis ornato.

Type Collection: E. Asplund 9854 (holotype S), collected in the valley of Río Sangarinas (Desaguadero), Río San José, Cordillera de Llanganates, Prov. Tungurahua, Ecuador, elev. 3100-3200 m, 24 Nov. 1939. "Shrub 5 m high; calyx brownish green; petals white; anthers yellow."

Paratype (near-topotypical): E. Asplund 9795 (S), from "La Trinca," elev 3000 m.

Both suggested relatives have leaf blades with narrowly acute to acuminate apices. Miconia modica has somewhat smaller flowers (calyx [tube plus lobes] ca. 1.2 mm long; hypanthium 3-3.2 mm long; petals 4-5 mm long; anthers 2-2.5 mm long), but anthers of similar shape and hypanthium essentially lacking internal ribs. Miconia coronifera has considerably larger vegetative hairs ca. 0.25 mm diam., longer and more abundant toral and ovarial hairs, shorter calyx, and a larger (1.8 mm diam.) stigma. Other species of this general alliance such as M. floribunda (Bonpl.) DC. (smaller petals, hypanthium internally ribbed, anthers differently shaped, larger filament glands, stigma ca. 3 mm diam.), M. amabilis Cogn. (leaves narrowly acute or acuminate, much smaller flowers), M. majalis Cogn., M. grandiflora Cogn., and M. macrantha Triana (all three with much larger petals and stigmas) seem more distantly related, as do the three species with sharply quadrangular branchlets recently described by me (M. madisonii, M. incacachana, M. terborghii).

MICONIA SCHNELLII Wurdack, sp. nov.

Sect. Cremanium. M. biperuliferae Cogn. affinis, foliorum laminis ad basim plerumque rotundatis basaliter nervatis venarum primariarum poculis non evolutis differt.

Frutex vel arbor 2-8 m; ramuli primum obtuse sulcato-quadrangulati demum teretes sicut inflorescentia plerumque essentialiter glabri. Petioli 1-2.5 cm longi; lamina 4-8.5 X 2.5-3.5 cm oblongo-ovata apice acuto basi rotundata, tenuiter coriacea et obscure calloso-serrulata, supra glabra, subtus in superficie modice glanduloso-punctata et in venarum primariarum axillis (et paulo supra axillas) densiuscule setosa pilis simplicibus 1-4 mm longis persistentibus alioqui glabra, 3-nervata (pari exteriore tenui ca. 1-1.5 mm inframarginali neglecto) nervis secundariis ca. 2-2.5 mm inter se distantibus nervulis subtus planis laxiuscule reticulatis (areolis ca. 1 mm latis). Panicula 5-8 cm longa submultiflora; flores 5-meri, pedicellis ca. 4-5 mm longis et ca. 1.3-1.5 mm infra hypanthii basim articulatis, bracteolis 2.5-3 X 0.7-1 mm mox caducis. Hypanthium (ad torum) 2.5 mm longum ad anthesim plerumque glabratum; calycis tubus 0.4 mm altus, lobis interioribus ca. 0.4-0.5 mm longis remotis, dentibus exterioribus lobos interiores plerumque aequantibus callosis. Petala 2.6 X 2.3-2.4 mm alba suborbicularia glabra. Stamina subisomorphica glabra; filamenta 3 mm longa; antherarum thecae 1.3-1.4 X 0.45 X 0.55 mm oblongae late (0.45 mm) 4-porosae, connectivo ventraliter ca. 0.3-0.4 mm prolongato dorsaliter inconspicue hebeti-dentato. Stigma expansum 1 mm diam.; stylus 4.8 X 0.4-0.7 mm glaber in ovarii apicem paulo (0.2 mm) immersus; ovarium 3-loculare et ca. 2/3-3/4 inferum, apice conico 0.4 mm alto glabro.

Type Collection: Charles Schnell 711 (holotype US 2469374), collected in a pasture on volcanic ash soil, Valle Escondido, Prov. Cartago, Costa Rica, elev. 2600 m, 1 May 1966. "Stout pole 4 m X 4" DBH, with dense short horizontal branches."

Paratypes (all Costa Rica): Prov. Cartago: L. O. Williams 16270, from Cerro de la Muerte, elev. 3100 m; P. C. Standley 35166 and Margery Carlson 3627, both from Volcán de Turrialba, elev. 2000-2600 m; Margery Carlson 3559, from Volcán Irazú, elev. 2950 m. Prov. San José: William Burger & G. Matta U. 4363 and Schnell 187 and 597, all from near Villa Mills, elev. 3100-3200 m.

*Miconia biperulifera* has moderately stellulate-puberulous young branchlets and plinerved basally acute leaf blades with well-developed pocules in the primary vein axils beneath, but similar flowers; both species have 4-pored anthers. Generally *M. schnellii* has essentially glabrous branchlets and inflorescences; in Schnell 597 however, the young branchlets and hypanthia are moderately stellulate-furfuraceous. Most of the currently known collections of *M. biperulifera* are from Volcán de Poás, Alajuela, elev. 2000-2800 m; Tonduz 4266 is from Irazú (elev. 2000 m) and Schnell 780 from Volcán Barba, Heredia (elev. 2300 m). Cogniaux described the style of *M. biperulifera* as "nullo"; however all flowering collections seen by me have both pistils and anthers well-developed (flowers bisexual).

TOCOCA TETRAMERA Wurdack, sp. nov.

*T. caquetanae* Sprague affinis, inflorescentia maiora floribus 4-meris calycis calyptra in alabastris seta glandulifera excepta glabra petalis staminibusque maioribus differt.

Frutex 1-3.5 m; ramuli sicut petioli formicaria inflorescentiaque densiuscule setosi (pilis caduce glanduliferis [2-]3 [-4] mm longis) et modice caduceque stellulato-puberuli. Folia didymophysca in quoque pari aliquantum disparilia (1:1.5-1.7); petioli liberi 0.5-1 cm longi; formicaria 1.5-2.5 cm vel 0.3-1 cm longa juxta petiolorum apices evoluta; lamina 9.5-16 X 5-9 cm vel 17-27 X 6.5-12 cm elliptica apice paulo acuminato et ca. 4-6 mm mucronato basi late acuta vel obtusa, membranacea et serrulata dentibus ciliolatis ca. 1 mm profundis et 2-4 mm inter se distantibus, supra sparse appresso-setosa pilis laevibus caduce glanduliferis ca. 2 mm longis, subtus in nervis modice setosa (pilis ca. 1-2 mm longis et ut videtur eglandulosis) et sparse stellulato-puberula in nervulis superficieque glabra, 5-nervata nervis secundariis 6-10 mm inter se distantibus nervulis subtus paullulo elevatis modice reticulatis (areolis 0.3-0.4 mm latis). Panicula terminalis multiflora vel submultiflora 9-19 cm longa (pedunculo 3-6 cm longo incluso), ramis primariis in quoque nodo plerumque 4(-6); flores 4-meri, pedicellis (1-)3(-5) mm longis, bracteolis 0.6-0.9 mm longis oblongis mox caducis ca. 0.5-0.8 mm infra hypanthium insertis. Hypanthium (ad torum) 4.7 mm longum extus paullulo 8-alatum in alis modice glanduloso-setosum (pilis 1.5-2 mm longis) alioqui glabrum vel subglabrum (pilis stellulatis paucissimis obtectis); calyx in alabastris ca. 1.3 mm altus hyalinus conicus integer setula glandulifera 1.2 mm longa coronatus alioqui glaber ad anthesim in lobos 3-4 late ovatos 0.3 mm altos dehiscens, dentibus exterioribus 4 ca. 1.7-2(-3) mm eminentibus (setula terminali glandulifera 0.5 mm longa inclusa); torus intus glaber. Petala glabra 4.7-5 X 2.8-3 mm oblongo-obovata apice asymmetrice pauloque retuso. Stamina isomorphica glabra; filamenta 3.7-3.8 mm longa; antherarum thecae 4.2 X 0.6 mm paulo subulatae poro 0.1 mm diam. dorsaliter inclinato, connectivo dorsaliter per 0.9-1 mm supra basim 0.2 mm elevato. Stigma paulo expansum 0.4 mm diam.; stylus 7 X 0.3 mm glaber in ovarii apicem 0.1 mm immersus; ovarium 4-loculare et 1/2 inferum apice conico glabro.

Type Collection: José Schunke 3151 (holotype US 2587107A; isotype F), collected in high forest southeast of Nuevo Progreso (Río Huallaga), Distr. Uchiza, Prov. Mariscal Caceres, Depto. San Martín, Peru, elev. 500 m, 18 June 1969. "Arbusto 1 m; hojas de color amarillento; pédunculos rojizos; flores pardas amarillentas; anteras amarillas."

Paratypes (all Peru, fruiting): José Schunke 4778 (F, US), from Isla de Pucnuchu, Río Huallaga, Depto. San Martín; E. Asplund 12318 (S), from Tingo Maria, Depto. Huánuco; E. P. Killip & A. C. Smith 26482 (US), from Puerto Bermudez, Depto. Junín, elev. 375 m (distributed earlier as *T. micrantha*).

*Tococa caquetana* has 5(-6)-merous flowers in inflorescences only 2-5 cm long, terete and moderately to densely stellate-puberulent hypanthia, calyx moderately stellulate-puberulent and without a terminal seta, external calyx teeth not or barely projecting, petals 2.7-3.6 X 2-2.6 mm, and anthers 2-2.6 mm long. Most of the currently available material of *T. caquetana* (Amazonian Colombia, Ecuador, and Peru) was previously determined as *T. micrantha* Ule (1915), which is surely (from photos and Gleason notes) a synonym of *T. caquetana* (1904); the numerous specimens show both 3- and 4-celled ovaries but are otherwise quite consonant. The other obvious (and at least as close) relative, *T. parviflora* Spruce ex Triana (now known from as far south as Cuzco, Peru), has generally shorter (averaging ca. 1 mm) upper leaf surface hairs, inflorescence branchlet internodes without stellulate hairs, glabrous or very sparsely setulose hypanthia, and 3-celled ovaries, but a similar large inflorescence, predominantly 4-merous (in the typical subspecies) flowers, calycine calyptra, and projecting (in the typical subspecies) external calyx teeth. As further collections are accumulated, *T. parviflora* subsp. *manserichensis* Wurdack may prove specifically distinct. Apart from *T. parviflora* and *T. tetramera*, the only other 4-merous species of *Tococa* known to me are *T. caudata* Mgf. and *T. quadrialata* (Naud.) Macbr., which are otherwise quite different vegetatively and in flowers.

CLIDEMIA SIMPSONII Wurdack, sp. nov.

*C. siapensi* Wurdack affinis, foliorum laminis integris 5-nervatis calycis dentibus exterioribus longioribus petalis minoribus differt.

Ramuli teretes sicut petioli foliorum venae primariae supra et subtus inflorescentia hypanthiaque dense pilis stellatis breviter (0.1-0.3 mm) stipitatis induti. Petioli 1-3 cm longi; lamina (6-)9-17 X (2.5-)3.5-6 cm oblongo-lanceata apice acuto vel gradatim acuminato basi obtusa vel truncata, membranacea et integra, obscure ciliolata pilis laevibus 0.3-0.4 mm longis et pilis stellatis intermixtis, supra primum sparse stellato-puberula demum subglabrata, subtus sparsiuscule stellato-puberula pilis persistentibus breviter (ca. 0.1-0.2 mm) stipitatis, 5-nervata nervis secundariis ca. 3 mm inter se distantibus nervulis subtus obscure elevatis laxiuscule (areolis 0.5-0.8 mm latis) reticulatis. Inflorescentiae e foliorum superiorum axillas singulae 3-5 cm longae subpauciflorae paniculares; flores 5-meri plerumque breviter (ca. 2 mm) pedicellati, bracteolis setuliformibus sparse stellulato-puberulis persistentibus ad hypanthii bases insertis. Hypanthium 3-3.5 mm longum pilis gracillimis glanduliferis interdum sparsissime ornatum; calycis tubus 0.2 mm longus, lobis interioribus 0.8-1 mm longis oblongo-ovatis extus sparse stellulato-puberulis, dentibus exterioribus subulatis 1.1-1.8 mm eminentibus modice stellulato-puberulis. Petala glabra 2.3-2.7 X 0.8-1 mm oblonga apice rotundato. Stamina isomorphica glabra; filamenta 1.8-2 mm longa; thecae 2-2.2 X 0.3 mm paullo subulatae poro 0.1 mm diam. paulo ventraliter inclinato, connectivo non prolongato dorsaliter ad basim paullulo elevato non vere appendiculato. Stigma truncatum 0.3-0.4 mm diam.; stylus 5 X 0.25-0.35 mm glaber in ovarii apicem ca. 0.4 mm immersus; ovarium 3-loculare et 2/3-3/4 inferum apice modice stellulato-puberulo et interdum glandulis 0.1 mm longis sparsissime ornato.

Type Collection: D. R. Simpson & José Schunke 751 (holotype US 2649575; isotype F), collected along trail between Santa Maria de Nanay and Santa Rosa, Dist. Alto Nanay, Prov. Maynas, Depto. Loreto, Peru, 26 Feb. 1968. "Shrub ca. 1 m; leaves deep green above, red beneath; calyx lemon-green; corolla greenish white; fruit grey blue."

Paratypes: R. E. Schultes & Isidoro Cabrera 15736 (US), from Caño Guacayá, Río Miritiparaná, Depto. Amazonas, Colombia, elev. ca. 200 m, 2-8 March 1952; G. T. Prance, P. J. M. Maas, A. A. Atchley, W. C. Steward, D. B. Woolcott, D. F. Coelho, O. P. Monteiro, W. S. Pinheiro, & J. F. Ramos 14237 (NY, US), from near Cachoeira Santo Antonio, Rio Curuquete, Rio Purus-Rio Ituxi drainage, Est. Amazonas, Brazil, 15 July 1971 (fruiting).

*Clidemia siapensis* has cordulate 7-9-nerved leaf blades which are distantly undulate-serrulate, external calyx teeth projecting only 0.1-0.5 mm, and petals 4.5-5 X 3 mm, but similar indument. In both species, gland-tipped hairs are exceedingly sparse or absent.

HENRIETTELLA PRANCEI Wurdack, sp. nov.

*H. loretensi* Gleason affinis, foliis distincte 5-plinervatis floribus maioribus differt.

Ramuli primum quadrangulati demum teretes sicut innovationes petiolique primum dense setulosi (pilis gracillimis ca. 0.3 mm longis) et granuloso-glandulosi demum glabrati. Petioli 3-4 cm longi; lamina 11-18 X 6-8 cm elliptica apice anguste acuto basi late acuta vel obtusa, integra et coriacea, supra glabra, subtus in venis venulisque sparse appresso-setulosa pilis gracillimis ca. 0.2 mm longis in superficie glandulis paucis exceptis glabra et glaucescens, 5-plinervata (pari exteriore tenui inframarginali neglecto) pari interiore 2-3 cm supra basim divergenti nervis secundariis ca. 5 mm inter se distantibus nervulis subtus planis laxe reticulatis (areolis 1-1.5 mm latis). Flores 4-meri paucifasciculati, pedicellis 2.5-3.6 mm longis sicut hypanthiis petalisque extus et calyce ubique modice granuloso-glandulosis. Hypanthium (ad torum) 2.7 mm longum; calycis tubus 0.4-0.5 mm altus, lobis 0.2-0.3 mm altis oblatis, dentibus exterioribus obsoletis. Petala 4.7-5.1 X 2.6-3 mm ovato-oblonga intus ca. 2 mm infra apicem appendiculata apice hebeti-acuto extus obscure mucronulato. Stamina isomorphica glabra; filamenta 4.5 mm longa; thecae 3.1 X 1.2 X 1.2 mm anguste oblonga ventraliter ca. 0.6 mm infra filamenti insertionem prolongatae minute (0.1 mm) biporosae exappendiculatae vel dorsaliter obscure calcaratae. Stigma truncatum 0.4-0.45 mm diam.; stylus 7.5 X 0.4 mm glaber; ovarium 4(?)-loculare omnino inferum apice glabro.

Type Collection: G. T. Prance, P. J. M. Maas, D. B. Woolcott, O. P. Monteiro, & J. F. Ramos 15520 (holotype US 2647821; isotype NY), collected in savanna forest along Rio Uneiuxi 200-300 km above mouth, Rio Negro basin, Estado Amazonas, Brazil, 22 Oct. 1971. "Treelet 4 m. Calyx red; corolla white tinted pink; filaments white; anthers yellow."

Henriettella loretensis has shoot apices pulverulent with hairs less than 0.1 mm long, 3-plinerved leaf blades, and considerably smaller (but qualitatively similar) flowers (hypanthium plus calyx 1.9 mm long, petals 3.3 X 1.3-1.4 mm, anthers 1.8 X 0.8 mm). The general vegetative aspect of H. prancei is like that of some species of Bellucia and Loreya; the species of the latter genus all have 5-merous (and usually larger) flowers with generally expanded stigmas.

BLAKEA HIRSUTISSIMA (Macbride) Wurdack, comb. et stat. nov.

Blakea hirsuta Berg ex Triana var. hirsutissima Macbride, Field Mus. Publ. Bot. 13(4): 511. 1941.

BLAKEA HIRSUTISSIMA (Macbride) Wurdack var. CHONTALENSIS (Wurdack) Wurdack, comb. nov.

Blakea hirsuta Berg ex Triana var. chontalensis Wurdack, Mem. N. Y. Bot. Gard. 16(1): 41. 1967.

José Schunke's recent near-topotypical collections (San Martín, Prov. Mariscal Caceres: Distr. Campanilla, 4293; Distr. Tocache Nuevo, 4074 and 4947) of B. hirsuta var. hirsuta, coupled with examination of the type collection (W), show petioles ca. 1 cm long, ovate-lanceate floral bracts with eglandular hairs, anther thecae (dry) ca. 4 mm long with the dorso-basal blunt spur elevated 0.7-1 mm from the filament insertion, and ovary apex with ca. 12 robust setae 4-5 mm long; the leaf blades are often sparsely appressed-setose above when young but glabrate with age. The Marañón population of B. hirsutissima (cf. Wurdack 2100 and 2292) has petioles 2-3 cm long, obovate-oblong broadly acute to obtuse bracts with some gland-tipped hairs, anther thecae (dry) 5-5.5 mm long with the blunt dorso-basal spur elevated ca. 1.5-2 mm, and ovary apex glabrous. Blakea hirsutissima var. chontalensis has shorter cauline pubescence than the typical variety (and somewhat smaller anther thecae), but other floral details (bracts, glabrous ovary) as in the Marañón variety. From Markgraf's description as well as a fruiting specimen (Grubb, Lloyd, Pennington, & Whitmore 1586, from near Tena) very tentatively determined by me, B. hirsuta var. rotundata Mgf. may well not be conspecific with either B. hirsuta or B. hirsutissima, so transfer of this Ecuadorian variety has been postponed until topotypical flowering specimens are collected.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). I

A NEW SPECIES OF RHYSOLEPIS.

Harold Robinson
Smithsonian Institution, Washington, D.C. 20560.

Blake described the genus Rhysolepis in 1917 to include two species from Mexico having large rather clasping paleae and having a Viguiera type pappus. The genus was placed near Sclerocarpus because of the specialized paleae but Blake considered relationship was closer to Viguiera from which the species were transferred. The two original species were easily distinguished by differences of leaf insertion, leaf pubescence and phyllary length.

A specimen of Rhysolepis collected in October 1961 in southern Michoacan shows certain combinations of the characteristics of the two original species and shows a few distinctive microscopic features. The material is recognized here as a third, previously undescribed species. The new species, Rhysolepis kingii, is most like R. palmeri (A.Gray) Blake of northern Michoacan and Jalisco by the opposite leaves, the glabrous base of the ray flowers, the shorter setulae on the bases of the disk flowers, the nearly glabrous achenes and by the continuous series of squamulae on each side of the pappus. The new species is most like R. morelensis (Greenm.) Blake by the yellow stems and branches, the dense tomentum on the undersurface of the leaves, the shorter reflexed tips of the phyllaries, the more broadly truncate and lacerate tips of the paleae and the lack of UV absorption nectar guides on the basal halves of the ray flowers. A few apparently unique features of the new species are the very short basal internodes of the main branches, the smaller disk corollas, and the glands on the outer surfaces of the corolla lobes.

The anther appendages of Rhysolepis bear rather distinctive glands and a few short hairs. The glands seem unusually fragile with very weak bases. The enlarged portions of the glands consist of many tiers of very short broad cells in two rows. In material of R. palmeri and R. kingii the apical pair of cells of the glands is much larger and thinner walled. The apical pair of cells in R. morelensis is not enlarged in the material seen, but this may reflect a stage of development.

The three species of Rhysolepis can be distinguished by the following key.

1. Leaves alternate . . . . . . . . . . . . . . . . *R. morelensis*

1. Leaves opposite . . . . . . . . . . . . . . . . . . . . . 2

2. Leaves finely and densely tomentose below; stems and branches yellow; phyllaries with reflexed tips scarcely longer than wide . . . . . . . . . . . . . . . . *R. kingii*

2. Leaves not finely tomentose below; stems and branches partly redish; phyllaries with very long reflexed tips . *R. palmeri*

*Rhysolepis kingii* H. Robinson, sp. nov.

Frutices erecti 2-3 m alti multo ramosi. Caules teretes sublaeves flavescentes minute puberuli, internodiis basilaribus ramorum perbrevibus. Folia opposita breviter petiolata, petiolis 5-10 mm longis, laminis 4-9 cm long 1.5-3.5 cm latis oblongo-ovatis acutis margine subserrulatis base rotundatis distincte trinervatis supra valde scabrellis subtus dense tomentellis in nervis scabrellis. Inflorescentiae laxe corymbosae, pedicellis 1.5-3.5 cm longis. Capitula 1 cm alta et 1 cm lata. Involucri squamae ca. 5-seriatae 2-7 mm longae oblongae breviter acutae extus inferne subglabrae,in parte reflexo breves nigrae scabrellae; radiis ca. 10-12 flavis ca. 1.5 mm longis inferne glabris; paleis ca. 4 mm longis ad apicem late truncatis laceratis; corollae disci ca. 5 mm longae inferne perbreviter scabrellae in lobis extus breviter scabrellae glanduliferae et inferme piliferae; thecae antherarum ca. 2 mm longae; achaenia ca. 2.5 mm longa subglabra ad apicem lateraliter multisquamulifera. Grana pollinis ca. 25µ diam.

Type: MEXICO: Michoacan: West-facing slopes of Sierra Madre del Sur, ca. 32 kms north of Playa Azul (region of Los Encinos); vegetation mixed tropical deciduous forest. Elev. 1200-1500 ft. Abundant shrubs 2-3 meters tall, open sun, shaded areas. *Robert Merrill King* and *Thomas R. Soderstrom 4972* (Holotype, US).

The species is named for the senior collector who called the collection to the author's attention and who pointed out some of the distinguishing characteristics.

## Reference

Blake, S. F. 1917. III. New and noteworthy Compositae, chiefly Mexican. Contrib. Gray Herb. n.s. 52: 16-59.

# NOTES ON CARIBBEAN DISCOMYCETES. II. TWO SPECIES OF PULVINULA FROM PUERTO RICO

Donald H. Pfister

Laboratory of Tropical Mycology, Dept. of Biology,
University of Puerto Rico
Mayaguez, Puerto Rico 00708

In the preliminary study of some Puerto Rican Pezizales, two species of Pulvinula Boud. have been encountered. This genus is characterized as follows: ascospores spherical (rarely ellipsoid), carotenoid pigments present (Arpin, 1969), paraphyses slightly bent to deformed, apothecia lenticular or shallow cupulate, ectal excipulum of textura globosa to textura angularis, and medullary excipulum of textura intricata. Pulvinula has been discussed taxonomically and nomenclaturally by Rifai (1968). The genus has never been monographed, thus the identification of species has remained difficult.

Thus far, the following species have been identified from Puerto Rico:

1. PULVINULA SALMONICOLOR (Seaver) Pfister, comb. nov.

   ≡ Lamprospora salmonicolor Seaver, Mycologia 17: 47. 1925.
   Holotype: New York Botanical Garden, Exploration of Puerto Rico; N°. 551; on soil; F. J. Seaver and C. E. Chardon, Jan. 24 - April 5, 1923.

The holotype material is unfortunately in poorly preserved condition. One can, however, determine that the medullary excipulum is composed of small diameter cells which form textura intricata, as it is in Pulvinula. Though detailed anatomical comparisions are not possible, the morphology of the spores and form of the paraphyses leave little doubt as to its proper placement in Pulvinula.

This species is readily distinguished from other Pulvinulas by its large ascospores. The diameter of the spores is: 18.2 - 20 µm. In rehydrated condition the apothecia are 4-5 mm in diameter and are convex. The color of the hymenium in fresh condition is reported as salmon; it is buff when rehydrated. To date, the fungus has not been recollected.

2. Pulvinula globifera (Berk. & Curt.) Le Gal sensu Rifai (1968).
   ≡ Peziza globifera Berk. & Curt., Linn. Soc. (Bot.) 10: 366. 1868.
      ≡ Barlaea globifera (Berk. & Curt.) Sacc., Syll. Fung. 8: 114. 1889.
      ≡ Humaria globifera (Berk. & Curt.) Cooke, Handb. Austral. Fungi. p. 256. 1892.
      ≡ Barlaeina globifera (Berk. & Curt.) Sacc. & Trav. in Sacc., Syll. Fung. 19: 139. 1910.
      ≡ Pulvinula globifera (Berk. & Curt.) Le Gal, Prodr. Flore Mycol. Madagascar 4: 94. 1953. [misapplied = Pulvinula orichalcea (Cooke) Rifai]

The lectotype of Pulvinula globifera, as selected by Rifai (1968), was collected in Cuba. Rifai provided a redescription of the type, since there had been confusion concerning this species. According to Rifai the specimen described by Le Gal (1953) as P. globifera does not agree with the Cuban lectotype. For this species, described by Le Gal, Rifai has proposed the name P. orichalcea. I am here using the name P. globifera in the sense proposed by Rifai.

The Puerto Rican specimens agree in anatomical details with Rifai's description of P. globifera. They differ, however, in macroscopic characteristics. The fresh apothecia in these collections were pure white and reached a diameter of 11 mm. In the description provided by Rifai, P. globifera is said to be "yellow, orange-yellow to light red" and the apothecia are said to reach a maximum diameter of 4.5 mm. Thus, both the color and the apothecial size of the Puerto Rican specimens vary from that of the lectotype.

A white variety has been proposed for this taxon, Peziza globifera var. etiolata Cooke. This, according to Rifai, does not differ significantly from the typical Pulvinula globifera. Le Gal raised this variety to the species level; erecting P. etiolata (Cooke) Le Gal. Rifai (1968) has discussed fully the taxonomy and nomenclature of this name. He has found that Le Gal's concept of P. etiolata does not agree with the type of Cooke's variety, thus the name is misapplied. For this taxon, as defined by Le Gal, he has proposed P. tetraspora (Hansf.) Rifai.

Those who believe in recognizing varieties or forms based on hymenial color and apothecial form, might refer the Puerto Rican specimens to Cooke's variety. At present, however, far too little is known about the genus Pulvinula to pass judgement on the significance of these characteristics. The description and illustrations (Fig. 1, A-D) which follow are based solely on the Puerto Rican collections.

Pulvinula globifera (Berk. & Curt.) Le Gal

Apothecia gregarious to crowded, broadly sessile, 4-11 mm in diam. Disc concave, pure white, in age with buff tints, drying buff. Receptacle cupulate, in age margin often undulate from mutual pressure, surface smooth to slightly tomentose, concolorous with the disc. Ectal excipulum of globose to compressed globose cells intermixed with filamentous cells which are perpendicular to the outer surface and somewhat parallel to one another, 10.2 - 15.3 x 5.1 - 8.5 µm. Medullary excipulum of textura intricata 1.7 - 2 µm. Subhymenium of textura intricata, the cells more or less parallel to one another. Hymenium 140 - 155 µm thick. Asci long cylindrical, tapering toward the forked base, 137.5-

150 x 11.4 - 17 µm, 8-spored, with no indication of disintegration of spores or nuclei. Ascospores uniseriate, hyaline, globose, in youth containing several guttules, at maturity containing only one large guttule; 10.2 - 13.6 µm in diam. Paraphyses filiform, delicate, 1.6 - 2 µm in diam at the tip, sparingly septate and unbranched, tip moderately curved, extending beyond the ascus, contents granular but pigment globules lacking.

Habitat and distribution: on clay soil among mosses, Puerto Rico.

Specimens examined: on clay bank among mosses, Rio Duey, Rosario, Puerto Rico, elev. 140 m. D. H. Pfister (415) and Brigid Pfister 30. X. 1971 (CUP); on bank among mosses, location as above, D. H. Pfister and Cathleen Pfister, 9. IV. 1972 (CUP).

The author wishes to thank Drs. C. T. Rogerson and K. P. Dumont of the New York Botanical Gardens for the loan of specimens. This research was supported by National Science Foundation Grant GB-8548.

## LITERATURE CITED

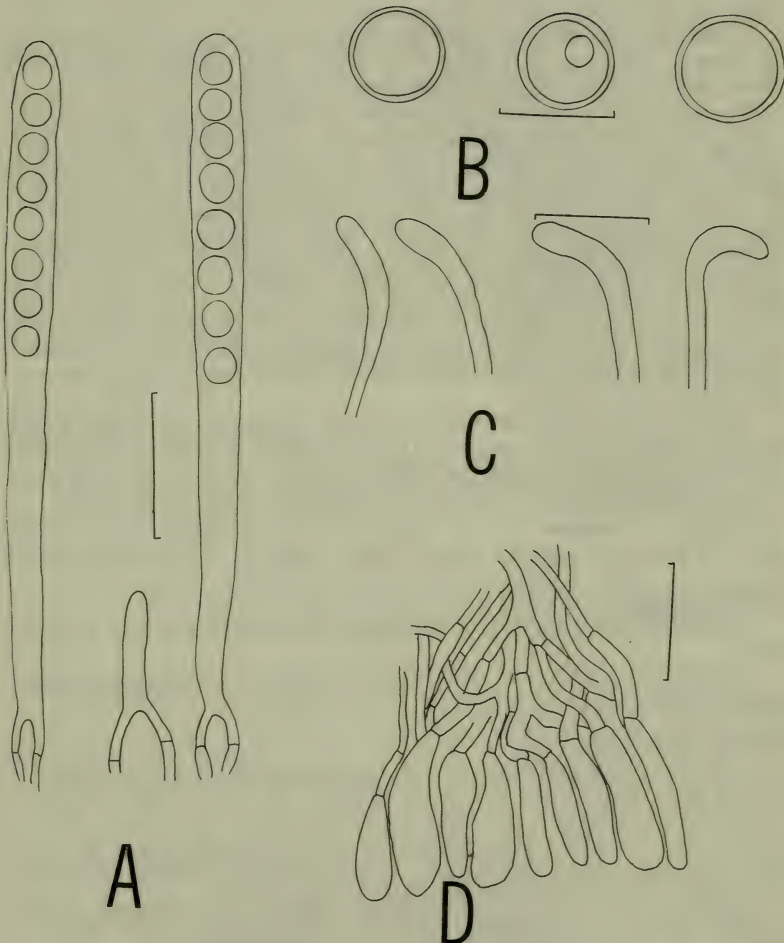
Arpin, N. 1968. Les Caroténoides des Discomycètes: Essai Chimiotaxinomique. 170 pp. Universite de Lyon, Villeurbanne; reissued 1969, Bull. Soc. Linnéenne Lyon 38 (Suppl.): 1-169.

Le Gal, M. 1953. Les Discomycètes de Madagascar. Prodr. Flore Mycol. Madagascar 4: 1 - 465.

Rifai, M. A. 1968. The Australasian Pezizales in the Herbarium of the Royal Botanic Gardens Kew. Verh. K. ned. Acak. Wet. II. 57 (3): 1 - 295.

---

Fig. 1 (A-D). Camera lucida drawing of Pulvinula globifera (scale in A equal to 30 um, in B-D equal to 10 um). A. Asci with ascospores. B. Ascospores. C. Paraphyses apices. D. A portion of the ectal excipulum.


A
B
C
D

ADDITIONAL NOTES ON THE GENUS VERBENA. XVII

Harold N. Moldenke

VERBENA [Dorst.] L.

Additional & emended bibliography: Leverett, New Cop. Lex. Latin Lang., new ed., 373, 508, 643, & 947—948. 1852; Holland, Moth Book, pr. 1, 163. 1903; Almagia in Pirotta, Fl. Col. Erit. 1: [Ann. Inst. Bot. Roma 8:] 130. 1903; Métraux, Bishop Mus. Bull. 160: 342. 1940; Reitz, Sellowia 6: 254. 1954; Rambo, Sellowia 6: 60, 84, 153, & 165 (1954), 7: 260, 266, & 288 (1956), and 9: 158. 1958; Lind & Tallantire, Some Com. Flow. Pl. Uganda 145. 1962; W. G. Wright, Wild Fls. South. Afr. 156—158. 1963; Holland, Moth Book, pr. 2, 163. 1968; Reitz, Sellowia 22: 145. 1970; Dwyer, Raymondiana 4: 71. 1971; Moldenke, Biol. Abstr. 52: 1316 & 9948 (1971) and 53: 5798. 1972; Zepernick, Baessl.-Arch., new ser., 8: 124, 132, 133, 159, 219, 224, 225, 246, 271, 273, 277, 282, & 306. 1972; Anon., Biol. Abstr. 53 (11): B.A.S.I.C. S.266. 1972; Montz, Castanea 37: 143. 1972; Moldenke, Phytologia 24: 20—54 & 126—150. 1972; Gillett, Tweedie, & Fulton, Guide Some E. Afr. Upland Fls. [14], fig. 1. s.d.

Holland (1903) states that the moth, Catabena lineolata Walker, feeds on Verbena while in the larval stage. Métraux (1940) notes that a species of Verbena is used on Easter Island for skin and sexual organ diseases. It is an introduced species known as "puringa". I assume that he refers to V. litoralis H.B.K., since that is the only species of the genus known to me from the island.

VERBENA ABRAMSI Moldenke

Additional bibliography: Moldenke, Phytologia 23: 213 & 286. 1972.

Additional citations: CULTIVATED: California: Moldenke & Moldenke 25709 (Ld).

VERBENA BONARIENSIS L.

Additional bibliography: Neal in Handy, Pukui, & Livermore, Bishop Mus. Bull. 126: 41. 1934; Parham, Pl. Fiji Isls. 216. 1964; Reitz, Sellowia 22: 145. 1970; Moldenke, Phytologia 24: 20—21, 29, & 130. 1972; Zepernick, Baessl.-Arch., new ser., 8: 132, 219, 246, 273, 277, 282, & 306. 1972; Gillett, Tweedie, & Fulton, Guide Some E. Afr. Upland Fls. [14], fig. 1. s.d.

Additional illustrations: Gillett, Tweedie, & Fulton, Guide Some E. Afr. Upland Fls. [14], fig. 1 (in color). s.d.

Gillett and his associates, in the undated booklet cited above, describes this plant as "A much branching plant originally from South America, growing to about 3'6", and often found in large patches near buildings." Additional vernacular names recorded for it are "ha'uoi" in Hawaii, "titania" on Rapa island, and "vunikuta" in the Fiji Islands.

Additional citations: CALIFORNIA: Merced Co.: Moldenke & Moldenke 25749 (Ac, Ld).

VERBENA BRASILIENSIS Vell.

Additional bibliography: W. G. Wright, Wild Fls. South. Afr. 156 & 157. 1963; Reitz, Sellowia 22: 145. 1970; Moldenke, Phytologia 24: 21. 1972; Montz, Castanea 37: 143. 1972.

Additional illustrations: W. G. Wright, Wild Fls. South. Afr. 157 [as V. officinalis]. 1963.

The so-called "Verbena officinalis" of Wright (1963) is actually V. brasiliensis Vell., at least insofar as she has illustrated it. She says that the plant [which one?] "is used by the Sotho people for treatment of fever, anaemia, dropsy and pleurisy," gives the flower color as "mauve", and records the vernacular Sotho name "seona-se-seholo", as well as "vervain" and "wild verbena". Irwin and his associates found V. brasiliensis growing at 1650 meters altitude in "cerrado and gallery forest with some campo" in Brazil. The corolla is described as "violet" on Irwin, Harley, & Onishi 29512. Montz (1972) records the species from "East St. Charles Parish", Louisiana.

Additional citations: BRAZIL: Minas Gerais: Irwin, Harley, & Onishi 29512 (Rf).

VERBENA CALIFORNICA Moldenke

Additional bibliography: Moldenke, Phytologia 23: 218. 1972.

Additional citations: CALIFORNIA: Tuolumne Co.: Moldenke & Moldenke 25758 (Ac, Ld, Ws).

VERBENA DISSECTA Willd.

Additional & emended bibliography: Schnack & Covas, Darwiniana 7: [71] & 73. 1945; Reitz, Sellowia 22: 145. 1970; Moldenke, Phytologia 23: 260, 283, & 431. 1972.

VERBENA FLAVA Gill. & Hook.

Additional & emended bibliography: Schnack & Covas, Darwiniana 7: [71], 72, 74, & 75, pl. 4 C ["G"]. 1945; Moldenke, Phytologia 23: 260 & 426. 1972.

Emended illustrations: Schnack & Covas, Darwiniana 7: pl. 4 C ["G"]. 1945.

VERBENA GRACILESCENS (Cham.) Herter

Additional synonymy: Verbena glabrescens (Cham.) Herter ex Moldenke, Phytologia 23: 436, sphalm. 1972.

Additional bibliography: Moldenke, Phytologia 23: 261 & 436. 1972; A. L. Moldenke, Phytologia 23: 318. 1972.

The corollas are described as having been "bluish-white" on the Tressens et al. collection cited below.

Additional citations: ARGENTINA: Corrientes: Tressens, Benítez, Bissio, Cristóbal, Fernández, Mroginski, Pire, & Pueyo 230 (Rf).

VERBENA HUMIFUSA Cham.

Additional bibliography: Rambo, Sellowia 9: 158. 1958; Reitz, Sellowia 22: 145. 1970; Moldenke, Phytologia 23: 271. 1972.

xVERBENA HYBRIDA Voss

Additional bibliography: Moldenke, Phytologia 24: 22, 39, & 42. 1972.

In July and August, 1972, my wife and I observed this plant in outdoor cultivation in several localities in Uganda, Kenya, and Tanzania (Tanganyika).

VERBENA INCISA Hook.

Additional bibliography: Moldenke, Phytologia 23: 369 (1972) and 24: 37 & 140. 1972.

The corollas are described as having been "red" on both of the collections cited below.

Additional citations: ARGENTINA: Corrientes: Schinini & Mroginski 4449 (Rf); Tressens, Benítez, Bissio, Cristóbal, Fernández, Mroginski, Pire, & Pueyo 135 (Ac).

VERBENA LASIOSTACHYS var. SEPTENTRIONALIS Moldenke

Additional bibliography: Moldenke, Phytologia 23: 286 & 287. 1972.

Additional citations: CALIFORNIA: Santa Cruz Co.: Moldenke & Moldenke 25971 (Ld).

VERBENA LITORALIS H.B.K.

Additional bibliography: Métraux, Bishop Mus. Bull. 160: 342. 1940; Reitz, Sellowia 22: 145. 1970; Moldenke, Phytologia 23: 369, 371, 415, & 419 (1972) and 24: 30, 31, & 126. 1972; Zepernick, Baessl.-Arch., new ser., 8: 133, 159, & 271. 1972.

Métraux (1940) notes that on Easter Island a species of Verbena, called "puringa", is used to treat skin diseases and diseases of the sex organs. Verbena litoralis is the only species of the genus known to me from the island, so I am assuming that it is to this plant that he refers. Irwin and his associates describe V. litoralis as a "slender herb to 1 m. tall", with lilac corollas, growing in secondary forests on lower slopes with numerous rock outcrops.

Additional citations: BRAZIL: Minas Gerais: Irwin, Harley, & Onishi 28721 (Rf).

VERBENA MICROPHYLLA H.B.K.

Additional bibliography: Moldenke, Phytologia 23: 370, 426, & 431 (1972) and 24: 22. 1972.

The Herrera 3450, cited below, was originally distributed as V. laciniata (L.) Briq. and later erroneously cited by me as V. tenuisecta Briq.

Additional citations: PERU: Cuzco: Herrera 3450 (N).

VERBENA OFFICINALIS L.

Additional bibliography: Almagia in Pirotta, Fl. Col. Erit. 1: [Ann. Inst. Bot. Roma 8:] 130. 1903; W. G. Wright, Wild Fls. South. Afr. 156 & 157. 1963; Moldenke, Phytologia 24: 20, 22—27, & 31. 1972.

Miss Wright's (1963) explanation of the Celtic "ferfaen" [supposed source of the name "Verbena"] as meaning to drive away stones "as the plant was used to expel gravel" is a rather curious way to describe the medicinal use of the plant in the treatment of gall-stones and bladder-stones! The illustration given by her and labeled as V. officinalis actually depicts V. brasiliensis Vell. instead! She says that "the plant is used by the Sotho people for treatment of fever, anaemia, dropsy and pleurisy", but it is not clear if she is referring here to the true V. officinalis or to V. brasiliensis, or both.

Almagia (1903) cites the following collections from Eritrea: Pappi 212, 393, 847, 973, 984, 1032, 1551, 1862, & 2168, Terracciano & Pappi 3580, 3654, 3879, 4213, 4274, & 4344, and Ragazzi 89, as well as Schimper 145 and Schweinfurth 1116.

Additional citations: EIRE: J. Butler 351 (N).

VERBENA PULCHELLA Sweet

Additional bibliography: Moldenke, Phytologia 24: 36, 38, 46—49, 137, 138, & 141. 1972.

The Krapovickas, Fernández, Mroginski, Bissio, & Quarin 19932, distributed as V. pulchella, is actually V. tenuisecta Briq.

VERBENA RIGIDA Spreng.

Additional bibliography: Reitz, Sellowia 22: 145. 1970; Moldenke, Phytologia 24: 128—133. 1972; C. D. Adams, Flow. Pl. Jam. 627, 628, & 848. 1972.

Additional illustrations: Batten & Bokelmann, Wild Fls. East. Cape Prov. pl. 99 (9) [in color]. 1966.

Adams (1972) describes this plant as a "Cultivated ornamental escaping occasionally.....on roadsides and in rough pastures; 2000—3500 ft; fl. and fr. May—Sept.", cites Adams 11205, Harris 11969, Proctor 23557, and comments "Native of subtropical S. Amer., introduced into Bermuda, United States, Cuba and elsewhere".

Batten & Bokelmann (1966) call it a "Slender perennial, growing in groups, occasionally in grasslands and along roadsides throughout the country [South Africa]. Escape from cultivation", flowering from October to March.

A letter written by T. S. Cochrane on July 19, 1972, informs me that in the herbarium of the University of Wisconsin there are the following specimens of this species not as yet seen by me: SOUTH CAROLINA: Richland Co.: Logue 976. ALABAMA: Tuscaloosa Co.: Deramus 571. MISSISSIPPI: Hancock Co.: F. H. Sargent 8356. LOUISIANA: Ascension Par.: Sauer 3984. TEXAS: Harris Co.: G. L. Fisher s.n. [14 Sept. 1913] (2 sheets).

The Krapovickas, Cristóbal, Arbo, Benítez, Maruñak, Maruñak, Pire, & Tressens 18226, distributed as typical V. rigida, is actually V. rigida var. obovata (Hayek) Moldenke.

VERBENA RIGIDA var. OBOVATA (Hayek) Moldenke

Additional bibliography: Moldenke, Phytologia 24: 131—133. 1972.

The color of the corollas on the Krapovickas et al. collection cited below is said to have been "purple".

Additional citations: ARGENTINA: Corrientes: Krapovickas, Cristóbal, Arbo, Benítez, Maruñak, Maruñak, Pire, & Tressens 18226 (Rf).

VERBENA SCABRA Vahl

Additional bibliography: Moldenke, Phytologia 24: 138—140 & 146. 1972.

Liogier describes this plant as a much-branched herb and found it growing in open places along streams. He describes the corollas as having been "violet" in color.

Additional citations: HISPANIOLA: Dominican Republic: Liogier 18486 (N).

VERBENA STRICTA Vent.

Additional bibliography: Britton & Br., Illustr. Fl., ed. 2, pr. 5, 3: 94—96, fig. 3556. 1970; Domville & Dunbar, John Burroughs Nat. Hist. Soc. Bull. 8: 94. 1970; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1315 & 1319—1320. 1970; Reed & Hughes, U. S. Dept. Agr. Agric. Handb. 366: [Common Weeds U. S., pr. 1] 308—309, fig. 152. 1970; Brown & Wherry, Bartonia 40: 13. 1971; Cochrane, W. E. & M. M. Rice, Mich. Bot. 10: 184. 1971; J. L. M., Weed Abstr. 20: 321. 1971; Ownbey & Monserud, Common Wild Fls. Minn. 313. 1971; Reed & Hughes, Common Weeds U. S., pr. 2, 308—309, fig. 152. 1971; Thilenius, U. S. Dept. Agr. Forest Serv. Res. Paper RM.71: 42. 1971; Moldenke, Fifth Summ. 1: 14—20, 22, 23, 27, 32, 34—36, 38—42, 44, 46, 47, 50—53, 60, 62—64, 77, & 372 (1971) and 2: 649, 656, 665, 669, 672—674, 684, 692—695, 697, 698, 705, 708, 920, & 967. 1971; Moldenke, Phytologia 22: 485 (1971) and 23: 196, 221, 237, & 265. 1972; A. L. Moldenke, Phytologia 23: 317, 413, & 414 (1972) and 24: 131, 135, 136, 145, & 149—150. 1972; W. A. Weber, Rocky Mtn. Fl. 306. 1972.

Additional & emended illustrations: Britton & Br., Illustr. Fl., ed. 1, 3: 71, fig. 3061 (1898) and ed. 2, pr. 1, 3: 96, fig. 3556. 1913; Pammel & King, Iowa Geol. Surv. Bull. 4 (rev.): 269 & 270, fig. 153 & 153A. 1926; Pellett, Nat. Mag. 18: 185. 1931; Britton & Br., Illustr. Fl., ed. 2, pr. 2, 3: 96, fig. 3556. 1936; Noack, Biol. Zentralbl. 57: 386, fig. 7. 1937; F. H. & H. H. Hillman, Seed Trade Buyers Guide 1938: 137, pl. 12, fig. 7. 1938; Harvey, Erickson, & Larson, Seed Trade Buyers Guide 1945: 86. 1945; Martin & Barkley, Seed Ident. Man. 37, pl. 236. 1961;

Peterson & McKenny, Field Guide Wildfls. [287]. 1968; Rickett, Wild Fls. U. S. 3 (2): [363], pl. 110 (in color). 1969; Britton & Br., Illustr. Fl., ed. 2, pr. 5, 3: 96, fig. 3556. 1970; Reed & Hughes, U. S. Dept. Agr. Agric. Handb. 366: [Common Weeds U. S., pr. 1] 309, fig. 152. 1970; Ownbey & Monserud, Common Wild Fls. Minn. 313. 1971; Reed & Hughes, Common Weeds U. S., pr. 2, 309, fig. 152. 1971.

Recent collectors have encountered this plant at watertable tanks, in sandy soils along rivers, and (in Wheeler County, Texas) in limestone soil of a Salix community. An additional vernacular name recorded for it is "verbain". Weaver (1968) describes the plant as follows: it "is a characteristic weed of nearly all medium- or low-grade pastures. The woody stems grow rapidly and are 2.5 to 3 feet tall late in June, when the first blossoms appear. Blossoming continues until late fall. The small, individual blue flowers are clustered in erect spikes. This bitter-leaved plant is rarely eaten, even in very low-grade pastures where good forage is rare. When all the grasses are dry, this plant still remains green, and often blooms profusely". Weber characterizes it as having "Spikes stout, blunt at the apex; leaves light green, whitened by appressed pubescence;flowers light blue" and says that it is found on "Plains and mesas, abundant in very badly overgrazed areas." The corollas are described as "purple" on Bare 207 and B. Hutchins 1323 and as "lavender to pale-purple" on C. M. Rowell 4115. Patermann (1935) records the diploid chromosome number as 12, while Dermen (1936), Noack (1937), and Poindexter (1960) give it as 14.

Abrams (1967) records V. stricta from Stevens County, Washington; Brown & Wherry (1971) say that it has been introduced in Cape May County, New Jersey; Cochrane & the Rices (1971) describe it as common in fields and pastures of Rock County, Wisconsin; Dobbs (1963) reports it as "Generally distributed throughout [Henry County, Illinois] as a common weed on sandy roadsides and often locally abundant in dry sandy fallow fields". Domville & Dunbar (1970) describe it as "rare in dry places" in Ulster County, New York, blooming there in the summer. Gattinger (1894) tells us that in his time it was "abundant" in the "Counties along the Mississippi river, in sandy soils", flowering there in July, and the "whole plant" was used medicinally.

Grimm (1968) describes V. stricta as a "densely pale-hairy plant with a quite roundish, simple or sparingly branched stem 1 to 4 feet tall. The leaves are stalkless or nearly so, sharply-toothed, and 2 to 4 inches long. Its flowers are deep blue or purple, a bit over 1/4 inch across; and in dense, narrow, blunt-tipped, and practically stalkless clusters. It grows in dry open places from N. Y. and Ont. to Mont. south to Tenn., Ark., Okla., Tex., and N. Mex. Introduced in the Northeast. It flowers June to September." Harger (1930) found it in Fairfield and Litchfield Counties, Connecticut.

Hitchcock and his associates (1959) describe the plant as "Short-lived, perhaps sometimes annual, plants with one or several erect stems 3—12 dm. tall arising from a taproot; herbage densely and conspicuously spreading-hairy, or the hairs of the upper surface of the leaves often appressed; leaves wholly cauline, narrowed to a sessile or subpetiolar base rarely as much as 1 cm. long, the blade broadly elliptic or ovate, 4—11 cm. long, 2—5 cm. wide, coarsely (often doubly) serrate, firm and evidently rugose-veiny; spikes elongate, 6—30 cm. long, typically few or solitary, terminating the stem and branches, more numerous when the stem is more branched; bracts lance-subulate, 4 mm. long, equaling or slightly shorter than the 4—5 mm. calyx; corolla deep blue or purple, the tube 6—7 mm. long, the limb 7—11 mm. wide". They report that in the northwestern part of North America it inhabits "Roadsides and other dry places; a characteristic species of the prairies and plains of c. U. S., extending w. through n. Ida. to n.e. Wash., and introduced eastward to the Atlantic", flowering from June to September. Lakela (1965) cites Lakela 2669 & 5175 as the only known collections from northeastern Minnesota. Lowe (1921) found it on damp open ground on bluffs in Tishomingo County, Mississippi; Meyncke (1885) reports it from Franklin County, Indiana, Mohlenbrock (1968) from Pope County, Illinois, and Moore (1965) from Yell County, Arkansas. Morley avers that it is "common in grazed prairie pastures" in Republic County, Kansas, while Ownbey & Monserud (1971) tell us that in Minnesota it inhabits "Moist to dry prairie and barren fields. Found in the southern and southwestern parts of the state, south and west of a line joining Washington and Clay Counties; also reported from near Duluth."

Radford, Ahles, & Bell (1964) describe it as "rare in pastures and along roadsides" in Onslow County, North Carolina, blooming there from June to September. Reed & Hughes (1970) give its distribution as "Prairies and barrenlands, pastures, old fields, and waste places. Native. Throughout all the United States excepting areas in northern New England and New York, the Southeastern States along the Atlantic and gulf coasts, an area between central Montana and central Minnesota, and an area in the west from Washington and Idaho south to the Mexican border; north into southern Ontario; south into eastern Mexico." They give a map showing this purportedly continuous distribution, but this differs very considerably from the actual distribution of the species as mapped by myself on the basis of actual herbarium specimens examined. I do not know it at all from the states of Oregon or California where they give its distribution as continuous; I know it only from northeastern Washington, while they show it only from the westernmost parts of that state; I know it from parts of Idaho, Utah, and Arizona, where they claim that it does not occur. Intensive field work in Texas by many botanists has revealed its presence so far in only five widely scattered counties instead of continuous in 3/4th of the state as indicated on their map. It is most certainly not continuous in Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware, Pennsylvania, West Virginia, Kentucky, and Tennessee as indicated on their map -- it is actually known from a very few widely scattered localities in these states as an accidental introduction. I do not know it at all from Maryland or Virginia, where they indicate that it is abundant, but it does occur in isolated spots in North Carolina, Georgia, and Alabama. Rowell describes it as "occasional in moist areas" in Hemphill County, Texas. Beebe & Hoffman (1968) record it from Union County, South Dakota.

Swink (1969) says that in the Chicago area V. stricta is found "In rocky pastures [where] it occurs with.....Verbascum thapsus, Cynoglossum officinale, and Lappula echinata......Frequent in overgrazed gravelly pastures, where it associates with Cynoglossum officinale, Eupatorium altissimum, Hordeum jubatum, Nepeta cataria, Poa pratensis, Verbascum thapsus, and Verbena simplex. It is also frequent in sandy abandoned fields, with Ambrosia artemisiifolia elatior, Cassia fasciculata, Lespedeza capitata, Monarda punctata villicaulis, Oenothera rhombipetala, Opuntia humifusa, Plantago lanceolata, Rumex acetosella, and Silene antirrhina. It occasionally grows along railroads and on roadsides. Rarely it is found in gravelly, degraded prairie remnants, growing with Achillea millefolium, Amorpha canescens, Arenaria stricta, Asclepias verticillata, Coreopsis lanceolata, Echinacea pallida, Kuhnia eupatorioides corymbulosa, Lithospermum incisum, Petalostemon purpureum, Poa compressa, Potentilla arguta, Psoralea tenuiflora, and Solidago rigida."

Tatnall (1946) reports it "occasionally established on roadsides and waste ground" in Delaware; Wheeler (1900) cites W. A. Wheeler 401 from Jefferson, Minnesota [perhaps an error for Jeffers in Cottonwood County?]; the Winters & Van Bruggen (1959) record it as "common in old pastures" in South Dakota; while Wunderlin (1966) reports it as common in waste ground and on prairies in Carroll County, Illinois, and cites Wunderlin 49 & 130. Stephens found it abundant in sandy soil of weedy wooded riverbanks in Platte County, Nebraska.

Shinn (1967) found the flowers of Verbena stricta visited by the bees, Calliopsis nebraskensis and C. verbenae. Cheymol (1937) isolated verbenaloside from the species, fat and glucoside were reported from it by Zufall & Richtman (1944), and ursolic acid by King and his associates (1950). McCarthy & Morrow (1969) found that in a long-term experiment on rundown pastures in Nebraska, regular spraying with 2,4-D significantly reduced the number of plants of Verbena stricta along with Vernonia baldwini, Aster multiflorus, and species of Solidago, whereas it increased the number of such plants as Asclepias syriaca, A. verticillata, Physalis heterophylla, Chamaelirium luteum, and species of Cirsium.

Thornberry (1966) records the following fungi attacking Verbena stricta: Ascochyta verbenae Siem. (a leaf-spot) in Wisconsin, Cercospora verbenae-strictae Pk. in Illinois and Kansas, Erysiphe cichoracearum P. DC. (a powdery mildew) general over its range, Phyllosticta texensis Seaver (a leaf-spot) in Texas, Puccinia vilfae Arth. & Holw. from Indiana to Oklahoma and South Dakota, and Septoria verbenae Rob. (a leaf-spot) from Vermont to Mississippi, Texas, and South Dakota [actually I have no record of V. stricta growing anywhere in Vermont].

It should be noted here that the Tischler (1927) publication cited in the bibliography of Verbena stricta is sometimes cited as "Pflanzl. Chrom." Pellett (1931) has identified the plant in his illustration as "blue vervain", but it certainly represents V. stricta and not V. hastata. The cultivated specimens cited below from the University of Michigan Botanical Garden were grown there from seed collected by Wernecke near Royal, Nebraska, in September of 1928.

Material of V. stricta has been misidentified and distributed in some herbaria as V. xutha Lehm. On the other hand, the H. M. Parker 501, distributed as V. stricta, is actually V. delticola Small, Cumbie 173 is V. halei Small, Beetham s.n. [Sept. 19, 1966] and Cumbie 89 are V. hastata L., Tyson, Dwyer, & Blum 4300 is V. litoralis H.B.K., P. O. Schallert 1961 is V. rigida Spreng., and C. L. Porter 5150 is Salvia sp. in the Lamiaceae.

Additional citations: ILLINOIS: Marion Co.: M. S. Bebb s.n. [Salem, 1860] (W--2549471). McHenry Co.: H. R. Bennett s.n. [August 10, 1957] (Se--180362). Tazewell Co.: V. H. Chase 17507 (Se--218575). IOWA: Story Co.: Birkenholz 21 (Se--171506); B. Martin 86 (Se--171507). Woodbury Co.: Williges 232 (Au--177991). MICHIGAN: Saint Clair Co.: C. K. Dodge s.n. [8/31/97] (Lk). WISCONSIN: Dane Co.: Ferry 8466 (Mi); C. G. Shaw s.n. [August 1, 1941] (Se--121159). Iowa Co.: T. J. Hale s.n. [Arena] (W--2549470). MINNESOTA: Hennepin Co.: S. F. Blake 326 [Herb. Blake 1280] (Ld). Rock Co.: P. Johnson 327 (Se--202345). SOUTH DAKOTA: Nemo Co.: P. Johnson 254 (Se--201265). Pennington Co.: Bartlett & Grayson 1325 (N). KANSAS: Osage Co.: W. H. Horr E.33 (Au--122280, N). Republic Co.: Morley 909 (N). MISSOURI: Jefferson Co.: Collector undetermined s.n. [Bushberg, May 9, 1883] (Au--122720). Saint Francois Co.: L. F. Ward s.n. [Aug. 24, 1878] (Au--122719). County undetermined: Trécul 494 (W--2546677). Saint Louis: Engelmann s.n. [St. Louis, Aug. 1843] (Au--122721). ARKANSAS: Baxter Co.: Demaree 29314 (Au--122746). Clay Co.: Demaree 27030 (Au--122750). Craighead Co.: Demaree 5085 (N, N, Rf), 30772 (Au--122753). Faulkner Co.: Demaree 5936 (N), 5971 (N). Independence Co.: Demaree 26792 (Au--122748). Marion Co.: Demaree 30909 (Au--122751). Washington Co.: F. L. Harvey 61 (Mi); B. J. Turner s.n. [Summer 1939-40] (Au--122745). WYOMING: Albany Co.: C. L.

Porter 7151 (Se—172308). Crook Co.: Welsh, Moore, & Matthews 9269 (N). COLORADO: Baca Co.: Weber & Anderson 5204 (Se—127055). Boulder Co.: W. A. Weber 5270 (Se—131320). Yuma Co.: Maslin 4271 (Se—187547). NEBRASKA: Banner Co.: Porter & Porter 8752 (Se—209097). Cherry Co.: Boivin 13815 (N); Ostenson 1 (Mi). Platte Co.: S. Stephens 49032 (N). OKLAHOMA: Alfalfa Co.: Stratton 1280 (Lk), Comanche Co.: E. J. Palmer 11748 (N). FeFlore Co.: Bare 207 (N). Murray Co.: Hopkins, Nelson, & Nelson 659 (Se—98542). Pontotoc Co.: G. T. Robbins 3176 (N, Se—153533). TEXAS: Hemphill Co.: Blassingame s.n. [June 20, 1964] (Lk); B. Hutchins 1323 (Lk); C. M. Rowell 4115 (Lk—photo, Lk--photo, Lk), 10380 (Lk). Wheeler Co.: L. C. Higgins 4537 (N). CULTIVATED: Michigan: Herb. Univ. Mich. Bot. Gard. 11965 (Mi), 11966 (Mi). LOCALITY OF COLLECTION UNDETERMINED: A. Brown s.n. (N).

VERBENA STRICTA f. ALBIFLORA Wadmond

Additional bibliography: Dobbs, Fl. Henry Co. 231. 1963; Moldenke, Phytologia 16: 205. 1968; Reed & Hughes, U. S. Dept. Agr. Agric. Handb. 366: [Common Weeds U. S., pr. 1] 308. 1970; Reed & Hughes, Common Weeds U. S., pr. 2, 308. 1971; Moldenke, Fifth Summ. 1: 14, 35, 38, 41, 42, 44, 46, 47, 52, & 54 (1971) and 2: 673, 697, 698, & 920. 1971.

Stephens & Brooks encountered this form "abundant" in dry sandy-rocky clay soil on a prairie pasture hillside, while Dobbs (1963) found only a single plant in a dry sandy fallow field.

Additional citations: IOWA: Emmet Co.: W. H. Welch 9701 (Au—122752). SOUTH DAKOTA: Stanley Co.: Stephens & Brooks 33953 (N). KANSAS: Ellsworth Co.: Bare 2104 (N). ARKANSAS: Stone Co.: Demaree 27888 (Au—122749).

VERBENA STRICTA f. ROSEIFLORA Benke

Additional bibliography: Dobbs, Fl. Henry Co. 230. 1963; Moldenke, Phytologia 11: 480. 1965; Reed & Hughes, U. S. Dept. Agr. Agric. Handb. 366: [Common Weeds U. S., pr. 1] 308. 1970; Reed & Hughes, Common Weeds U. S., pr. 2, 308. 1971; Moldenke, Fifth Summ. 1: 35, 40, 41, 44, 46, 50, 52, & 54 (1971) and 2: 920. 1971; Ownbey & Monserud, Common Wild Fls. Minn. 313. 1971.

Magrath & Hays found this plant "scattered" in sandy soil of a moist slough in grazed prairie pastures, while Dobbs (1963) refers to it as "rare. Known only from two stations, one being on the border of a small woodland.....and the other on the dry sandy open margin" of a canal in Henry County, Illinois. The corollas are said to have been "pink" on Magrath & Hays 5602.

Additional citations: NEBRASKA: Phelps Co.: Magrath & Hays 5602 (N).

VERBENA STRIGOSA Cham.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 573. 1965; Moldenke, Phytologia 16; 205. 1968; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 840 & xix, map 1395. 1970; Reitz, Sellowia 22: 145. 1970; Moldenke, Fifth Summ. 1: 179 (1971) and 2: 920. 1971.

Additional citations: BRAZIL: Paraná: Hatschbach 22574 (N).

VERBENA SUBINCANA (Troncoso) Shinners

Additional bibliography: J. A. Clark, Card Ind. Gen. Sp. Var. issue 248 (1964) and 251. 1965; Hocking, Excerpt. Bot. A.11: 124. 1967; Moldenke, Phytologia 16: 205. 1968; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 206. 1970; G. Taylor, Ind. Kew. Suppl. 14: 63. 1970; Moldenke, Fifth Summ. 2: 522, 920, & 968. 1971.

Schnack & Rubens (1970) record this species from Entre Ríos, Argentina.

VERBENA SUBPALUDOSA Malme

Synonymy: Verbena subpaludosa "Malme ex Angely" apud Angely, Fl. Anal. Paran., ed. 1, 573. 1965.

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 573. 1965; Moldenke, Phytologia 11: 240. 1965; Moldenke, Fifth Summ. 1: 179 (1971) and 2: 699 & 920. 1971.

VERBENA SUBULIGERA Greene

Additional bibliography: Moldenke, Phytologia 11: 240—241. 1965; Moldenke, Fifth Summ. 1: 77 (1971) and 2: 699 & 920. 1971.

xVERBENA SUKSDORFI Moldenke

Additional bibliography: Moldenke, Phytologia 11: 241—242. 1965; Moldenke, Fifth Summ. 1: 372 (1971) and 2: 679, 684, 699, 782, & 920. 1971.

VERBENA SULPHUREA D. Don

Additional synonymy: Glandularia sulphurea (D. Don in Sweet) Schnack & Covas apud J. A. Clark, Card Ind. Gen. Sp. Var. issue 183. 1944. Glandularia sulfurea (D. Don) Schnack & Covas ex J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 616. 1960.

Additional & emended bibliography: Lorents & Niederlein. Bot. Exped. Rio Negro 266. 1889; Reiche & Phil., Fl. Chil. 5: 273 & 289—290. 1910; Goyena, Fl. Nicarag. 1: 558. 1911; J. A. Clark, Card Ind. Gen. Sp. Var. issue 183. 1944; Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. Chile Santiago 25: 65—67. 1951; Cabrera, Bol. Soc. Argent. Bot. 5: 96. 1953; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 614, 616, & 625. 1960; Moldenke, Phytologia 16: 205—206. 1968; Moldenke, Résumé Suppl. 16: 28. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Heusser, Pollen & Spores Chile 61—62, pl. 58-667. 1971; Moldenke, Phytologia 22: 466. 1971; Moldenke, Fifth Summ. 1: 193, 202, & 372 (1971) and 2: 522, 619, 621, 600, 681, 699, & 920. 1971; Moldenke, Phytologia 23: 431 & 437. 1972.

Additional illustrations: Heusser, Pollen & Spores Chile pl. 58-667. 1971.

Heusser (1971) describes the pollen of this plant as "Monad, isopolar, radiosymmetric; tricolporate, colpi lengthy, relatively broad, appearing constricted at the equator and with only a poroid area in some specimens, in others with a distinct transverse or more or less circular protruding pore interrupting the colpus, colpi membranes granular; subprolate, amb subtriangular; exine ca 1 μ thick, faintly tectate, more or less psilate; 41—70 x 36—56 μ", based on material collected by C. Jiles P. in Coquimbo, Chile, in September 1942 [SGO 57599]. He gives the overall distribution of the species as "Province of Antofagasta—Araucaría". Schnack & Covas (1944) report its diploid chromosome number as 10.

Goyena (1911) records this species from Nicaragua, where, he says, it is called "no me olvides". This seems most doubtful to me, unless it is cultivated for ornament there. Schnack & Covas (1945) cultivated it in Argentina.

Additional citations: CHILE: Coquimbo: Zöllner 4399 (Ac).

VERBENA SULPHUREA f. ALBA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 268. 1966; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 920. 1971.

VERBENA SULPHUREA var. CANESCENS R. A. Phil.

Additional bibliography: Moldenke, Phytologia 11: 480. 1965; Moldenke, Résumé Suppl. 16: 28. 1968; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 699 & 920. 1971.

VERBENA SULPHUREA var. FUSCORUBRA Skottsberg

Synonymy: Verbena sulphurea f. fuscorubra Skottsberg ex Moldenke, Phytologia 11: 480, sphalm. 1965.

Additional bibliography: Moldenke, Phytologia 11: 480. 1965; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 920. 1971; Moldenke, Phytologia 23: 437. 1972.

VERBENA SULPHUREA var. INTERMEDIA Kuntze

Additional bibliography: Moldenke, Phytologia 11: 249—250. 1965; Moldenke, Fifth Summ. 1: 193 & 202 (1971) and 2: 699 & 920. 1971.

VERBENA SULPHUREA var. LONGITUBA Kuntze

Additional bibliography: Moldenke, Phytologia 11: 250. 1965; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 699 & 920. 1971.

VERBENA SULPHUREA var. PEDUNCULATA C. Gay

Additional bibliography: Moldenke, Phytologia 11: 250. 1965; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 921. 1971.

VERBENA SULPHUREA var. SCABRA Acevedo de Vargas

Additional bibliography: Cabrera, Bol. Soc. Argent. Bot. 5: 96. 1953; Moldenke, Phytologia 11: 251. 1965; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 921. 1971.

VERBENA SULPHUREA var. TALTALENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 13: 268. 1966;

Moldenke, Fifth Summ. 1: 193 (1971) and 2: 921. 1971.

VERBENA SUPINA L.

Additional & emended synonymy: Verbenaca supina sive foemina Fuchs, Hist. Plant. Basil. 593. 1542. Verbenaca supina Matth., Pl. Epit. Util. 797. 1586. Verbena sacra Gerarde, Herb., ed. 1, 580, fig. 2. 1597. Verbenaca supina Dodon., Stirp. Hist. Pemptad., ed. 2, 149--151. 1616. Verbenaca supina Cord. apud A. Haller, Enum. Meth. Stirp. Helv. Indig. 1: 661, in syn. 1742. Verbenaca supina s. femina Fuchs apud A. Haller, Enum. Meth. Stirp. Helv. Indig. 1: 661, in syn. 1742. Verbena tenuifolia Hill, Brit. Herb. 356 & [536]. 1756. Verbena tenuifolia Tourn. ex Moldenke, Phytologia 23: 437, in syn. 1972. Verbena supina Dodon. ex Moldenke, Phytologia 23: 437, in syn. 1972.

Additional & emended bibliography: Fuchs, Hist. Plant. Basil. 593. 1542; Matth., Pl. Epit. Util. 797. 1586; Gerarde, Herb., ed. 1, 580--582, fig. 2. 1597; Dodon., Stirp. Hist. Pemptad., ed. 2, 149--151. 1616; Gerarde, Herb., ed. 2, 717--719, fig. 2. 1633; Tourn., Compl. Herb. 357. 1719; J. Hill, Brit. Herb. 356 & [536]. 1756; Russell, Nat. Hist. Aleppo, ed. 1, 40. 1756; L., Sp. Pl., ed. 2, 29. 1762; Crantz, Inst. Rei Herb. 1: 573. 1766; [Retz.], Nom. Bot. 11. 1772; J. F. Gmel. in L., Syst. Nat., ed. 13, pr. 1, 2: 42. 1789; Russell, Nat. Hist. Aleppo, ed. 2, 2: 242. 1794; J. F. Gmel. in L., Syst. Nat., ed. 13, pr. 2, 2: 42. 1796; Balbis, Cat. Pl. Hort. Bot. Taur. 48. 1804; Sibth. & Sm., Fl. Graec. Prodr. 1 (2): 402. 1809; Balbis, Cat. Stirp. Hort. Acad. Taur. 80. 1813; Pers., Sp. Pl. 3: 346. 1819; Steud., Nom. Bot. Phan., ed. 1, 873 & 874. 1821; Jan, Elench. Pl. 1. 1824; Moris, Stirp. Sard. El. 1: 37. 1827; Sibth. & Sm., Fl. Graec. 6: 44, pl. 554. 1827; Gussone, Fl. Sic. Prodr. 2: 145--146. 1828; Reichenb., Fl. Germ. Exc. 2: 334. 1830; Tenore, Syll. Vasc. Pl. 298. 1831; Tenore, Syll. Pl. Vasc. Fl. Neapol. App. 4: 86. 1831; Colla, Herb. Pedem. 4: 494. 1835; Tenore, Fl. Nap. 3: 20. 1836; Bertol., Fl. Ital. 6: 261 & 263--264. 1844; Gussone, Fl. Sic. Syn. 2: 108. 1844; Reichenb., Icon. Fl. Germ. 18: 52, pl. 91 (1292) & 103. 1857; Moris, Stirp. Sard. Fl. 3: 342. 1859; Ces., Passer., & Gib., Comp. Fl. Ital. 327. 1874; Nyman, Consp. Fl. Eur. 563. 1881; Arcang., Compend. Fl. Ital., ed. 1, 561 & 885. 1882; Caruel in Parl., Fl. Ital. 6: 334. 1884; Tornabene, Fl. Sic. 418. 1887; Tornabene, Fl. Aetnea 3: 171--172. 1891; Arcang., Compend. Fl. Ital., ed. 2, 445 & 831. 1894; Battandier & Trabut, Fl. Anal. & Synop. Alg. 272 & 459. 1902; Almagia in Pirotta, Fl. Col. Erit. 1: [Ann. Inst. Bot. Roma 8:] 130. 1903; Bég. & Vacc., Ann. di Bot. 12: 118. 1913; Pampanini, Nuov. Giorn. Bot. Ital., n. s., 23: 284. 1916; Lázaro e Ibiza, Comp. Fl. Españ., ed. 3, 3: 297. 1921; Cavara, Atti Soc. Ital. Progr. Sc. 14: 337. 1925; Bouloumoy, Fl. Liban & Syrie 259. 1930; Pampanini, Prodr. Fl. Círen. 384. 1930; Cheymol, Bull. Soc. Chim. Biol. 19: 1647--1653. 1937; Cheymol, Chem. Abstr. 32: 2977. 1938; Savage, Cat. Linn. Herb. Lond. 4. 1945; Berhaut, Fl. Sénégal, ed. 1, 65. 1954; F. Herman, Fl. Nord & Mitteleur. 839. 1956; Montasir

& Hassib, Ill. Fl. Egypt 1: 389. 1956; V. Täckholm, Stud. Fl. Egypt 154. 1956; Humbert, Fl. Sahara Sept. & Cent. [406] & 407, fig. 149. 1958; Lems, Sarracenia 5: 79. 1960; Buia, Fl. Mic. Illustr. Rep. Pop. Rom. 401 & 403, fig. 369. 1961; Quezel & Santa, Nouv. Fl. Alg. 2: 780. 1963; Al-Rawi, Iraq Min. Agr. Tech. Bull. 14: 149. 1964; Berhaut, Fl. Sénégal, ed. 2, 158. 1967; Patzak & Rech. in Rech., Fl. Iran. 43: 2 & 8. 1967; Zukowski in Pawlowskiego, Fl. Polsk. 11: 64 & 65. 1967; Moldenke, Phytologia 16: 206—207. 1968; Moldenke, Résumé Suppl. 16: 13 (1968) and 17: 4. 1968; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 267. 1969; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Michel, Naegelé, & Toupet, Bull. Inst. Fond. Afr. Noire A.31: 800. 1969; A. Pedersen, Bot. Tidsskr. 64: [342] & 357. 1969; Polunin, Field Guide Fls. Eur. 343. 1969; Daoud & Sheikh, Bull. Coll. Sci. Univ. Baghdad 11 (2): 24—44. 1970; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Kunkel, Cuad. Bot. Canar. 8: 36. 1970; Kunkel, Monog. Biol. Canar. 1: 40. 1970; Willaman & Li, Lloydia Suppl. 33 (3a): 220. 1970; Anon., Biol. Abstr. 52 (5): B. A.S.I.C. S.238 & S.240. 1971; N. F. Good, Biol. Abstr. 52: 2515. 1971; Moldenke, Fifth Summ. 1: 32, 203—211, 213, 215, 265, 266, 269, 306, 349, & 372 (1971) and 2: 594, 618, 668, 669, 686, 691, 692, 696, 699—702, 707, & 921. 1971; Moldenke, Phytologia 23: 265, 419, 436, & 437. 1972.

Additional & emended illustrations: Gerarde, Herb., ed. 1, 580, fig. 2. 1597; Dodon., Stirp. Hist. Pemptad., ed. 2, 150. 1616; Gerarde, Herb., ed. 2, 718, fig. 2. 1633; Reichenb., Icon. Fl. Germ. 18: pl. 91 (1292). 1857; Humbert, Fl. Sahara Sept. & Cent. [406], fig. 149. 1958; Buia, Fl. Mic. Illustr. Rep. Pop. Rom. 403, fig. 369. 1961.

The Verbena sacra of Gerarde (1597) has been reduced previously by me to the synonymy of V. officinalis L., but a re-examination of the illustration given by Gerarde indicates plainly that the plant which he was describing is what we now know as V. supina L. According to Savage (1945), sheet number 16 under genus 35, VERBENA, in the Linnean Herbarium, is inscribed "supina" in Linnaeus' own handwriting and may thus be considered the type.

Matthioli (1586) quotes Dioscorides: "Ramulos emittet cubitales aut maiusculos, angulosos, in quibus ex internallis folia exeunt quercus sed minora, & angustiora, eiusdem in ambitu diuisuris, colore aliquantemus caesio. Radix loga tenuis. Flores purpurei, graciles." Also, "Folia cum radice in vino pota, illitáve, serpentiam ictibus auxiliantur. Folia bibuntur comode ex vino vetere quadragenis e duebus ad icteritiam: veteres tumores & inflammationes mitigant: sordide ulcera purgat: tota in vino decocta tonsillarum crustas abrumpit: oris noman gargarizatu cohibet, Datur potandum in tertianis febribus, tertium à terra geniculum, cum foliis circundantibus: quartanis quartum. Sacram vocat herbam, quoniam multum ad amuleta, expiationesque commendetur."

Täckholm (1956) points out that sterile specimens of Verbena supina have very much the general appearance of Ambrosia maritima. The corollas on Barkley & Ha'if 4003 are described as having been "lavender". The Kotschy 447 collection, cited below, exhibits stems which seem at first to have been prostrate, but the tips and branches are erect. This is probably the typical form of the species, since in f. erecta Moldenke all the stems are erect from the beginning. Kotschy's plant was growing as a weed in fields of Vicia faba. Covas & Hunziker (1954) report the diploid chromosome number as 14. Cheymol (1937) isolated verbenaloside from the species. Additional vernacular names reported for it include "berbena", "berbenaca", "briina", "brivina", "djaïda", "Eisenkraut", "fine-leaved vervain", "procumbent vervain", "thin-leav'd vervain", "thin-leaved vervain", "vermonacola", and "veruaine".

Patzak & Rechinger (1967) describe the corolla color as "coerulescens" and give the overall distribution of the species as "Regio Mediterranea a Makaronesia et Lusitania et Hispania orientem versus usque ad Mesopotamiam, Rossiam australem, Transcaucasiam et Turcomaniam". Polunin (1969) notes that the species is much like V. officinalis L., "but stems procumbent, much-branched, and lvs. twice cut into oval segments. Corolla pale lilac, shorter, 3 mm. Southern Europe". Bouloumoy (1930) tells us that it is found in the "région moyenne du Liban, et au Nord près d'Antioche", with flowers that are "bleuâtres, petites, subsessîles", growing on "Terrains sableux ou argileux inondés ou très humides" in Lebanon and Syria. Berhaut (1967) cites Berhaut 554 from Sénégal, while Kunkel (1970) records it from Lobos Island in the Canaries, citing Kunkel 11978, a few plants of which he found growing among Euphorbia and Atriplex near a garden. Lázaro e Ibiza (1921) records it from central, eastern, and southern Spain, where he says that it blooms from May to October; Lems (1960) records it from the islands of Fuerteventura, Lanzarote, and Tenerife in the Canaries; Montasir & Hassib (1956) describe the plant as a weed along canal banks of the Nile river and the western Mediterranean; Pampanini (1930) cites Ruhmer s.n. [Bengasi, 1882], Vaccari s.n. [Berka, 1913], and Zanon s.n. [Raaba, 1915] from Cyrenaica; and Pedersen (1969) records it from Denmark. Pampanini also cites "Bég. e Vacc. ...Schedae ad fl. lib. exs., 60, n. 183". Humbert (1958) records it from "Tout le Sahara septentrional, assez commun, dans les dépressions argilo-limoneuses et les dayas", while Quezel & Santa (1963) record it from "dans toute l'Algérie" and list the vernacular name "djaïda" for it from that area.

Material of Verbena supina has been misidentified and distributed in some herbaria under the names V. hastata L. and Lippia repens Spreng. On the other hand, the Askari 1015, distributed as V. supina, is not verbenaceous and Kuntze s.n. [Granada, 21/6/82] is a mint. Almagia (1903) cites Pappi 4432 and Terracciano & Pappi 160, 309, 311, 2491, & 2523 from Eritrea, growing there at altitudes of 2200—3400 meters.

Additional citations: SPAIN: E. Reverchon s.n. [Malaga, 27 août 1888] (Se—140865). ALGERIA: A. Dupuis 190 (Se—128038). SUDAN: Nubia: Kotschy 447 (W—2496926). IRAQ: Barkley & Ha'if

4003 (N).

VERBENA SUPINA f. ERECTA Moldenke

Additional bibliography: Desf., Fl. Atlant. 1: 17. 1800; Gussone, Fl. Sic. Prodr. 2: 146. 1828; Moldenke, Phytologia 16: 207. 1968; Moldenke, Fifth Summ. 1: 205, 206, 208, 209, 211, & 266 (1971) and 2: 699 & 921. 1971; Moldenke, Phytologia 23: 419. 1972.

Gussone (1828) does not name this form, but describes it as follows: "b. caule erecto, foliisque glabriusculis Desf. Atl. l. p. 17 -- Varietas b. inter hanc et praecedentem [V. officinalis L.] mediam; cum illa caule erecto, cum hac foliis, floribus, fructibusque convenit. An hybrida?" Presumably he found it in Sicily. I do not believe that it is hybrid in nature.

Recent collectors describe the plant as a perennial. The Davises found it growing in sandy places at the edge of a cornfield in Morocco, at 200 meters altitude, flowering in March. The corollas are described as having been "violet" in color on Davis & Davis D.48616.

Additional citations: MOROCCO: Davis & Davis D.48616 (N).

VERBENA SUPINA var. MINOR Post

Additional bibliography: Moldenke, Phytologia 11: 260—261. 1965; Moldenke, Fifth Summ. 1: 266 (1971) and 2: 921. 1971.

VERBENA SWIFTIANA Moldenke

Additional bibliography: Moldenke, Phytologia 11: 261—262. 1965; Moldenke, Fifth Summ. 1: 179 & 202 (1971) and 2: 921. 1971.

Recent collectors have encountered this plant growing on campos, flowering in January. The corollas are said to have been "blue" on G. J. Schwarz 6207.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo 30975 (N). ARGENTINA: Misiones: G. J. Schwarz 4811 (N), 6207 (N).

VERBENA TAMPENSIS Nash

Additional synonymy: Glandularia tampensis Small apud J. A. Clark, Card Ind. Gen. Sp. Var. issue 141. 1933.

Additional bibliography: J. A. Clark, Card Ind. Gen. Sp. Var. issue 141. 1933; Moldenke, Phytologia 16: 207. 1968; Moldenke, Résumé Suppl. 16: 22. 1968; Long & Lakela, Fl. Trop. Fla. 741 & 961. 1971; Moldenke, Fifth Summ. 1: 31 (1971) and 2: 522, 525, 699, & 921. 1971.

Lakela describes this species as "decumbent, branches profuse from the crown" and found it in disturbed open pineland with secondary longleaf pine, sabal, saw palmetto, Myrica, Lyonia, and Befaria. The corollas are described as having been "rose-purple" on Lakela 24997.

Additional citations: FLORIDA: Hillsborough Co.: Lakela 24997 (N), s.n. [28 April 1962] (Ft—9503). Lee Co.: J. K. Small s.n. [Punta Rassa, May 1928] (N).

xVERBENA TEASII Moldenke

Additional bibliography: Arora & Khoshoo, Indian Journ. Genet. & Pl. Breed. 27: 275--277, fig. 1. 1967; Moldenke, Phytologia 16: 207. 1968; Khoshoo & Arora, Am. Hort. Mag. 50: 16--18, fig. 2--5. 1971; Anon., Hort. Abstr. 41: 1117. 1971; Furia, Biol. Abstr. 52: 8978. 1971; Moldenke, Fifth Summ. 1: 372 (1971) and 2: 667, 675, 699, 700, & 921. 1971; Moldenke, Phytologia 23: 427. 1972.

Additional illustrations: Khoshoo & Arora, Am. Hort. Mag. 50: 16--18, fig. 2--5. 1971.

Arora & Khoshoo (1967) report that "fertility breakdowns in the $F_1$ caused by the interaction of the genomes of V. tenuisecta and V. hybrida, result in the upset of the intricate balance controlling fertility [in the hybrid]. However, such an interaction exercises a differential control, affecting only pollen and not ovule fertility. The amphidiploids and triploids are both totally sterile. The amphidiploid is a duplication of the $F_1$ but unlike the latter due to preferential pairing there is no change, whatsoever, for segregation in the former of factors causing sterility. Since the diploid female gamete for the triploid is derived from the amphidiploid, the latter is also sterile. Heterogeneity is due to segregation of sterility factors in the $F_1$. On backcrossing with the balance genome of V. hybrida, partial fertility appears immediately. The restoration of balance is due to the harmonious influence of V. hybrida chromosomes. This process can be continued until desired combinations with the desired fertility are obtained."

VERBENA TECTICAULIS Troncoso

Bibliography: Troncoso, Darwiniana 14: 633--636 & 638, fig. 2. 1968; Anon., Biol. Abstr. 50 (18): B.A.S.I.C. S.210. 1969; N. F. Good, Biol. Abstr. 50: 9661. 1969; Moldenke, Fifth Summ. 1: 188 (1971) and 2: 921. 1971.

Illustrations: Troncoso, Darwiniana 14: 634, fig. 2. 1968.

This species is based on Fiebrig 5837 bis, collected in the upper course of the Río Paraná in 1909 or 1910 and deposited in the herbarium of the Darwinion Institute at San Isidro, Argentina. The type material was mixed with Glechon ciliata under the original Fiebrig 5837 number. Troncoso (1968) comments that it is "una especie muy característica, fácilmente diferenciable por sus hojas tricuspidadas, erectas y aplicadas contra los tallos. Posee el hábito de V. Balansae Briq., pero en esta especie las hojas son trífidas hasta la base y sus lacinias son lineares."

VERBENA TENERA Spreng.

Additional synonymy: Glandularia tenera (Spreng.) Cooper ex Moldenke, Fifth Summ. 2: 522, in syn. 1971.

Additional & emended bibliography: A. Gray, Field For. & Gard. Bot., ed. 1, pr. 1, 242 (1868), ed. 1, pr. 2, 242 (1869), and ed. 1, pr. 3, 242. 1880; L. H. Bailey in A. Gray, Field For. & Gard. Bot., ed. 2, 341. 1895; Reiche & Phil., Fl. Chil. 5: 296. 1910;

Lázaro e Ibiza, Comp. Fl. Españ., ed. 3, 3: 297. 1921; Macself in Sanders, Encycl. Gard., ed. 21, pr. 1, 457 (1931), ed. 21, pr. 2, 457 (1934), and ed. 21, pr. 3, 457. 1938; Winge, Proc. Linn. Soc. Lond. 150: 236. 1938; Macself in Sanders, Encycl. Gard., ed. 21, pr. 4, 457. 1942; Cain, Found. Pl. Geogr., pr. 1, 335. 1944; Macself in Sanders, Encycl. Gard., ed. 21, pr. 5, 457 (1945) and ed. 21, pr. 6, 457. 1946; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 1, 457 (1950) and ed. 22, pr. 2, 506 & 507. 1952; Cabrera, Man. Fl. Alred. Buenos Aires 397 & 398. 1953; J. A. Clark, Card Ind. Gen. Sp. Var. issue 217. 1953; Kuck & Tongg, Mod. Trop. Gard. 213 & 237. 1955; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 3, 506 & 507. 1956; Emberger in Chadefaud & Emberger, Traité Bot. 2: 829, fig. 1175. 1960; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 616 & 629. 1960; Willaman & Schubert, Agr. Res. Serv. U. S. Dept. Agr. Tech. Bull. 1234: 237. 1961; W. G. Wright, Wild Fls. South. Afr. 156 & 158. 1963; Angely, Fl. Anal. Paran., ed. 1, 573. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 2: 2266. 1966; Yotaro, Gard. Pl. World 3: 128, pl. 64, fig. 3. 1966; Moldenke, Phytologia 16: 207--209. 1968; Moldenke, Résumé Suppl. 16: 28 (1968) and 17: 8. 1968; Munz, Suppl. Calif. Fl. 101--102. 1968; Munz & Keck, Calif. Fl. 687, 688, & 1679. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; R. F. V. Cooper in Pastore, Bol. Soc. Argent. Hort. 157: 123--125. 1969; Hay & Synge, Dict. Gard. Pl. 177, 369, & 370, pl. 1413. 1969; Reitz, Sellowia 22: 145. 1970; Rickett, Wild Fls. U. S. 4 (3): 539 & 799. 1970; Schnack & Rubens, Bol. Soc. Argent. Bot. 13: 207. 1970; Cain, Found. Pl. Geogr., pr. 2, 335. 1971; Moldenke, Fifth Summ. 1: 32, 179, 190, 202, 203, & 372 (1971) and 2: 522, 621, 652, 670, 684, 689, 699, 700, 789, & 921. 1971; Moldenke, Phytologia 23: 276, 417, 427, 436, & 437 (1972) and 24: 37 & 142. 1972.

Additional illustrations: Emberger in Chadefaud & Emberger, Traité Bot. 2: 829, fig. 1175. 1960; Hay & Synge, Dict. Gard. Pl. 177, pl. 1413 (in color). 1969.

Yotaro (1966) gives a color illustration of what purports to be Verbena tenera, but actually depicts V. tenuisecta Briq. instead. He records the common name "zartes Eisenkraut". Cooper (1969) illustrates his paper with a picture which he labels "Lilac Verbena" and seems to depict neither of the species concerning which his paper deals (V. laciniata and V. tenera). The illustration seems to be of V. dissecta Willd. Kuck & Tongg (1955) reduce V. erinoides Lam. and V. pulchella Sweet to synonymy under V. tenera, but this is manifestly incorrect — V. erinoides is now known as V. laciniata (L.) Briq. and V. pulchella is amply distinct. The V. tenera described and pictured by Wright (1963) is most certainly V. tenuisecta instead!

Beale (1940) reports the diploid chromosome number for V. tenera as 30, while Datta (1952) reports it to be 10 — probably these workers used incorrectly identified material in one or both cases. Bolkhovskikh and his associates (1969) cite Datta's paper as published in "1953".

Lázaro e Ibiza (1921) record V. tenera from Spain, doubtless in cultivation. Munz (1968) tells us that "V. tenera Spreng. and V. tenuisecta Briq. are confused and both are to be looked for in Calif. According to one author, V. tenera has the calyx-hairs appressed and V. tenuisecta ascending-spreading". Unfortunately, the unidentified "author" quoted by Munz has the characters just reversed! Munz & Keck (1968) record V. tenera as an "escape in Ventura and Los Angeles Counties", California, but I have seen only material of V. tenuisecta from those two counties. Schnack & Rubens (1970) record V. tenera from Uruguay.

The Herter 181a [Herb. Herter 68181] in the University of California herbarium, previously cited by me as V. tenera, proves actually to be V. selloi Spreng., while the Krapovickas & Cristóbal 15910, Pedersen 9176, and H. M. Pollard s.n. [Apr. 28, 1945], distributed as V. tenera, are actually V. tenuisecta Briq.

Additional citations: VENEZUELA: Mérida: López-Palacios 2565 bis (Ft).

VERBENA TENERA var. ALBIFLORA Kuntze

Additional bibliography: Moldenke, Phytologia 14: 299. 1967; Moldenke, Fifth Summ. 1: 190 & 202 (1971) and 2: 921. 1971.

VERBENA TENERA var. MAONETTI Regel

Additional synonymy: Verbena tenera mahonetti Hay & Synge, Dict. Gard. Pl. 370. 1969. Verbena peruviana 'Chiquita' Graf, Exot. Pl. Man., ed. 1, 410. 1970.

Additional bibliography: Moldenke, Phytologia 16: 208. 1968; Moldenke, Résumé Suppl. 16: 28 (1968) and 17: 8. 1968; Hay & Synge, Dict. Gard. Pl. 370. 1969; Graf, Exot. Pl. Man., ed. 1, 410 & 831. 1970; Moldenke, Fifth Summ. 1: 10 & 372 (1971) and 2: 649, 682, 691, 699, 700, & 921. 1971; Moldenke, Phytologia 23: 276, 436, & 437 (1972) and 24: 37. 1972.

Additional illustrations: Graf, Exot. Pl. Man., ed. 1, 410. 1970.

This plant is often called "peppermint-stick verbena" by gardeners. Sykes describes it as a prostrate plant with ascending branch ends, the corolla being purple with white margins.

Additional citations: CULTIVATED: New Zealand: W. R. Sykes 1043/64 [Herb. Bot. Div. D. S. I. R. 153305] (Ld, Z).

xVERBENA TENTAMENTA Moldenke

Additional bibliography: Moldenke, Phytologia 11: 280. 1965; Moldenke, Fifth Summ. 1: 372 (1971) and 2: 522, 688, 689, & 921. 1971.

VERBENA TENUISECTA Briq.

Additional synonymy: Verbena ericoides Macself in Sanders, Encycl. Gard., ed. 21, pr. 1, 457, sphalm. in syn. 1931. Glandularia tenuisecta Small apud J. A. Clark, Card Ind. Gen. Sp. Var. issue

141. 1933. Glandularia tenuissecta Martínez-Crovetto, Bonplandia 2: 41, sphalm. 1965. Verbena ericoides Hirata, Host Range & Geogr. Distrib. Powd. Mild. 276, nom. nud. 1966.

Additional & emended bibliography: W. Barton, Travels, ed. 1, 436 (1791) and ed. 2, 434. 1794; Macself in Sanders, Encycl. Gard., ed. 21, pr. 1, 457. 1931; J. A. Clark, Card Ind. Gen. Sp. Var. issue 141. 1933; Macself in Sanders, Encycl. Gard., ed. 21, pr. 2, 457 (1934), ed. 21, pr. 3, 457 (1938), ed. 21, pr. 4, 457 (1942), ed. 21, pr. 5, 457 (1945), and ed. 21, pr. 6, 457. 1946; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 1, 457 (1950) and ed. 22, pr. 2, 506 & 507. 1952; Cabrera, Man. Fl. Alred. Buenos Aires 397 & 398. 1953; Greene & Blomquist, Fls. South 108. 1953; Michalowski, Serv. Tecn. Interam. Coop. Agr. Bol. 169 (1954) and 173. 1955; Hellyer in Sanders, Encycl. Gard., ed. 22, pr. 3, 506 & 507. 1956; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 725 & 727. 1960; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 614 & 629. 1960; Lewis & Oliv., Am. Journ. Bot. 48: [639]—641, fig. 1. 1961; Reitz, Sellowia 13: 67 & 110. 1961; Hocking, Excerpt. Bot. A.6: 91. 1963; W. G. Wright, Wild Fls. South. Afr. 156 & 158. 1963; Radford, Ahles, & Bell, Guide Vasc. Fl. Carol. 281 & 282. 1964; Angely, Fl. Anal. Paran., ed. 1, 573. 1965; Martínez-Crovetto, Bonplandia 2: 41 & 51. 1965; Solbrig, Castanea 30: 173—174. 1965; Greensill, Trop. Gardening 79. 1966; Hirata, Host Range & Geogr. Distrib. Powd. Mild. 276. 1966; Yotaro, Gard. Pl. World 3: 128, pl. 64, fig. 4. 1966; Arora & Khoshoo, Indian Journ. Genet. & Pl. Breed. 27: 275—277. 1967; Ewan, Southwest. La. Journ. 7: 11. 1967; Hocking, Excerpt. Bot. A.11: 123. 1967; E. Lawrence, South. Gard., ed. 2, 115, 135, 172, & 214. 1967; Carter & Jones, Castanea 33: 203. 1968; W. C. Grimm, Recog. Flow. Wild Pl. 228 & 229. 1968; Hocking, Excerpt. Bot. A.13: 571. 1968; Moldenke, Résumé Suppl. 16: 1, 2, 7, 8, & 22 (1968) and 17: [1], 2, 8, & 12. 1968; Munz, Suppl. Calif. Fl. 101—102. 1968; Pullen, Jones, & Wats., Castanea 33: 333. 1968; Tawada, Okinawa Seibutsugakkai [Biol. Mag. Okinawa] 4 (6): 36. 1968; Troncoso, Darwiniana 14: 636 & 638. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; R. F. V. Cooper in Pastore, Bol. Soc. Argent. Hort. 157: 125. 1969; N. F. Good, Biol. Abstr. 50: 9661. 1969; Khoshoo & Arora, Biol. Abstr. 50: 10213. 1969; Khoshoo & Arora, Chromosoma 26: [259]—269, fig. 1, 3, 5, & 6. 1969; Arora & Khoshoo, Euphytica 18: 237—248, fig. 1—25. 1969; Rickett, Wild Fls. U. S. 3 (2): 362 & [363], pl. 110 (1969) and 4 (3): 539, [541], & 799, pl. 176. 1970; Anon., Biol. Abstr. 51: 1687. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1876 & 1877. 1970; Gibson, Fieldiana Bot. 24 (9): 230. 1970; Reitz, Sellowia 22: 145. 1970; Anon., Biol. Abstr. 52 (16): B.A.S.I.C. S.269. 1971; Anon., Hort. Abstr. 41: 1117. 1971; Furia, Biol. Abstr. 52: 8978. 1971; Khoshoo & Arora, Am. Hort. Mag. 50: 16—18, fig. 1, 3, & 5. 1971; Long & Lakela, Fl. Trop. Fla. 741 & 961. 1971; Moldenke, Fifth Summ. 1: 14, 23, 25, 27, 31—33, 39, 46, 47, 49, 60, 63, 66, 77, 86, 106, 111, 128, 144, 179, 184, 188, 190, 203—205, 209, 222, 231, 248, 255, 257, 266, 267, 279, 298, 328, 349, & 372 (1971) and 2: 522, 652, 654, 658, 666, 667, 675, 683, 684, 689, 692, 694, 700, & 921. 1971; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1317 & 1324. 1970; Moldenke, Phytologia 22: 463, 470, 471, 491, & 496 (1972), 23: 194, 216, 219, 279, 283, 284, 369, 427, 431, & 436 (1972), and 24: 129. 1972.

Additional illustrations: Greene & Blomquist, Fls. South 108. 1953; Lewis & Oliv., Am. Journ. Bot. 48: 640, fig. 1. 1961; W. G. Wright, Wild Fls. South. Afr. 157 [as V. tenera]. 1963; Yotaro, Gard. Pl. World 3: pl. 64, fig. 4 [as V. tenera] (in color). 1966; W. C. Grimm, Recog. Flow. Wild Pl. 229. 1968; Arora & Khoshoo, Euphytica 18: 240--242, 245, & 246, fig. 1--25. 1969; Khoshoo & Arora, Chromosoma 26: 261 & 262, fig. 1, 3, 5, & 6. 1969; Rickett, Wild Fls. U. S. 3 (2): [363], pl. 110 (in color) (1969) and 4 (3): [541], pl. 176 (in color). 1970; Khoshoo & Arora, Am. Hort. Mag. 50: 16--18, fig. 1, 3, & 5. 1971.

Recent collectors have found this plant growing in calcareous marl and in slightly saline clay-loam soil, in calcareous clay, in eroded soil on riverbanks, in grasslands, and on wooded hillsides, and describe it as a decumbent perennial herb. The corollas are said to have been "blue" on Descole 2063, Ibarrola 1283, and Ruíz Huidobro 1330 & 3742, "violet-blue" on Liogier 11910, "violet" on Burkart 19469, Hatschbach 15051, Lavastre 2219, and G. J. Schwarz 1059, "lilac" on Fabris 3241 and Krapovickas & Cristóbal 15910, and "purple" on Aguilar 29, 1090, & 1306, Krapovickas & al. 18053, Molina R. 25401, Sultan-ul-Abedin 2643, and Woolston 1661. Lewis & Oliver (1961) record the diploid chromosome number of the species as 10. Hirata (1966) reports the powdery mildew, Microsphaera ferruginea, infesting it in Germany. Greensill (1966) informs us that "cuttings of half-ripe wood strike easily" in propagation efforts.

The Reitz & Klein 17728 collection, cited below, is anomalous in that the calyx is merely strigillose on the outer surface instead of being definitely appressed antrorse-strigose. The Dahlstrand 178 from Transvaal definitely represents a garden escape, according to the collector; Akmad 113, from Iran, is also plainly labeled as not being taken from cultivated material.

Lawrence (1967) continues to misidentify this species as "V. erinoides", calling it "moss verbena" and averring that in the southern parts of the United States it starts to bloom about May 1 and continued to bloom until late autumn. Solbrig (1965), however, accepts Glandularia pulchella var. gracilior Troncoso as the correct name for the plant so widely naturalized in the southern United States. Troncoso (1968) reduces Verbena tenuisecta Briq. to synonymy under what she calls Glandularia aristigera (S. Moore) Troncoso, although I still regard V. aristigera and V. tenuisecta as distinct, albeit closely related, taxa. The illustration given by Yotaro (1966) and labeled "Verbena tenera" by him actually represents V. tenuisecta instead. Likewise, the "Verbena laciniata" of Macself (1931--1946) and of Hellyer (1950--1956) is most probably also V. tenuisecta. The V. tenera of Wright (1963) is certainly V. tenuisecta instead, as I have seen only material of the latter species from Natal. She says that it "carpets the ground for months at a time in every waste corner, looking especially lovely under blooming Jacaranda trees where they form a kind of 'echo' on the ground." She describes the corolla color as "mauve".

Bartram (1791 & 1794) recounts that "here is likewise a new and beautiful species of Verbena, with decumbent branches and lacerated deep green leaves; the branches terminate with corymbi of Violet blue flowers, this pretty plant grows in old fields where there is good soil." Ewan (1967), in commenting on this passage from Bartram, says "Verbena rigida is an introduced South American species, unknown in the state [of Louisiana] before 1900, and so the species noticed by Bartram near Baton Rouge was more likely V. tenuisecta." Personally, I would rather suppose that it was V. canadensis (L.) Britton, a species well known from the Baton Rouge area. I have also seen V. rigida from that area, but not V. tenuisecta as yet.

Carter & Jones (1968) record V. tenuisecta from Forrest County, Mississippi; Gibson (1970) found it in cultivation in Guatemala; Howell & McClintock (1960) describe it as common along roadsides and in parking areas in Arizona, citing Gould 5303; while Munz (1968) comments as follows: "V. tenera Spreng. and V. tenuisecta Briq. are confused and both are to be looked for in Calif[ornia]. According to one author, V. tenera has the calyx-hairs appressed and V. tenuisecta ascending-spreading. The latter is described as having lvs. 2--4 cm. long, segms. mostly ca 1 mm. wide; corolla-limb ca 10 mm. wide. -- Reported from Bakersfield region, Kern Co., Twisselmann; native of S. Am. All California material which I have seen seems to be V. tenuisecta." I agree that all the California material is V. tenuisecta, but the pubescence characters quoted from an unnamed "author" are reversed.

Radford, Ahles, & Bell (1964) record V. tenuisecta from pastures and roadsides in the piedmont and central parts of South Carolina north into Richmond, Cumberland, and Duplin Counties, North Carolina, blossoming there from March until frost. Schwarz describes it as "rare" in Corrientes, Argentina.

Khoshoo & Arora (1969) describe a hybrid which they call "V. aubletia x V. tenuisecta" -- presumably xV. wingei Moldenke. They aver that both parental species "form bivalents during meiosis".

Krapovickas is of the opinion that the natural hybrid between V. tenuisecta and V. incisa Hook., which he has seen in the field, is V. calliantha Briq. The hybrid, however, has been described and named xV. trinitensis Moldenke by me (1962) and bears little resemblance to V. calliantha. Briquet's binomial has never formally been shifted to hybrid status as far as I am aware.

Troncoso (1968), in reducing V. tenuisecta to synonymy under V. aristigera S. Moore, comments that "El estudio del tipo de Verbena aristigera Sp. Moore, que se conserva en el 'British Museum (Nat. History)', ha permitido establecer su identidad con Glandularia tenuisecta del Paraguay. El carácter 'antherarum omnium connectivo apice inappendiculato', dado por Spencer Moore para su especie, es erróneo. Las anteras del ejemplar tipo possen apéndices glandulares, pero éstos son muy reducidos y no sobrepasan las tecas, de ahí que probablemente hayan pasado desapercibidos al autor." She cites S. Moore 1083 from Mato Grosso, Brazil, and Bazzi 230 from Chaco, as well as Jörgensen 2470 and Pierotti 10 from Formosa, Argentina.

Rickett (1969) compares V. tenuisecta with V. bipinnatifida Nutt., saying "V. tenuisecta has leaves similarly divided or cleft, the final parts being even narrower, almost hairlike. It is sparsely hairy, the leaves finally becoming smooth. The corolla is large and handsome, purple, lilac, or rose. The bracts are much shorter than the calyx. This blooms from March to July in eastern Texas and eastward to Florida; it is native to South America, and has been much cultivated in the United States."

Solbrig (1965) informs us that in the Gray Herbarium of Harvard University there is a cultivated specimen of V. tenuisecta collected in New York in 1896, although he identifies it as Glandularia pulchella (Sweet) Troncoso. I have seen a specimen of it collected in Mobile, Alabama, in 1893, already naturalized there.

Macbride (1960) lists V. tenuisecta in his work on the flora of Peru, but comments that whether V. tenera, V. laciniata, V. aristigera, and V. mendocina are actually all distinct taxa "must await results of modern methods of investigation. In any case Briquet's plant as to type is scarcely in Peru." My earlier reporting of the species from Cuzco, Peru, based on Herrera 3450, was erroneous — the specimen seems to represent V. microphylla H.B.K. instead.

Greene & Blomquist (1953), speaking of V. tenuisecta, say "This resembles a true verbena in its flower characteristics but because of its flat-topped inflorescence and appendaged stamens, is sometimes placed in the genus Glandularia. A reclining, hairy plant with opposite, dissected leaves with narrow lobes. Flowers are small but showy, with purple, pink, or white corollas. Sandy or clayey soil, roadsides and waste places. Coastal Plain, Fla. to Ga. and La.", often associated with Phyla nodiflora (L.) Greene. Grimm (1968) also says that "It is commonly seen blooming in the sands along highways in the coastal plain between June and September, from e. N. C. south to Fla. and west to La."

Arora & Khoshoo (1969) have done considerable cytologic work on this species. "Four, out of the maximum of 5 possible, primary trisomics were identified karyomorphologically in Verbena tenuisecta. These are Pseudo Normal, Slender, Semi Erect and Weak, trisomic for C, A, B and D chromosomes respectively. The trisomics are reasonably distinguishable from one another on the basis of qualitative and quantitative characters. like growth habit and rate, stem thickness, internode length, size and shape of leaves and flowers and fertility. The most common type of association at meiosis is 5 II +1 I followed by 1 III + 4 II. The trisomics differ in the number and type of trivalents. There is a significant increase in range and number of ring bivalents in all trisomics particularly in Slender. This is attributable to a correspondingly significant increase in chiasma frequency. The reasons for this are not clear. Anaphase segregation is ordinarily normal and pollen fertility is high except in Semi Erect in which it is correlated with segmentational errors. Although seed setting is apparently normal in all except Slender, yet germinability is very poor. Greater phenotypic effects and lesser tolerance to the addition results in trisomics for the long submedian and satellited A and medium submedian D chromosomes than for B and C chromosomes".

Material of V. tenuisecta has been misidentified and distributed in some herbaria under the names V. bipinnatifa Reimsch., V. bipinnatifida Schau., V. crinoides Lam., Glandularia tenera (Spreng.) Cabrera, and G. pulchella (Sweet) Troncoso. On the other hand, the Woolston 254, distributed as V. tenuisecta and so cited by me in a previous installment of these notes, is actually V. aristigera S. Moore, López-Palacios 2565 bis is V. tenera Spreng., and Rodriguez 578 is probably V. tenuisecta f. rubella Moldenke.

Additional citations: SOUTH CAROLINA: Hampton Co.: Ahles & Bell 10592 (N). Jasper Co.: Ahles & Bell 10443 (Se—199423). Lexington Co.: Leonard & Radford 1654 (N); A. E. Radford 44819 (Au—250986, W—2499723). GEORGIA: Wayne Co.: P. O. Schallert 251 (Se—202512). FLORIDA: Alachua Co.: Janish & Janish 264 (Se—187172). Gadsden Co.: J. K. Small s.n. [Chattahoochee, May 1931] (N). Jackson Co.: Small & Wherry 11707 (N). Taylor Co.: Porter & Porter 8913 (Se—212676). MISSISSIPPI: George Co.: Jones & Jones 11253 (Au—260971). LOUISIANA: Ouachita Par.: R. D. Thomas 3912 (Se—235180). TEXAS: Hardin Co.: Cory 52723 (Mi). Harris Co.: Spoon 21 (Au—248051, Au—248335). Jasper Co.: Lundell & Lundell 10511 (Se—163588). Montgomery Co.: Gould 8580 (Lk). Webb Co.: Netzer 27 (Lk). Zapata Co.: Balleza & Valdez 169 (Lk). ARIZONA: Maricopa Co.: D. F. Howe s.n. [24 April 1966] (Sd—63845). CALIFORNIA: Ventura Co.: H. M. Pollard s.n. [Apr. 28, 1945] (Se—172765). HISPANIOLA: Dominican Republic: Liogier 11910 (Ld, N, N, N, N, N). BRAZIL: Paraná: Hatschbach 15051 (W—2564568); Reitz & Klein 17728 (N, W—2548336). BOLIVIA: Santa Cruz: I. Peredo s.n. [23-XI-1946] (Se—129890). PARAGUAY: Hassler 2650 (Ca—950515); Woolston 1661 (N). ARGENTINA: Buenos Aires: Descole 2063 (N); Fabris 3241 (N); O'Donell 1424 (N); Rodrigues Vaquero 721 (N), 794 (N), 838 (N); Ruíz Huidobro 1330 (N). Chaco: R. M. Aguilar 29 (N), 1090 (N), 1306 (N). Corrientes: Burkart 19469 (W—2567996); Ibarrola 1283 (N); Krapovickas & Cristóbal 15910 (Ld); Krapovickas, Cristóbal, Arbo, Benitez, Maruñak, Maruñak, Pire, & Tressens 18053 (Ld); Krapovickas, Fernández, Mroginski, Bissio, & Quarin 19932 (Ld); Ruíz Huidobro 3742 (N); G. J. Schwarz 119 (N), 156 (N). Entre Ríos: Pedersen 9176 (N). Formosa: I. Morel 3678 (N), 4207 (N). La Pampa: Fortuna 14 (N), 17 (N). Misiones: Montes 14663 (Ac, Ld, N); G. J. Schwarz 1059 (N), 6240 (N). San Luis: Varela 553 (N). SOUTH AFRICA: Transvaal: Dahlstrand 178 (Go). IRAQ: Sayid Akmad 113 (N, W—2437672). PAKISTAN: Lahore: Sultan-ul-Abedin 2643 (N). THAILAND: Surapat 41 (W—2450873). CULTIVATED: Dominican Republic: Lavastre 2219 (N). Honduras: Molina R. 25401 (N). Iraq: Selman 405 (N). New Zealand: W. R. Sykes 543/65 (Nz—156225a). Pennsylvania: H. N. Moldenke 14570 (Se—146537). Utah: Reimschussel s.n. [October 28, 1964] (N).

VERBENA TENUISECTA var. ALBA Moldenke

Additional synonymy: Verbena laciniata var. alba Barker ex Moldenke, Fifth Summ. 2: 678, in syn. 1971.

Additional bibliography: Greene & Blomquist, Fls. South 108. 1953; Harler, Gard. Plains, ed. 4, 23, 24, 29, 238, & 250. 1962; Grimm, Recog. Flow. Wild Pl. 228. 1968; Hocking, Excerpt. Bot. A. 13: 571. 1968; Moldenke, Phytologia 16: 210. 1968; Moldenke, Résumé Suppl. 16: 2 (1968) and 17: 2 & 12. 1968; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1317 & 1324. 1970; Long & Lakela, Fl. Trop. Fla. 741. 1971; Moldenke, Fifth Summ. 1: 25, 27, 31, 49, 60, 63, 77, 188, 203, & 372 (1971) and 2: 667, 668, 678, 700, & 921. 1971; Moldenke, Phytologia 23: 283. 1972.

Liogier reports that in the Dominican Republic he found only a few individuals of this variety intermixed with the population of normally colored individuals.

The "white verbena", "moss verbena", and "Verbena erinoides" discussed by Harler (1962) from the gardens of India are probably V. tenuisecta var. alba. She notes that the plant is useful there for bedding, tough enough to be walked on occasionally, is perennial, needs sun, and can be used in hanging baskets and in rockeries.

Additional citations: HISPANIOLA: Dominican Republic: Liogier 11911 (Ac). CULTIVATED: California: Mrs. M. L. Barker s.n. [May 1945] (Sd—36317).

VERBENA TENUISECTA var. GLABRATA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 273. 1966; Reitz, Sellowia 22: 145. 1970; Moldenke, Fifth Summ. 1: 179 (1971) and 2: 700 & 921. 1971.

VERBENA TENUISECTA f. RUBELLA Moldenke

Synonymy: Verbena tenuisecta var. alba f. rubella Moldenke apud Hocking, Excerpt. Bot. A.13: 571, sphalm. 1968.

Bibliography: Greene & Blomquist, Fls. South 108. 1953; Grimm, Recog. Flow. Wild Pl. 228. 1968; Hocking, Excerpt. Bot. A.13: 571. 1968; Moldenke, Phytologia 16: 210. 1968; Moldenke, Résumé Suppl. 16: 2. 1968; Rickett, Wild Fls. U. S. 3 (2): 362. 1969; Long & Lakela, Fl. Trop. Fla. 741. 1971; Moldenke, Fifth Summ. 1: 63 (1971) and 2: 921 & 968. 1971.

The corollas are described as "rose" on Rodriguez 578, while Greene & Blomquist (1953), Grimm (1968), Rickett (1969), and Long & Lakela (1971) describe them as "pink". The plant has been encountered on the campos in Argentina.

Citations: ARIZONA: Cochise Co.: Moldenke & Moldenke 2033, in part (Rf—type). ARGENTINA: Misiones: Rodriguez 578 (W—2595166).

VERBENA TENUISPICATA Stapf

Additional bibliography: Patzak & Rech. in Rech., Fl. Iran. 43: 1 & 8. 1967; Moldenke, Phytologia 16: 210. 1968; Moldenke, Fifth Summ. 1: 267 (1971) and 2: 687 & 921. 1971.

Patzak & Rechinger (1967) reduce this species to synonymy under V. officinalis L.

VERBENA TESSMANNII Moldenke

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 614 & 629—630. 1960; Angely, Fl. Anal. Paran., ed. 1, 573. 1965; Moldenke, Phytologia 11: 304—305. 1965; Moldenke, Fifth Summ. 1: 179 (1971) and 2: 921. 1971.

Macbride (1960) includes this species in his Flora of Peru and indicates that he does so on the basis of information published by me. However, I am unable to find anywhere in my publications or correspondence that I ever stated that V. tessmannii grows, either wild or cultivated, in Peru. As far as I know, it is endemic to the state of Paraná, Brazil.

VERBENA TEUCRIIFOLIA Mart. & Gal.

Emended synonymy: Verbena teucrifolia Mart. & Gal. ex Hocking, Excerpt. Bot. A.6: 91. 1963.

Additional & emended bibliography: Lewis & Oliv., Am. Journ. Bot. 48: [639]—641, fig. 12. 1961; Hocking, Excerpt. Bot. A.6: 91. 1963; Moldenke, Phytologia 16: 210—211. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Gibson, Fieldiana Bot. 24 (9): 230 & 233. 1970; Moldenke, Fifth Summ. 1: 77 & 81 (1971) and 2: 668, 702, & 921. 1971; Moldenke, Phytologia 22: 461 (1972) and 23: 188 & 415. 1972.

Lewis & Oliver (1961) report the diploid chromosome number for this species to be 30. Recent collectors have found the plant growing on grassland salt flats, in subalpine meadows, in oak woods, in high altitude internal drainage basins, and in zacatal of Muhlenbergia quadridentata, often in black sandy loam soil. Gilbert encountered it as small plants between limestone fragments in alpine meadows, while Beaman found it in small grassy meadows surrounded by Abies forests. Gibson (1970) calls it "verbena de monte" and describes it as "Inconspicuous plants, common in the region of Quezaltenango", Guatemala.

The corollas are described as having been "blue" on Rosas R. 805, "purple" on J. Rzedowski 1009, and "blue-violet" on Rebolledo Vélez s.n. [20.VIII.1967]. Material has been misidentified and distributed in some herbaria under the names V. ambrosifolia Rydb. and V. ambrosiifolia Rydb. On the other hand, the Galicia 17, distributed as V. teucriifolia, is actually V. ciliata Benth.

Additional citations: MEXICO: Federal District: H. Hernández s.n. [25/IV/1965] (Ld); Hitchcock & Stanford 7037 (Au—301092); J. Rzedowski 1009 (Ip). Hidalgo: Chávez O. s.n. [4.VIII.1963] (Ip). México: Cruz Cisneros 1403 (Ip); González Quintero 1148 (Ip), 1155 (Ip); Rebolledo Vélez s.n. [20.VIII.1967] (Mi). Michoacán: Beaman 4351 (W—2575719). Nuevo León: Beaman 2667 (Au—240758, Ca—1304588, W—2576001), 4460 (Ca—1304912, W—2575737); L. Gilbert 22 (Au—252411). Puebla: Barkley, Paxson, & Webster 2493 (Au—123244); Beaman 4229 (W—2575614); Johnston & Davis s. n. [27 July 1947] (Au—278288). Veracruz: Beaman 2191 (Ca—1213637); Rosas R. 805 (Ld).

VERBENA TEUCRIIFOLIA var. COROLLULATA Perry

Additional bibliography: Moldenke, Phytologia 11: 481. 1965; Moldenke, Fifth Summ. 1: 77 (1971) and 2: 921. 1971.

VERBENA THYMOIDES Cham.

Additional synonymy: Glandularia thymoides Martínez-Crovetto, Bonplandia 2: 41, 51, 58, 65, & [68], hyponym. 1965.

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 621. 1960; Angely, Fl. Anal. Paran., ed. 1, 573. 1965; Martínez-Crovetto, Bonplandia 2: 41, 51, 58, 65, & [68]. 1965; Moldenke, Phytologia 16: 211. 1968; Moldenke, Résumé Suppl. 16: 22. 1968; Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 4: 840 & xix, map 1395. 1970; Reitz, Sellowia 22: 145. 1970; Moldenke, Fifth Summ. 1: 179, 188, 190, & 203 (1971) and 2: 522, 702, & 921. 1971; Moldenke, Phytologia 22: 465 (1972) and 23: 191. 1972.

Hatschbach encountered this plant on "campo, orla da capão". The corollas are described as having been "lilac" in color on Hatschbach 22310. The Krapovickas & Cristóbal 16028 and Krapovickas & al. 17113, distributed as V. thymoides, are both actually V. balansae Briq.

Additional citations: BRAZIL: Paraná: Hatschbach 22310 (Mi, N).

VERBENA THYMOIDES f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, Phytologia 11: 312—314. 1965; Moldenke, Fifth Summ. 1: 190 (1971) and 2: 781 & 92. 1971.

VERBENA TOMOPHYLLA Briq.

Additional bibliography: Moldenke, Phytologia 11: 314—315. 1965; Moldenke, Fifth Summ. 1: 188 & 203 (1971) and 2: 677 & 921. 1971.

This species has been collected in fruit in October.

Additional citations: ARGENTINA: Formosa: I. Morel 3750 (N).

xVERBENA TORPA Moldenke

Additional bibliography: Moldenke, Phytologia 11: 481. 1965; Moldenke, Fifth Summ. 1: 373 (1971) and 2: 685, 705, & 921. 1971.

VERBENA TOWNSENDII Svenson

Synonymy: Verbena townsendi Svenson ex Moldenke, Phytologia 23: 293. 1972.

Additional bibliography: Moldenke, Phytologia 11: 316—317 (1965) and 16: 342. 1968; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 503, 506, & 509. 1971; Moldenke, Fifth Summ. 1: 138 (1971) and 2: 921. 1971; Wiggins & Porter, Fl. Galáp. Isls. 45 & 997. 1971; Moldenke, Phytologia 23: 293 & 437. 1972.

VERBENA TRACHEA R. A. Phil.

Additional bibliography: Reiche & Phil., Fl. Chil. 5: 289 & 292. 1910; Moldenke, Phytologia 11: 317—318. 1965; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 703 & 921. 1971.

xVERBENA TRANSITORIA Moldenke

Additional bibliography: Moldenke, Phytologia 11: 481. 1965; Moldenke, Fifth Summ. 1: 373 (1971) and 2: 521, 678, 683, 700, & 921. 1971.

VERBENA TRIFIDA H.B.K.

Emended synonymy: Verbena trifida Humb. & Bonpl. ex Steud., Nom. Bot. Phan., ed. 1, 874. 1821.

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 1, 874. 1821; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 614, 618, & 630. 1960; Moldenke, Phytologia 16: 211. 1968; Moldenke, Fifth Summ. 1: 77, 120, & 373 (1971) and 2: 703 & 921. 1971; Moldenke, Phytologia 23: 191 & 370 (1972) and 24: 46. 1972.

Macbride (1960) incorrectly dates the original publication of this species as "1818", but as has been explained previously in this series of notes, the folio edition of the volume in question was issued in 1817. He records the species as doubtfully from Peru, with the note "Not seen by Perry, nor placed. Weberbauer 2723 was referred here by Hayek perhaps correctly, but this, typically at least, has leaves with only three narrow lobes; the type came from Mexico." I know V. trifida in its typical form only from Boyacá and Cundinamarca, Colombia. Material has been misidentified and distributed in some herbaria as V. microphylla H.B.K.!

Additional citations: COLOMBIA: Department undetermined: Mutis 3691 (W—1562720).

VERBENA TRIFIDA var. DESERTICOLA Moldenke
Additional bibliography: Moldenke, Phytologia 11: 320. 1965; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 921. 1971.

xVERBENA TRINITENSIS Moldenke
Additional bibliography: Moldenke, Phytologia 16: 211--212. 1968; Moldenke, Fifth Summ. 1: 188 (1971) and 2: 657, 662, 677, 689, 700, & 921. 1971; Moldenke, Phytologia 22: 491 (1972) and 23: 279. 1972.

VERBENA TRISTACHYA Troncoso & Burkart
Additional bibliography: Moldenke, Phytologia 16: 212. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 715. 1969; Moldenke, Fifth Summ. 1: 203 (1971) and 2: 522, 700, & 921. 1971; Moldenke, Phytologia 23: 419. 1972.
Schnack & Covas (1951) report the diploid chromosome number for this species as 10. The plant has been collected in flower and fruit in September.
Additional citations: ARGENTINA: Misiones: G. J. Schwarz 6210 (N).

VERBENA TRITERNATA R. A. Phil.
Additional bibliography: Moldenke, Phytologia 11: 324--325. 1965; Moldenke, Fifth Summ. 1: 193 (1971) and 2: 654 & 921. 1971.

VERBENA TUMIDULA Perry
Additional bibliography: Moldenke, Phytologia 13: 274. 1966; Rickett, Wild Fls. U. S. 3 (2): 364. 1969; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1316 & 1324. 1970; Moldenke, Fifth Summ. 1: 60, 62, & 77 (1971) and 2: 921. 1971.
Rickett (1969) describes this plant as follows: "V. tumidula has hairy stems. The leaves, an inch long or longer, are cleft into three lobes which are coarsely toothed or scalloped or again cleft unevenly; they have short hairs on the under side. The fringed bracts are no longer than the calyx, which is glandular and hairy. The corolla is purplish-blue, 1/3 — 2/5 inch across. May to November: on the Edwards Plateau and in western Texas, and in New Mexico." It is, of course, the fruit character which alone can be depended on to distinguish this species. Johnston describes it as an erect plant and found it growing in gravelly moist places, flowering and fruiting in September.
Additional citations: MEXICO: Coahuila: I. M. Johnston 9252 (Au—300491).

VERBENA URTICIFOLIA L.
Additional synonymy: Verbena urticae-folia canadensis Tourn., Compl. Herb. 358. 1719. Verbena diffusa Desf. ex Steud., Nom. Bot. Phan., ed. 1, 873. 1821. Verbena urticiefolia L. apud S. W. Bailey, Barth. Cobble Fl. n.p. 1957.
Additional & emended bibliography: Tourn., Compl. Herb. 358.

1719; Crantz, Inst. Rei Herb. 1: 573. 1766; [Retz.], Nom. Bot. 11. 1772; J. F. Gmel. in L., Syst. Nat., ed. 13, pr. 1, 2: 42 (1789) and pr. 2, 2: 42. 1796; Balbis, Cat. Stirp. Hort. Acad. Taur. 80. 1813; Pers., Sp. Pl. 3: 347. 1819; Steud., Nom. Bot. Phan., ed. 1, 873 & 874. 1821; Jan, Elench. Pl. 1. 1824; Beck, Bot., ed. 1, 284. 1833; A. Wood, Class-book, ed. 1, 269 (1845), ed. 2, pr. 1, 412 (1847), ed. 2, pr. 2, 412 (1848), and ed. 10, pr. 1, 412. 1848; Beck, Bot., ed. 2, pr. 1, 285. 1848; A. Gray, Man. Bot., ed. 1, 311--312. 1848; A. Wood, Class-book, ed. 10, pr. 2, 412 (1849), ed. 10, pr. 3, 412 (1850), ed. 17, 412 (1851), ed. 23, 412 (1851), ed. 29, 412 (1853), ed. 35, 412 (1854), ed. 41, pr. 1, 412 (1855), and ed. 41, pr. 2, 412. 1856; Beck, Bot., ed. 2, pr. 2, 285. 1856; A. Gray, Man. Bot., ed. 2, pr. 1, 298 (1856), ed. 2, pr. 2, 298 (1858), and ed. 2, pr. 3, 298. 1859; A. Wood, Class-book, [ed. 42], pr. 1, 537. 1861; A. Gray, Man. Bot., ed. 3, 298 (1862) and ed. 4, pr. 1, 298. 1863; A. Wood, Class-book, [ed. 42], pr. 2, 537. 1863; A. Gray, Man. Bot., ed. 4, pr. 2, 298. 1864; A. Wood, Class-book, [ed. 42], pr. 3, 537. 1865; Darby, Bot. South. States 474. 1866; A. Wood, Class-book, [ed. 42], pr. 4, 537. 1867; A. Gray, Man. Bot., ed. 5, pr. 1, 340 (1867) and ed. 5, pr. 2, 340. 1868; Beck, Bot., ed. 2, pr. 3, 285. 1868; A. Wood, Class-book, [ed. 42], pr. 5, 537. 1868; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 1, 242 (1868) and ed. 1, pr. 2, 242. 1869; A. Wood, Class-book, [ed. 42], pr. 6, 537 (1869) and [ed. 42], pr. 7, 537. 1870; A. Gray, Man. Bot., ed. 4, pr. 3, 298. 1870; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1, 236 (1870), ed. 1, pr. 2, 236 (1871), and ed. 1, pr. 3, 236. 1872; A. Wood, Class-book, [ed. 42], pr. 8, 537. 1872; A. Wood, Am. Bot. & Flor., ed. 1, pr. 4, 236 (1873), ed. 1, pr. 5, 236 (1874), and ed. 1, pr. 6, 236. 1875; A. Wood, Class-book, [ed. 42], pr. 9, 537. 1876; A. Gray, Man. Bot., ed. 5, pr. 8, 340 (1878) and ed. 5, pr. 8 [9], 340. 1880; A. Gray, Field For. & Gard. Bot., ed. 1, pr. 3, 242. 1880; A. Wood, Class-book, [ed. 42], pr. 10, 537. 1881; Meyncke, Bull. Brooksville Soc. Nat. Hist. 1: [Fl. Franklin Co.] 31. 1885; O. R. Willis in A. Wood, Am. Bot. & Flor., ed. 2, 235. 1889; S. Wats. & Coult. in A. Gray, Man. Bot., ed. 6, pr. 1, 402 (1889) and ed. 6, pr. 2, 402. 1890; Gattinger, Med. Pl. Tenn. 63. 1894; L. H. Bailey in A. Gray, Field For. & Gard. Bot., ed. 2, 341. 1895; W. A. Wheeler, Minn. Bot. Stud. 2: 403. 1900; H. Kraemer, Text-book Bot. & Pharmacog., ed. 1, 368 (1902), ed. 2, 368 (1907), ed. 3, 368 (1908), and ed. 4, 368. 1910; Graves, Eames, Bissell, Andrews, Harger, & Weatherby, Bull. Conn. Geol. & Nat. Hist. Surv. 14: [Cat. Flow. Pl.] 331. 1910; Britton & Br., Illustr. Fl., ed. 2, pr. 1, 3: 94 & 95, fig. 3553. 1913; Shull, Pl. World 17: 333, 335, & 336. 1914; Harshberger, Veg. N. J. Pine Barrens, pr. 1, 206, 254, & 257. 1916; Lowe, Miss. State Geol. Surv. Bull. 17: 236. 1921; Pammel & King, Iowa Geol. Surv. Bull. 4 (rev.): 264—267, fig. 151, 161A, & 151B. 1926; G. Klein, Handb. Pflanzenanal. 3 (2): 1238. 1932; Sefferien, Torreya 32: 125. 1932; Britton & Br., Illustr. Fl., ed. 2, pr. 2, 3: 94 & 95, fig. 3553. 1936; Noack, Biol. Zentralbl. 57: 384 & 386, fig. 4. 1937; F. H. & H. H. Hillman, Seed Trade Buyers Guide 1938: 137, pl. 12, fig. 5. 1938; Britton & Br., Illustr. Fl., ed. 2, pr. 3, 3: 94 & 95, fig. 3553. 1943; Zufall & Richtm., Pharm. Arch. 15: 1—9. 1944; Zufall & Richtm., Chem. Abstr. 38: 4092. 1944; Savage, Cat. Linn. Herb. Lond. 4. 1945; Britton & Br., Illustr. Fl., ed. 2, pr. 4, 3: 94 & 95, fig. 3553. 1947; E. L. Palmer, Fieldbook Nat. Hist., ed. 1, pr. 3, 297 & 663. 1949; Abrams, Illustr. Fl. Pacif. States, pr. 1, 3: 611. 1951; Fogg, Weeds Lawn & Gard. 141. 1956; S. W. Bailey, Barth. Cobble Fl. n.p. 1957; Jacobs & Burlage, Ind. Pl. N. C. 221—222 & 251. 1958; R. McVaugh, Bull. N. Y. State Mus. 360: 196. 1958; F. Bartley in J. C. Bartley, Bull. Ohio Biol. Surv., new ser., 1: 181. 1959; Winter, Winter, & Van Bruggen, Check List Vasc. Pl. S. D. 124. 1959; Ferris in Abrams & Ferris, Illustr. Fl. Pacif. States, pr. 1, 4: 730. 1960; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 626. 1960; Rattenbury, Madroño 15: 220. 1960; Lewis & Oliv., Am. Journ. Bot. 48: [639]—641, fig. 21. 1961; Poindexter, Trans. Kans. Acad. Sci. 65: 409, 410, 412, 413, & 415—419, fig. 1, 2, 5, & 6. 1962; Dobbs, Fl. Henry Co. 229. 1963; Hocking, Excerpt. Bot. A.6: 91. 1963; Newcomb, Pocket Key Comm. Wild Fls. 24. 1963; Radford, Ahles, & Bell, Guide Vasc. Fl. Carol. 281 & 282. 1964; Rouleau in Marie-Victorin, Fl. Laurent., ed. 2, 489 & 490, fig. 170. 1964; Hocking, Excerpt. Bot. A.7: 206 (1964), A.8: 537 (1965), and A.9: 366 & 367. 1965; Ferris in Abrams & Ferris, Illustr. Fl. Pacif. States, pr. 2, 4: 730. 1965; H. S. Fitch, Univ. Kans. Nat. Hist. Reserv. 49. 1965; Lakela, Fl. Northeast. Minn. 110. 1965; Hirata, Host Range & Geogr. Distrib. Powd. Mild. 277. 1966; Mohlenbrock, Castanea 31: 224 & 235. 1966; F. H. Montgomery, Plants from Sea to Sea 262. 1966; Thornberry, U. S. Dept. Agr. Agric. Handb. 165: 479. 1966; Abrams, Illustr. Fl. Pacif. States, pr. 2, 3: 611. 1967; Rendle, Classif. Flow. Pl., ed. 2, 2: 502, fig. 230. 1967; Shinn, Univ. Kans. Sci. Bull. 46: 790, 791, 886, 887, & 928. 1967; Wherry, Bartonia 37: 13. 1967; Zukowski in Paelowskiego, Fl. Polsk. 11: 65. 1967; Boivin, Phytologia 16: 39. 1968; Boivin, Provanch. 2: 194. 1968; Burlage, Ind. Pl. Tex. 184, 206, 225, & 237. 1968; Freer, Castanea 33: 185. 1968; W. C. Grimm, Recog. Flow. Wild Pl. 228. 1968; Gunn, Castanea 33: 102. 1968; Mohlenbrock, Trans. Ill. Acad. Sci. 61: 71. 1968; Moldenke, Phytologia 16: 212—214 & 340. 1968; Moldenke, Résumé Suppl. 16: 1, 7, & 28 (1968) and 17: [1]. 1968; Paterson & McKenny, Field Guide Wildfls. 62, [63], & 418. 1968; Streams, Shahjahan, & Le Masurier, Journ. Econ. Ent. 61: 997. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Cody, Ind. Sem. Bot. Gard. Ottawa 1969: 22. 1969; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 262 & 267. 1969; Hocking, Excerpt. Bot. A.14: 206. 1969; C. E. O. Hopkins, Castanea 34: 179. 1969; W. E. Hopkins, Castanea 34: 46. 1969; Jervis, Castanea 34: 115. 1969; Lowden, Ohio Journ. Sci. 69: 280. 1969; Moldenke, Biol. Abstr. 50: 418. 1969; A. L. Moldenke, Phytologia 18: 126 & 127. 1969; Rickett, Wild Fls. U. S. 3 (2): 365. 1969; C. L. Rodgers, Castanea 34: 390. 1969; F. C. Seymour, Fl. New Eng. 456. 1969; Swink, Pl. Chicago Reg. 428. 1969; Beaman, Mich. Bot. 9: 158. 1970; G. H. & J. C. Bick, Entomol. News 81: 158, 159, & 163. 1970; Britton & Br., Illustr. Fl., ed. 2, pr. 5, 3: 94 & 95, fig.

3553. 1970; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Domville & Dunbar, John Burroughs Nat. Hist. Soc. Bull. 8: 95. 1970; DuMond, Castanea 35: 237. 1970; Harrington in Frankel & Bennett, Genetic Resources 516. 1970; Harshberger, Veg. N. J. Pine Barrens, pr. 2, 206, 254, & 257. 1970; Joyal, Natur. Canad. 97: 561 & 577. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1314 & 1319. 1970; W. R. Weber, Trans. Ill. Acad. Sci. 63: 25. 1970; Bostick, Castanea 36: 206. 1971; Brown & Wherry, Bartonia 40: 13. 1971; Cochrane, W. E. Rice, & M. M. Rice, Mich. Bot. 10: 184. 1971; Cody, Ind. Sem. Bot. Gard. Ottawa 1971: 20. 1971; Farnsworth, Pharmacog. Titles 5, Cumul. Gen. Ind. 1971; Moldenke, Fifth Summ. 1: 14—23, 25, 27, 31—35, 37—42, 44, 46, 47, 49, 52, 54, 60, 204, & 373 (1971) and 2: 656, 659, 666, 668, 669, 673, 674, 677, 679, 685, 689, 692, 696, 698, 701, 704—706, 709, 773, 782, & 921. 1971; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 508. 1971; H. V. Sm., Mich. Bot. 10: 198 & 201. 1971; Stalter, Castanea 36: 174. 1971; Thilenius, U. S. Dept. Agr. Forest Serv. Res. Pap. RM.71: 42. 1971; Wiggins & Porter, Fl. Galáp. Isls. 997. 1971; Cody, Ind. Sem. Bot. Gard. Ottawa 1972: 25. 1972; Moldenke, Phytologia 23: 185, 225, 229, 265, 303, 370, & 413 (1972) and 24: 33. 1972; Tucker, Castanea 37: 23. 1972.

Additional illustrations: Britton & Br., Illustr. Fl., ed. 2, pr. 1, 3: 95, fig. 3553. 1913; Pammel & King, Iowa Geol. Surv. Bull. 4 (rev.): 265 & 266, fig. 151 & 151A. 1926; Britton & Br., Illustr. Fl., ed. 2, pr. 2, 3: 95, fig. 3553. 1936; Noack, Biol. Zentralbl. 57: 386, fig. 4. 1937; F. H. & H. H. Hillman, Seed Trade Buyers Guide 1938: 137, pl. 12, fig. 5. 1938; Britton & Br., Illustr. Fl., ed. 2, pr. 3, 3: 95, fig. 3553 (1943) and ed. 2, pr. 4, 3: 95, fig. 3553. 1947; Fogg, Weeds Lawn & Gard. 141. 1956; Rouleau in Marie-Victorin, Fl. Laurent., ed. 2, 489, fig. 170. 1964; Rendle, Classif. Flow. Pl., ed. 2, 2: 502, fig. 230. 1967; Paterson & McKenny, Field Guide Wildfls. [63]. 1968; Britton & Br., Illustr. Fl., ed. 2, pr. 5, 3: 95, fig. 3553. 1970; H. V. Sm., Mich. Bot. 10: 201. 1971.

Savage (1945) reports that in the Linnean Herbarium in London sheet number 13, under genus 35, Verbena, is inscribed "urticifolia 11", the specific epithet being in Linnaeus' own handwriting.

Recent collectors have found the plant growing in alluvial or dry upland woods, on granitic outcrops and bushy uplands, in dry alluvial sandy soil, on floodplains, and in shady places. Rowell reports that it is an occasional herb in the dense shade of Diospyros groves in Hemphill County, Texas. Grimm (1968) says of it: "This plant is similar to the preceding one [V. hastata] but it has more lax end clusters of small white flowers. It grows in fields, thickets, and the borders of woods from Que. to Ont. and S. D. south to Fla. and Tex." Bartley (1959) records it from Jackson County, Ohio, Cochrane (1971) from woods, thickets, and roadsides in Rock County, Wisconsin, and Dobbs (1963) from Henry County, Illinois, where he says it is "frequent to common on the borders of woodlands, also in pasture fields and waste places". Domville &

Dunbar (1970) describe it as frequent in wet pastures in Ulster County, New York, where it blooms in the "summer"; Freer (1968) cites Freer 7149 from Amherst County and Freer 7207 from Rockbridge County, Virginia; Gunn (1968) records it from Bullett County, Kentucky; Hopkins (1969) cites W. E. Hopkins 1022 from Pope County, Illinois; and Joyal (1970) cites Joyal 1231 from Soeur Island, Québec. Gattinger (1894) says of it "Flower-spike and flowers very much like the former [V. officinalis], but more robust and taller, 3—5° high; leaves oval or oblong-ovate, acute, coarsely serrate, petioled; spikes at length much elongated, loosely panicled; flowers very small, white. A homely weed, everywhere along roadsides or open grounds" in Tennessee. For medicinal usage, he says, "Collect the root."

Lakela (1965) avers that V. urticifolia is recorded for northeastern Minnesota only on the basis of "coll of Jol8597 Ely". Lowden (1969) records it from Squaw Island, Ohio; Lowe (1921) says that it is "A common weed in waste places" in Hinds, Lafayette, Oktibbeha, Union, and Warren Counties, Mississippi; Mohlenbrock (1968) lists it from Pope County, Illinois; while Radford, Ahles, & Bell (1964) tell us that it occurs in marshes, mesic woodlands, old fields, and waste places throughout the Carolinas, blooming there from May to November. They do not recognize var. leiocarpa Perry & Fern.

Stalter (1971) has reported V. urticifolia from Georgetown County, South Carolina, Tucker (1972) from Ashe County, North Carolina, Weber (1970) from Randolph County, Illinois, and Wherry (1967) from Delaware County, Pennsylvania. Swink (1969) says that it is found in the Chicago area "In degraded woodland, with Aster sagittifolius drummondii, Carya cordiformis, Circaea quadrisulcata canadensis, Cornus racemosa, Eupatorium rugosum, Parthenocissus quinquefolia, Phlox divaricata, Prunus serotina, Quercus alba, Quercus macrocarpa, Quercus rubra, Tilia americana, Ulmus americana, and Vitis riparia. It is found on shaded flood plains, with Actinomeris alternifolia, Impatiens capensis, Laportea canadensis, Rudbeckia laciniata, and Silphium perfoliatum. Along old logging roads, and in other artificial shaded habitats, it is found with Amphicarpa bracteata, Cirsium vulgare, Dioscorea villosa, Erigeron annuus, Fragaria virginiana, Oxalis stricta, Phytolacca americana, Silene stellata, and Solidago altissima." Tatnall (1946) reports it as "frequent in thickets and waste places, chiefly on Piedmont, occasional on Coastal Plain" of Delaware, citing Earle 1734 & 3112 and Tatnall 1519; Wheeler (1900) cites W. A. Wheeler 406 & 548 from Jefferson, Minnesota; Winter and his associates (1959) aver that it grows in "Thickets and waste places over the state" of South Dakota, while Wunderlin (1966) reports it as only local in open ground in Carroll County, Illinois, citing Wunderlin 136. Rouleau (1964) states that in Québec it is found only in the western portion of the province.

The corolla is described as having been "white" on C. A. Brown

2650, B. Hutchins 1321, and Whitehouse 16426, but as "blue" on R. Runyon 1260 (probably an error in recollection by the collector, since the collection certainly does not represent the blue-flowered hybrid often found where V. urticifolia grows in proximity to V. hastata L.) The illustration given by Smith (1971) shows the plant in its winter condition. Harrington (1970) reports that its seeds have a life span of 39 years. Shull (1914) kept seeds in mud covered by several inches of water for 4 1/2 years in a dark attic where the temperature seldom dropped below freezing; upon draining the water, the seeds germinated readily in a greenhouse.

Glucoside is reported from the tissues of V. urticifolia by Zufall & Richtman (1944), while Burlage (1968) reports that the plant has been used with Quercus alba to treat Toxicodendron poisoning and that it was used by the Amerinds as a diuretic and emmenagogue.

Thornberry (1966) records the following fungi as attacking V. urticifolia: Erysiphe cichoriacearum P. DC. (a powdery mildew, also reported by Hirata, 1966), general through its range, Puccinia vilfae Arth. & Holw. (a rust) from Indiana to Oklahoma and South Dakota, Septoria verbenae Rob. (a leaf-spot) from Vermont to Mississippi, Texas, and South Dakota, and an unidentified virus forming a mosaic in Iowa.

Patermann (1935) records the diploid chromosome number as 12, but Junell (1934), Dermen (1936), Noack (1937), Lewis & Oliver (1961), and Poindexter (1962) give it as 14. An additional common name for the species recorded in old literature is "nettle-leaved vervain of Canada".

The Bicks (1970) report that a dragonfly, Archilestes grandis, has been observed depositing her eggs on the stems of V. urticifolia as far as "2.3 m. above water" [meaning, I assume, the water-line of the stream or pond margin]. Streams and his associates (1968) report that the nymphs of the tarnished plant bug often infest Verbena urticifolia as well as V. hastata, Erigeron annuus, E. strigosus, Oenothera biennis, Daucus carota, and Solidago spp., and are there parasitized by the wasp, Leiophron pallipes Curtis, which provides biologic control of the bug which would otherwise spread from weeds to cultivated crops.

Those who regard this vervain as an undesirable "weed" are assured by Pammel & King (1926) that it can easily be destroyed by cutting. Fogg (1956) describes it interestingly as follows: "Although seemingly at home in thickets and woodland borders, White Vervain is a common species of roadsides, meadows, fields, and waste places. In poor soils it may occur as a weak, scrawny plant with only a single stem, but in more favorable situations it often develops to a height of four or five feet and becomes so profusely branched as to be almost shrub-like. In either case it is easy to recognize by virtue of its opposite, coarsely toothed, and conspicuously veined leaves which so much resemble those of certain nettles as to have suggested the specific name urticaefolia given to it by the Swedish botanist Linnaeus. The small white flowers of this species are borne in numerous long, slender spikes, and each flower is capable of producing four minute seeds or nutlets. The plant has a period of bloom extending over at least three months, and the apex of the stem continues to produce new buds long after the lowest flowers have withered and liberated their seeds. It therefore behooves those whose gardens this species has invaded to learn to recognize it early in the season and to lose no time in effecting its removal. Like most species with perennial roots, it should be attacked when the earth is soft."

As mentioned previously in this series of notes, there are several more or less distinct forms or races of this plant: the one characterized by having coarse (not short) hairs over the entire under surface of the leaf lamina is well represented by B. Hutchins 1321, cited below, while the form with the coarse hairs only on the venation of the lower surface is well represented by Roop 77, C. M. Rowell 5563 & 10723, and Stratton 1619, also cited below.

The Schnée s.n. [Mexique, VI.X], distributed as V. urticifolia, is actually V. ehrenbergiana Schau., M. E. Wharton 5633a is xV. engelmannii Moldenke, J. T. Stewart 13861 is xV. perriana Moldenke, M. E. Wharton 5186a is V. urticifolia var. leiocarpa Perry & Fernald, and Andreasen, Davis, & Luikart 40 is Perilla frutescens (L.) Britton in the Lamiaceae.

Additional citations: QUÉBEC: Huntingdon Co.: Ernest & Le Blanc 61-230 (Go). VERMONT: Chittenden Co.: S. F. Blake 2119 [Herb. Blake 3221] (Ld). NEW YORK: Bronx Co.: Collector undetermined s.n. [William's Bridge, 8.9.77] (N). Dutchess Co.: Hyde & Hyde 180 (Go), 275 (Go), 312 (Rf). Seneca Co.: Chickering s.n. [Ovid, July 1858] (W—2605972). NEW JERSEY: Camden Co.: Day s.n. [Stratford, Aug. 20, 1871] (Pa). Union Co.: A. L. Moldenke s.n. [July 12, 1968] (Ps—120); H. N. Moldenke 24476 (Go, Lk, Mu), 24903 (Lk, Mu); Moldenke & Moldenke 24476 (Ft, Ip, Tk, Ws, Ws), 24903 (Au, Go, Ip, L, Ws, Ws). PENNSYLVANIA: Centre Co.: C. G. Shaw s.n. [7/18/39] (Se—115998). DELAWARE: New Castle Co.: Canby s.n. (Pa). DISTRICT OF COLUMBIA: Sudworth 603 (Mi). NORTH CAROLINA: Jones Co.: Radford 37095 (N). Yadkin Co.: B. King s.n. [Radford 44917] (W—2499792). SOUTH CAROLINA: Lancaster Co.: Ahles & Haesloop 31241 (Se—199294). ALABAMA: Jefferson Co.: E. L. Reed 1539 (Lk). OHIO: Butler Co.: Cobbe 144 (Go); M. Miller s.n. [July 7, 1932] (Go). ILLINOIS: Cook Co.: H. R. Bennett s.n. [August 17, 1957] (Se—180352), s.n. [August 31, 1957] (Se—180361). Parke Co.: Daubenmire s.n. [July 11, 1930] (Se—177666), s.n. [July 26, 1930] (Se—181531). Tazewell Co.: V. H. Chase 3228 (N, Se—180435, Se—204859). Woodford Co.: V. H. Chase 9991 (Au—122809, Au—122810). INDIANA: Fulton Co.: Friesner 23098 (Au—122812). KENTUCKY: Bath Co.: M. E. Wharton 3174 (Mi). Boyd

Co.: M. E. Wharton 2919 (Mi). Estill Co.: M. E. Wharton 3010b (Mi). Henry Co.: J. L. Gentry Jr. 363 (N). Madison Co.: M. E. Wharton 835 (Mi). Montgomery Co.: M. E. Wharton 3076 (Mi). MICHIGAN: Cass Co.: H. R. Bennett 2706 (W—2445851). Clinton Co.: C. A. Brown 2650 (N). WISCONSIN: Brown Co.: Castelnau s.n. [G. de Baie Verte] (W—2546793). MINNESOTA: Murray Co.: Jensen-Haarup s.n. [Slayton, summer 1913] (Ac). KANSAS: Atchison Co.: Horr & McGregor E.531 (N). MISSOURI: Reynolds Co.: Evans, Sharp, Morton, Delgadillo, Furr, & Bowers 42566 (N). Saint Louis: Muehlenbach 3129 (Ac), 3204 (Ac). ARKANSAS: Garland Co.: Demaree 59636 (Ac), 60535 (Ac). Hot Spring Co.: Demaree 17887 (Se—200354). Pope Co.: Demaree 58426 (Rf). Sharp Co.: Demaree 26273 (Au—122813). Stone Co.: Demaree 59189 (Rf), 61029 (Ac). NEBRASKA: Jefferson Co.: Rohrbaugh 167 (Au—122811). OKLAHOMA: Comanche Co.: E. J. Palmer 11749 (N), 11749b (N). McCurtain Co.: C. M. Rowell 10723 (Lk). Osage Co.: Stratton 1619 (Lk). Payne Co.: Roop 77 (Lk). TEXAS: Denton Co.: Whitehouse 16426 (N). Hemphill Co.: C. M. Rowell 5563 (Lk, Lk). Wheeler Co.: B. Hutchins 1321 (Lk). LOCALITY OF COLLECTION UNDETERMINED: Day s.n. [Hudson R. Railroad, Aug. 1872] (Pa); Lesueur s.n. [Amer. sept.] (W—2546791).

VERBENA URTICIFOLIA var. INCARNATA (Raf.) Moldenke

Additional bibliography: Moldenke, Phytologia 13: 275. 1966; Moldenke, Fifth Summ. 1: 19 (1971) and 2: 677 & 921. 1971.

It is possible that the Correll & Mitchell 34397, cited herein under V. urticifolia var. leiocarpa Perry & Fernald, with "light-lavender" corollas, may represent var. incarnata instead.

VERBENA URTICIFOLIA var. LEIOCARPA Perry & Fernald

Additional synonymy: Verbena urticifolia var. leiocarpa Perry ex Moldenke, Fifth Summ. 2: 705, in syn. 1971.

Additional bibliography: Wherry, Bartonia 37: 13. 1967; Burlage, Ind. Pl. Tex. 184. 1968; Moldenke, Phytologia 16: 214. 1968; F. C. Seymour, Fl. New Ebg. 456. 1969; Swink, Pl. Chicago Reg. 428. 1969; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1314 & 1319. 1970; Cochrane, W. E. Rice, & M. M. Rice, Mich. Bot. 10: 184. 1971; Moldenke, Fifth Summ. 1: 17—22, 24, 25, 31, 34, 37—42, 44, 46, 48, 52, 54, 60, & 373 (1971) and 2: 703—705 & 921. 1971.

Cochrane and his associates (1971) record this variety from along roadsides in Rock County, Wisconsin, citing Wickham s.n. [La Prairie, 1947] in the herbarium of the University of Wisconsin; Wherry (1967) records it from Delaware County, Pennsylvania, while Swink (1969) notes that "Var. leiocarpa occurs in our area [the Chicago region], but Jones & Fuller make it a synonym of the type".

The corollas are said to have been "light-lavender" on Correll & Mitchell 34397, cited below, and, if this description is accurate, it is very possible that this collection by represent var. incarnata (Raf.) Moldenke instead.

Additional citations: DISTRICT OF COLUMBIA: Sudworth s.n. [19 June 1890] (Mi). KENTUCKY: Estill Co.: M. E. Wharton 5186a (Mi). MICHIGAN: Cass Co.: H. R. Bennett 2708 (W--2445853). ARKANSAS: Stone Co.: Demaree 59366 (Ac), 61208 (Rf). TEXAS: Red River Co.: Correll & Mitchell 34397 (Ld, Ld).

xVERBENA URUGUAYENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 13: 275. 1960; G. Taylor, Ind. Kew. Suppl. 14: 142. 1970; Moldenke, Fifth Summ. 1: 190 (1971) and 2: 683, 689, 700, & 922. 1971.

xVERBENA VAGA Moldenke

Additional bibliography: Moldenke, Phytologia 16: 214. 1968; Solbrig, Passani, & Glass, Am. Journ. Bot. 55: 1239. 1968; Moldenke, Fifth Summ. 1: 203 & 373 (1971) and 2: 522, 683, 694, 705, 782, & 922. 1971.

VERBENA VALERIANOIDES H.B.K.

Emended synonymy: Verbena valerianoides Humb. & Bonpl. ex Steud., Nom. Bot. Phan., ed. 1, 874. 1821.

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 1, 874. 1821; Moldenke, Phytologia 16: 214. 1968; Moldenke, Fifth Summ. 1: 120 (1971) and 2: 705 & 922. 1971.

VERBENA VARIABILIS Moldenke

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 613 & 630. 1960; Moldenke, Phytologia 13: 275. 1966; Moldenke, Fifth Summ. 1: 144 (1971) and 2: 922. 1971.

VERBENA VENTURII Moldenke

Additional & emended bibliography: Hocking, Excerpt. Bot. A. 9: 367. 1965; Moldenke, Phytologia 13: 275. 1966; Moldenke, Fifth Summ. 1: 203 (1971) and 2: 922. 1971.

VERBENA VILLIFOLIA Hayek

Additional synonymy: Verbena villifolia "Hayek in Engl." ex Hocking, Excerpt. Bot. A.9: 367. 1965.

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 613 & 614. 1960; Moldenke, Phytologia 13: 275. 1966; Moldenke, Fifth Summ. 1: 144 (1971) and 2: 706 & 922. 1971.

Additional citations: PERU: Junin: Hutchison & Tovar 4209 (N).

VERBENA WEBERBAUERI Hayek

Synonymy: Verbena weberbaueri "Hayek in Engl." ex Hocking, Excerpt. Bot. A.9: 367. 1965.

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 613, 615, & 622. 1960; Moldenke, Phytologia 14: 292 & 301. 1967; Moldenke, Fifth Summ. 1: 144 & 184 (1971) and 2: 706 & 922. 1971.

xVERBENA WINGEI Moldenke

Additional & emended bibliography: Cain, Found. Pl. Geogr., pr. 1, 335. 1944; Moldenke, Phytologia 13: 275—276. 1966; Khoshoo & Arora, Chromosoma 26: [259]—269, fig. 3 & 7—15. 1969; Khoshoo & Arora, Biol. Abstr. 50: 10213. 1969; Cain, Found. Pl. Geogr., pr. 2, 335. 1971; Moldenke, Fifth Summ. 1: 373 (1971) and 2: 652, 658, 699, 700, & 922. 1971; Moldenke, Phytologia 23: 427. 1972.

Illustrations: Khoshoo & Arora, Chromosoma 26: 261 & 263—265, fig. 3 & 7—15. 1969.

Khoshoo & Arora (1969) tell us that "Both 6x Verbena aubletia ($n = 15$) and 2x V. tenuisecta ($n = 5$) form bivalents during meiosis, however, their 4x$F_1$ hybrid (V. aubletia x V. tenuisecta) shows almost complete homoeologous pairing involving on [sic] average 19.74 out of its 20 chromosomes. In 10% cells there are 4IV + 2II indicating that essentially there may be 4 homoeologous sets of 5 chromosomes each in the $F_1$ hybrid. Evidently, V. aubletia is segmental allohexaploid involving 3 homoeologous genomes ($A_1A_1A_2A_2A_3A_3$). Whether its cytologically diploid behavior is the result of a multivalent suppressor system or due to an acute property of preferential pairing, cannot be answered with certainty. In either case intergenomal homologies are totally suppressed resulting in bivalent pairing, meiotic isolation of the 3 genomes and institution of normal fertility." Cain (1971) adds that "Certain species may differ by more than one character and still segregation of the factors are linked in chromosomes. Winge......obtained both parental forms of the cross between Tragopogon pratensis and T. porrifolius in the $F_2$ and subsequent generations. Also from Verbena tenera x V. Aubletia it was possible to segregate the parental species in pure form." My son, Dr. Andrew R. Moldenke, tells me that all this indicates that V. canadensis is hexaploid (the gamete $n = 15$, somatic cells $n = 30$), while V. tenuisecta is diploid (gamete $n = 5$, somatic cells $n = 10$) and the hybrid, xV. wingei, is octoploid (gamete $n = 20$, somatic cells $n = 40$), the base number (x) being 5, indicating their position in the subgenus Glandularia. At meiosis the hybrid is 4IV 2II; the fact that it isn't 5IV indicates that V. canadensis was a hybrid somewhere back in its evolutionary history between a diploid Glandularia $n = 5$(a') and an autopolyploid quadruploid Glandularia $n = 10$(a"). It also implies that V. tenuisecta is more closely related to (if not actually the same as) the original Glandularia parent of V. canadensis (a') than to the other parent (a"). This is extremely interesting since V. tenuisecta is regarded as now being native only in southern South America and V. canadensis in central North America.

VERBENA WRIGHTII A. Gray

Additional & emended bibliography: Whitehead, Torreya 33: 60. 1933; Wyman & Harris, Univ. N. M. Bull. 388 (Anthrop. Ser. 3, 5): [Navajo Ind. Ethnobot.] 20, 45, & 47. 1941; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, 725 & 727. 1960; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 612 & 613. 1960; Lewis & Oliv., Am. Journ. Bot. 48: [639]—641, fig. 5. 1961; Rattenbury, Madroño 16: 267. 1962; Turrill in Curtis, Bot. Mag. 174: pl. 409. 1963; Hocking, Excerpt. Bot. A.6: 91 (1963), A.9: 367 (1965), and A.12: 424. 1967; Moldenke, Phytologia 16: 214—215. 1968; Pace & Johnson, U. S. Dept. Agr. Forest Serv. Res. Paper RM.41: 18. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Rickett, Wild Fls. U. S. 3 (2): 362 & [363], pl. 110. 1969; Synge, Suppl. Dict. Gard. 548. 1969; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1317 & 1325. 1970; Rickett, Wild Fls. U. S. 4 (3): 539, [541], & 799, pl. 176. 1970; Mahler, Key Vasc. Pl. Black Gap, ed. 3, 71. 1971; Moldenke, Fifth Summ. 1: 44, 51, 54, 60, 62, 64, 77, 248, & 373 (1971) and 2: 653, 654, 690, 708, & 922. 1971; Moldenke, Phytologia 22: 461 (1971), 23: 228 (1972), and 24: 51. 1972.

Additional illustrations: Rickett, Wild Fls. U. S. 3 (2): [363], pl. 110 (in color) (1969) and 4 (3): [541], pl. 176 (in color). 1970.

The haploid chromosome number for this species is reported by Solbrig (1962) as 10, based on Solbrig 3187 from Pecos County, Texas. Lewis & Oliver (1961) also report the same number. The Rattenbury (1962) reference in the bibliography given above is often credited to Solbrig.

Vernacular names reported for the species are "Arizona verbena", "desert verbena", and "Wright verbena". The color plate given by Turrill (1962) as representing V. wrightii is very plainly misidentified; it certainly depicts V. elegans var. asperata Perry instead!

Rickett (1969) describes V. wrightii as follows: "V. wrightii may have erect stems, which are sparsely hairy. The leaves may have a short stalk. The calyx is densely glandular. It grows from central Texas to Arizona and Colorado." Recent collectors describe it as decumbent or erect, the stem branched at the base, 3—4.5 dm. tall, the leaves "somewhat coarse", the flowers showy when in bloom, the petals narrow. The corolla is described as "bluish-lavender" on Spellenberg & Spellenberg 2250 and as "bluish-pink" on Solbrig 3187.

Recent collectors have found this species growing in shallow soils with rock or gravel, in deep sand dominated by mesquite and grasses, in limestone loam or rocky limestone loam, in limestone gravel and sandy loam of Larrea flats, in grassy valleys under oaks, at the margins of tobosa flats, on open silty deserts, and among foothills. Cory reports it frequent on road shoulders in Jeff Davis County, Texas; Howell & McClintock (1960) state that it is "rare" in Arizona; Pace & Johnson (1968) record it from Gila

County, Arizona; while Stanford, Retherford, & Northcraft aver that it is "common" among Larrea, Acacia, and herbaceous weeds in playa valleys with considerable drainage from surrounding hills in Coahuila, but their no. 241 has much the general aspect of V. ambrosifolia Rydb., at least insofar as the University of Texas specimen of that number is concerned.

The Dominguez & McCart 8263, J. S. Martin 933, M. D. McCracken 25, Norland s.n. [21 Aug. 1959], B. Pittman 39, J. Reed 28, Reséndez 79, Scholl 11, Spellenberg & Todsen 2543, and Youngblood 21, distributed as V. wrightii, are all actually V. ambrosifolia Rydb.; W. W. Jones s.n. [22 June 1962] & s.n. [23 July 1962], E. L. Reed 3943, Reséndez 78, and Studhalter & Camp 1105 are V. bipinnatifida Nutt.; C. F. Harbison 41178, N. H. Holmgren 3308, D. F. Howe s.n. [24 April 1966], Keil, Pinkava, & Lehto 9334, and Letcher s.n. [San Bernardino, March 31, 1929] are V. gooddingii Briq.; and L. M. Andrews 259a is V. gooddingii var. nepetifolia Tidestr.

Additional citations: COLORADO: Archuleta Co.: Weber & Livingston 6258 (Se—144902). TEXAS: Brewster Co.: Kruckeberg 4739 (Se—208448); C. H. Mueller 8140 (Lk). Ector Co.: T. Collins 60 (Lk, Lk), 91, in part (Lk). Hudspeth Co.: T. Wells s.n. [26 April 1968] (Lk). Jeff Davis Co.: Cory 52025 (Mi, N); Moore & Moore 2 (Se—119542); Tharp & Janszen 49-1141 (N). Pecos Co.: Solbrig 3187 (W—2607470). Presidio Co.: Carroll 15 (Lk). Reeves Co.: Canales 39 (Lk); Cory 52259 (Mi); Nelson & Nelson 4983 (Se—118763). County undetermined: C. R. Orcutt 6.1080 [western Texas] (Sd—23464). NEW MEXICO: Bernalillo Co.: Atwood 2563 (N). Dona Ana Co.: Spellenberg & Spellenberg 2250 (N). Eddy Co.: Porter & Porter 8978 (Se—210173). Roosevelt Co.: J. S. Martin 881 (Se—107337). San Miguel Co.: Ferris 11498 (Se—194234). Socorro Co.: Baad 1348 (Se—236221). Valencia Co.: Baad 1106 (Se—235332). ARIZONA: Apache Co.: Kruckeberg 4609 (Se—208324). MEXICO: Coahuila: Johnston & Muller 186 (Au—301897), 580 (Au—301429), 1125 (Au—300985); Stanford, Retherford, & Northcraft 241 (Au—301094).

VERBENA WRIGHTII f. ALBIFLORA Moldenke

Synonymy: Verbena wrightii albiflora Moldenke ex Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970.

Additional bibliography: Moldenke, Phytologia 13: 276. 1966; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1317 & 1325. 1970; Moldenke, Fifth Summ. 1: 60 (1971) and 2: 706 & 922. 1971.

VERBENA XUTHA Lehm.

Additional & emended bibliography: A. Wood, Class-book, [ed.

42], pr. 1, 538 (1861), [ed. 42], pr. 2, 538 (1863), [ed. 42], pr. 3, 538 (1865), [ed. 42], pr. 4, 538 (1867), [ed. 42], pr. 5, 538 (1868), [ed. 42], pr. 6, 538 (1869), and [ed. 42], pr. 7, 538. 1870; A. Wood, Am. Bot. & Flor., ed. 1, pr. 1, 236 (1870) and ed. 1, pr. 2, 236. 1871; A. Wood, Class-book, [ed. 42], pr. 8, 538. 1872; A. Wood, Am. Bot. & Flor., ed. 1, pr. 3, 236 (1872), ed. 1, pr. 4, 236 (1873), ed. 1, pr. 5, 236 (1874), and ed. 1, pr. 6, 236. 1875; A. Wood, Class-book, [ed. 42], pr. 9, 538 (1876) and [ed. 42], pr. 10, 538. 1881; O. R. Willis in A. Wood, Am. Bot. & Flor., ed. 2, 236. 1889; Lowe, Miss. State Geol. Surv. Bull. 17: 236. 1921; Lewis & Oliv., Am. Journ. Bot. 48: [639]--641, fig. 24. 1961; Hocking, Excerpt. Bot. A.6: 91 (1963) and A.11: 503. 1967; Rickett, Wild Fls. U. S. 2 (2): 464, [465], & 686, pl. 171. 1967; Hocking, Excerpt. Bot. A.13: 571. 1968; Hocking, Pharm. Abstr. 9 (2): entry 656. 1968; Moldenke, Biol. Abstr. 49: 5713. 1968; Moldenke, Phytologia 16: 215. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 717. 1969; Rickett, Wild Fls. U. S. 3 (2): 365, [367], & 551, pl. 111. 1969; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1877. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1315 & 1320. 1970; Moldenke, Fifth Summ. 1: 32, 33, 48, 49, 60, 64, & 373 (1971) and 2: 657, 680, 682, 698, 706--708, & 922. 1971; Moldenke, Phytologia 23: 242, 265, & 376. 1972.

Additional & emended illustrations: Rickett, Wild Fls. U. S. 2 (2): [465], pl. 171 (in color) (1971) and 3 (2): [367], pl. 111 (in color). 1969.

Recent collectors refer to this plant as a coarse annual to 12 dm. tall and have found it growing on low coastal prairies and on low marl and gypsum ridges, as well as on riverbanks, sometimes along with scattered Acacia farnesiana. Mears states that it is "not very common in a pasture with a lake" in Harris County, Texas, while Cory reports it "occasional in sandy fields" in Galveston County and "occasional in dense herbaceous vegetation in sand along roadsides" in Jefferson County of the same state. Lowe reports it from "Waste places, especially near the coast" in Harrison, Hinds, and Lafayette Counties, Mississippi. The corolla is described as having been "lavender" on D. S. Correll 35266, C. L. Lundell 11921 & 14135, and Lundell & Lundell 13107. Lewis & Oliver (1961) report the diploid chromosome number as 42 for this species.

Rickett (1969) describes V. xutha as having "bristly-hairy stems 2--4 feet tall. The leaves are generally three-lobed and coarsely toothed, hairy on the under side. The bracts are commonly a bit shorter than the calyx, which is about 1/6 inch long. The corolla is about as long, from deep blue to purple, and up to 1/3 inch across. March to October: in dry sandy soil on beaches, prairies, and roadsides and in fields through eastern, southern, and western Texas, and eastward to Alabama."

The Mears 546, distributed as V. xutha, is actually V. brasiliensis Vell.; Fleetwood 9010, E. G. Marsh 1625, and R. Runyon

2181 are V. halei Small; E. L. Greene s.n. [Pinos Altos Mtns., August 23, 1880] & s.n. [August 1, 1880] and C. H. Mueller 8138 are V. neomexicana (A. Gray) Small; S. S. White 3099 is V. neomexicana var. xylopoda Perry; E. G. Marsh 859 is V. perennis Wooton; R. Runyon 4871 is V. runyoni Moldenke; and B. J. Turner s.n. [Summer 1939-40] is V. stricta Vent.

Additional citations: ARKANSAS: Sevier Co.: Demaree 58093 (Ac). LOUISIANA: East Carroll Par.: Thomas, Thomas, Thomas, & Thomas 3347 (N). Plaquemines Par.: Langlois 612 (Pa). TEXAS: Brazoria Co.: Fleetwood 9360 (Ld). Brazos Co.: H. B. Parks s.n. [June 23, 1946] (Se—119421). Galveston Co.: Cory 51020 (Mi). Harris Co.: Boon 291 (Au—211303); E. Hall 434 (Pa); Joor s.n. [Harrisburg, June 12, 1875] (Pa), s.n. [Aug. 26, 1876] (W—2607109); Lundell & Lundell 13107 (N); Mears 549 (Au—249630). Jefferson Co.: Cory 50962 (Mi), 50968 (Mi); C. L. Lundell 14135 (N). San Jacinto Co.: D. S. Correll 35266 (Ld). Travis Co.: C. L. Lundell 11921 (N).

- - - - - - - - - - - - - - - -

## BOOK REVIEWS

Alma L. Moldenke

"PROBING PLANT STRUCTURE - A Scanning Electron Microscope Study of Some Anatomical Features in Plants and the Relationship of These Structures to Physiological Processes" by John Troughton & Lesley A. Donaldson, 116 pp., illus., McGraw-Hill Book Co., St. Louis, San Francisco, New York, New York 10036. 1972. $4.95 paper-back.

This beautifully effective picture-book with pertinent legends comes from scientists and equipment of the Department of Scientific and Industrial Research in New Zealand. The 105 large plates show leaf surfaces, stomata, leaf interiors, chloroplasts, xylem, apical meristem, flowers and their parts, fertilization and seed development, and seeds.

"The book concerns some aspects of three basic processes in plants: carbon dioxide uptake [and metabolism of the $C_3$, $C_4$, and crassalacean acid types], water transport and reproduction. It is intended that this book should be used to complement existing textbooks but at the same time it will be useful for practical classes in biology where the photographs will assist in the interpretation and understanding of fresh material or slides." Many others could enjoy and profit from this book, too.

"ECOLOGY POLLUTION ENVIRONMENT" by Amos Turk, Jonathan Turk & Janet T. Wittes, ix & 217 pp., illus., W. B. Saunders Co., London WCIA IDB, Toronto & Philadelphia, Pennsylvania 19105. 1972. Paperback.

Serving well as a text for a course in environmental science, as supplementary reading for a standard course in biology and/or chemistry, and as special reading for the concerned public, this book covers the following topics: introduction to ecology, agricultural environments, pesticides, radioactive wastes, air pollution, water pollution, solid wastes, growth of human populations, thermal pollution, and noise. Each chapter carefully analyzes the problems involved and has its own annotated bibliography. There is an appendix with the metric system, chemical symbols and equations, and a table of relative atomic weights, and there is an index.

The scientific material seems to be accurately and effectively demonstrated by word and illustration; the social discussions of problems and issues seem valid and logical. The authors claim that "Our purpose is not to provide answers, but to show how various scientific and economic factors must be taken into account so that the final judgments do not lead to unwarranted results." That's fine!

The fly-sheet claims that "It is estimated that the Printing of this Book on 100 PER CENT Recycled Paper has saved 136 Trees".

"MICROBIOLOGY", 3rd Edition, by Michael J. Pelczar, Jr., & Roger D. Reid, 948 pp., illus., McGraw-Hill Book Co., New York, N. Y. 10020. 1972. $12.95.

The first two editions of this book were (and are still) widely and appreciatively used as general college texts in this field. Since the present new edition has been refreshed and improved, it should meet with continued and additional acceptance. The main topics covered are: introduction to microbiology, characteristics of bacteria, microorganisms other than bacteria, control of microorganisms, microorganisms and disease, and applied microbiology. Each chapter has its own list of references. Appendix A has a modern outline classification of microorganisms. Appendix B gives characteristics of some genera of microorganisms. Appendix C is an intelligible glossary. There are separate indexed of persons, of organisms and of subjects. The illustrations are attractive and effective in learning.

In the preface to this edition the authors state that there has been "a complete rewriting and enlarging of many chapters, including those dealing with molds, yeasts, algae and viruses.

"The presentation of metabolic processes has been rearranged around two major themes, i.e., energy production and energy utilization. The chapter on genetics has been completely redone to incorporate the most recent conceps." Revisions have elaborated on the ecological role of microbes "in recycling elements to and from plant and animal life in aquatic, atmospheric, and soil environments". The second sentence in this preface used "most unique".

"DESIGN WITH NATURE" by Ian L. McHarg, ix & 198 pp., illus., published for the American Museum of Natural History by the Natural History Press, Garden City, New York 11530. 1969. $19.95.

This thoughtful and thought-provoking book was written with a grant from The Conservation Foundation of Washington, D. C. Lewis Mumford, to whom it is dedicated and who wrote the introduction, evaluates "Design with Nature" as a "notable addition to a handful of important texts that begin, at least in Western tradition, with Hippocrates' famous medical work on Airs, Waters and Places..

"Ian McHarg, while trained professionally as a town planner and a landscape architect, might better be described as an inspired ecologist......

"He demonstrates, by taking difficult concrete examples, how this new knowledge may and must be applied to actual environments, to caring for natural areas [Blue Ridge mountain area, Staten Island, New Jersey shore] like swamps, lakes and rivers, to choosing sites for further urban settlements, to reestablishing human norms and life-furthering objectives in metropolitan conurbations [Philadelphia, Washington, D.C.]....

"In establishing the necessity for conscious intention, for ethical evaluation, for orderly organization, for deliberate esthetic expression in handling every part of the environment, Mc Harg's emphasis is not on either design or nature itself, but upon the preposition WITH, which implies human cooperation and biological partnership......

"McHarg revives the hope for a better world."

These quotes indicate the reviewer's wholehearted agreement.

"BIOLOGICAL SYSTEMS - A Laboratory Manual", 3rd edition, by Shelby D. Gerking, x & 135 pp., illus., Burgess Publishing Co., Minneapolis, Minnesota 55415. 1971. $3.95.

This is a typical laboratory manual planned for a semester course for non-science majors neither better nor worse than most. It was designed to accompany the author's text "Biological Systems" published by Saunders of Philadelphia in 1969. It can be adapted to accompany several other similar texts.

An infinitive got split in the acknowledgements.

"THE MOTH BOOK - A Popular Guide to Knowkedge of the Moths of North America" by W. J. Holland, xxiv & 479 pp., illus., Dover Publications, Inc., New York, N. Y. 10014. 1968. $5.00. paper-back.

This is an unabridged republication of the work originally published by Doubleday, Page and Company in 1903. For years since then it has been too limitedly available and has not yet been replaced by an up-to-date treatment. This new edition has the color plates, drawings and text quite well reproduced. There is an additional foreword by A. E. Brower as well as footnotes correcting a few errors and taxonomy. This edition is much more "portable" for field work by scientist, student and amateur.

"POPULATION, RESOURCES, ENVIRONMENT - Issues in Human Ecology", 2nd edition, by Paul R. and Anne H. Ehrlich, xiv & 509 pp., illus., W. H. Freeman & Co., San Francisco, California 94104. 1972. $9.50.

The two year old first edition of this book was heartily welcomed by the editors and publishers of this journal because of the informative source material and logic brought to bear on the problems of human ecology.

In this new edition "the statistics have been updated throughout and substantial additions and revisions have been made in most sections. Entirely new sections have been added on many topics, including forest resources, net reproductive rates and zero population growth, the impact of population growth upon the environment, heavy metals pollution, ecocide in Indochina, and Thomas Malthus. The material dealing with energy, weather, pesticides, integrated control, the Green Revolution, novel foods, radiation hazards, air pollution, crowding, birth control, population policies, abortion, and other major topics have been considerably reworked or expanded. In response to requests for more thorough documentation, the annotated bibliographies have been greatly enlarged."

Any course or any intelligent private reading dealing in any way with human ecology should certainly use this book as its main text and/or source book.

"CAROTENOIDS" edited by Otto Isler, 932 pp., illus., Birkhauser Verlag in Basel & Stuttgart or Halsted Press of John Wiley & Sons, New York, N. Y. 10016. 1971. 118 Swiss Fr. $39.50.

This is a most carefully detailed study by 17 workers on the chemical and biochemical findings from 1950 to mid-1970 about these important widespread yellow and red pigments common throughout plants (often campuflaged by chlorophyll) and also occasional in some birds, insects and other animals. The topics covered, after an introduction by the editor, are: occurrence, isolation and reactions, spectroscopic methods, stereochemistry, total syntheses, biosynthesis, metabolism, function, vitamin A, use of carotenoids, and lists of natural carotenoids with their formulae and literature references.

The two main established functions of carotenoid pigments are "that they act as protective agents to prevent cells from undergoing damage due to a photodynamic action and.....that they act as accessory pigments in photosynthetic organisms, transferring radiant energy to the actual pigments involved in photosynthesis."

This book has many other advantages: clear and clean type, carefully written texts, each with its own bibliography, an appendix with the new tentative rules for the nomenclature of carotenoids, an author index, a subject index, and some excellent color plates of organisms displaying these chemicals. The F. Hoffman-La Roche Company provided funds for publication, the editor and some of the authors. This excellent book will serve as a storehouse of information and source material for scientists and students in this and related fields.

"THE GILLED MUSHROOMS (Agaricaceae) of Michigan and the Great Lakes Region" Volumes I & II by C. H. Kauffman, xxxii & xi & 924 pp., illus., Dover Publications, Inc., New York, N. Y. 10014. 1971. $4.50 per volume in paper-back.

This is an unabridged, but effectively rearranged, replication of the original "The Agaricaceae of Michigan" for the Michigan Geological and Biological Survey in the Biological Series 5, Publication 26 of 1918. Instead of having all text in one volume and all 172 plates in the other, this Dover edition has the text divided equally and combined with the pertinent (and quite well reproduced) plates, allowing for greater facility in handling. Of course, the nomenclature is not modernized. More than 875 species and varieties are carefully treated according to these topics: habitat, habit, odor, taste, edibility, pileus, gills, stem, mycelium, veils, volva, annulus, spores and cystidia.

Since so many of these agarics have a very wide geographic distribution, this book can and has been used by many mycologists, botany students, ecologists, and general as well as specialized naturalists. Now it is readily available again at a reasonable price.

"CYTOGENETICS: An Introduction" by E. D. Garber, xii & 259 pp., McGraw-Hill Book Co., New York, N. Y. 10020. 1972. $7.50 hard cover, $5.50 soft cover.

Planned as a text for this topic on the graduate or undergraduate level or as a supplement for similar level genetics courses, this small book has much clearly explained material included. The chapters are entitled: (1) introduction, (2) mitosis, meiosis and fertilization, (3) unusual chromosomes, (4) intrachromosomal structural aberrations, (5) interchromosomal structural aberrations, (6) aneuploidy, (7) euploidy, (8) mammalian cytogenetics, and (9) cytogenetics and speciation. Each chapter has its own bibliography. The book has a good glossary and index.

Studies from a wide range of living organisms are used. "The successful application of cytogenetic principles to the interpretation of genetic data from microbial species is a tribute to the cytogeneticists who accumulated the evidence for these principles during the long years in hot fields and humid greenhouses, in rooms filled with teeming pint bottles, or among endless cages."

"INTEGRATED EXPERIMENTAL ECOLOGY - Methods and Results of Ecosystem Research in the German Solling Project" edited by H. Ellenberg for Ecological Studies 2, xx & 214 pp., illus., Springer Verlag, Heidelberg, Berlin & New York, N. Y. 10010. 1971. $16.80.

"Under the direction of Prof. Ellenberg, one of the pilot projects of the International Biological Program has been begun in the Solling, a forest and grassland area near Göttingen, West Germany. Here scientists representing a variety of disciplines — meteorology, soil science, hydrology, botany, zoology, microbiology, agriculture and forestry — got together to ascertain the practical possibilities of the analysis of ecosystems. The research, which began in 1966, is still going on."

After the editor's introductory remarks about ecology, I B P, ecosystems, and the research set-up, the book is divided into four parts. Part 1 deals with primary production with 12 pertinent papers; Part 2 considers secondary production through 6 papers; Part 3 considers environmental conditions with 7 papers; and Part 4 evaluates the range of validity of the results with one paper on the forest research area and another on grassland mapping.

This second volume continues the high quality level of the first volume.

"FLORA NEOTROPICA - Monograph 9 - CHRYSOBALANACEAE" by Gillian T. Prance, 410 pp., illus., Hafner Publishing Co., New York, N. Y. 10022. $26.50 paperbound.

The author has only recently completed his world-wide survey of this family, closely related to the Rosaceae, at the generic level (in press) and reports that about 65 percent of the species are neotropical and that he has studied 92 of these in the field.

This work continues the format and high quality of the previous monographs in this series. The descriptions seem to be precise and the illustrations clearly detailed.

"THE PROCESS OF BIOLOGY: PRIMARY SOURCES" edited by Jeffrey J. W. Baker & Garland E. Allen, viii & 380 pp., illus., Addison-Wesley Publishing Co., Reading, Massachusetts, Menlo Park, California, Don Mills, Ontario, & London. 1970. Paperback.

This book consists of 30 full or abridged papers organized under six topics, each with short introductions by the editors, and each following the order of their text "The Story of Biology".

"One of the most exciting aspects of studying any science is to follow the thought processes of its great investigators...The [original] papers provide a means of analyzing the hypothesis (or hypotheses) which a worker has developed, the experiments which have been designed to test the hypothesis, and the way in which conclusions have been drawn from specific data." Only if used very effectively as a teaching device could students achieve the editors' hopes; otherwise this is just more reading matter that may be skimmed over carelessly.

Important papers are included, but almost nothing from the field of botany. An infinitive is split on p. v anf the word "held" is repeated on p. 335.

"ISLAND LIFE - A Natural History of the Islands of the World" by Sherman Carlquist, viii & 451 pp., illus., Doubleday/Natural History Press, Garden City, New York 11530. 1965. $10.95.

Since this interesting, excellent, and well illustrated book appeared seven years ago, it is too late for reviewing now except to mention its continued worth.

"THE ARENA OF LIFE - The Dynamics of Ecology" by Lorus & Margery Milne, 352 pp., illus., Doubleday/Natural History Press, Garden City, New York 11530. 1971. $15.00.

This well known team of authors — teachers — world traveling naturalists -- and therefore well oriented ecologists, have recently added this excellent book to their long list of accomplishments. Inviting and clear-cut text, copious and attractive photographs and diagrams, well chosen bibliography arranged by chapter topics, helpful glossary and index are its important ingredients. In legends on pages 121 and 258 "reedbuck" and "acacia" are misspelled, — unexpected slips for a Chanticleer Press Edition.

"Mankind belongs to the world, and can have a future only as a cooperating part of its ecology.

"The maintenance of a suitable environment for life depends on a chain of energy and on balances in nature that have taken billions of years to evolve. To understand the ecological principles in this system we have investigated the ways in which plants and animals meet the challenges in the oceans, in fresh waters and the soil, in rain forests, in grasslands where drought is seasonal, in deserts, at high elevations and high latitudes where intense cold prevails. In all of these situations we have looked for ways in which mankind might quickly minimize the impact of technology upon the environment. To keep man's options open, a prompt change from past procedures seems essential."

"ENERGY AND POWER - A SCIENTIFIC AMERICAN Book" edited by Dennis Flanagan et al., vii & 144 pp., illus., W. H. Freeman & Co., San Francisco, California 94104. 1971. $6.50 clothbound, $3.25 paperbound.

All the chapters in this book were first published as the September 1971 issue of "Scientific American" as one of its single topic issues. The usual notes about the authors and the bibliographies have been included; an index has been added. Throughout there are over one hundred illustrations with most of them in color.

The topics - all by different authors - covered are: (1) role of energy in human life from ancient times to present and future ones with their expanding needs and concomitant pollution problems, (2) the earthly energy flows as part of the universe's flows, (3) earth's resources from the sun, tides, radiant heat, fission and fusion fuel, (4) small amount of solar energy used by green plants yet maintaining all living matter, (5) energy flow in a hunting society on Baffin Island, (6) energy flow in an agricultural society in New Guinea, (7) energy flow in our United States industrial society where 6 percent of the world's population uses 35 percent of the world's energy, (8) conversion of energy through all kinds of devices, (9) economic geography of energy and concomitant interacting networks, (10) energy and information which are today interwoven through thermodynamic availability, and (11) decision-making in the production of power, engaging all the institutions of society in various debatable possible procedures.

If only enough folks who make the decisions re energy and power for our civilizations could have this information patterned into their brain cells!

"WORLD POLLEN FLORA: Volume 3, BATIDACEAE" by B. Prijanto, edited by G. Erdtman, 11 pp., illus., Hafner Publishing Co., New York, N. Y. 10003. 1970. Paperback

Batis maritima L. and B. argillicola van Royen of Queensland, New Guinea, tropical America and some tropical Pacific islands are the only known representatives of this family which shares some characteristics with the Gyrostemonaceae. The pollen grains of each species are described and pictured in electron micrographs.

This careful work serves as a suitable memorial to the young author-scientist who died shortly after completing this study.

# PHYTOLOGIA

*Designed to expedite botanical publication*

Vol. 24 November, 1972 No. 4

CONTENTS



Published by Harold N. Moldenke and Alma L. Moldenke

303 Parkside Road
Plainfield, New Jersey 07060
U.S.A.

Price of this number, $1.50; per volume, $8 in advance, or $8.50 at close of volume, 50 cents extra to foreign addresses

STUDIES IN THE EUPATORIEAE (ASTERACEAE). XCIX.

A NEW GENUS, *AMOLINIA*, AND A NEW

COMBINATION IN *BARTLETTINA*.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

The *Hebeclinium* complex is well represented in Mexico and Central America by such genera as *Hebeclinium*, *Bartlettina*, *Decachaeta* and *Erythradenia*. The complex is highly varied and its genera are best recognized individually by their own distinctive features, but a few general traits appear in most species, long petioles on the leaves, prominently hairy receptacles, and rather elongate anther collars with many essentially inornate quadrate cells. Such a combination of features occurs in a very distinctive species in Guatemala and southern Mexico for which we describe here the new genus *Amolinia*.

The genus *Amolinia* has anther appendages usually longer than wide and is most notably distinct in the phyllaries which are eximbricate and subequal. Individual phyllaries are long and narrow with margins recurved at maturity. Most other members of the complex have subimbricate multiseriate unequal phyllaries. The closest relative of *Amolinia* is undoubtedly *Bartlettina* which has the same form of broadly convex usually hairy receptacle and which shows the same alternately flattened nodes in some species. Actually, early authors first determined *A. heydeana* as *Eupatorium ehrenbergii* Hemsl., a species of *Bartlettina*. Still, *Amolinia* differs by not only the phyllary structure but by the reduced carpopodium that shows nothing of the expanded upper part characteristic of *Bartlettina*.

*Amolinia* R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae frutescentes vel arborescentes erectae usque ad 5 m alti pauce ramosae. Caules dense velutini ad nodis aliquantum complanati. Folia opposita longe petiolata, laminis ovatis sensim acuminatis integris base rotundatis utrinque puberulis subtus in nervis et nervulis velutinis. Inflorescentiae corymboso-paniculatae, pedicellis velutinis saepe minute bracteoliferis. Involucri squamae ca. 15

2-3-seriatae aliquantum inaequilongae plerumque lineares acutae extus dense puberulae margine distincte revolutae. Flores 20-25 in capitulo; corollae anguste infundibulares, lobis aequilateraliter triangularibus laevibus extus pauce glanduliferis; filamenta antherarum in parte superiore plerumque elongata, cellulis numerosis subquadratis superioribus longioribus, parietibus vix annulate ornatis; thecae base rotundatae, cellulis exothecialibus subquadratis, appendices 1-1¼ longiores quam latiores; styli inferne non incrassati glabri, appendicibus linearibus vix papillosis vel subglabris; achaenia prismatica elongata 5-costata dense glandulifera; carpopodia perbrevia vix prominula, cellulis basilaribus minutis multiseriatis, parietibus tenuibus plerumque collabentibus; pappus setiformis uniseriatus, setis ca. 30 scabris superne vix dilatatae, cellulis apicalibus anguste obtusis vel acutis.

Species typica: Eupatorium heydeanum B.L.Robinson

The genus is monotypic.

Amolinia heydeana (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium heydeanum B.L.Robinson, Proc. Amer. Acad. 35: 335. 1900. Mexico,

The need to correct the combination of Bartlettina ehrenbergii (Hemsl.) R.M.King & H.Robinson was called to our attention many months ago by the late C.V.Morton. The name ehrenbergii which is the valad name in Eupatorium is not the earliest name for the species.

Bartlettina macrocephala (Benth.) R.M.King & H.Robinson, comb. nov. Hebeclinium macrocephalum Benth., Pl. Hartw. 42. 1840.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). C.

## A KEY TO THE GENERA OF NUEVA GALICIA, MEXICO.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

Dr. Rogers McVaugh of the University of Michigan, who is preparing a flora of the Nueva Galicia area in Western Mexico, has been kind enough to send a list of the eupatorian species found in the area of his flora. This list was requested to provide a basis for a limited test of our efforts to revise the generic limits of the Eupatorieae. More recently Dr. McVaugh has published his "Pugilis" on the Mexican Flora (1972) where he in his own way has strived for workable concepts in various groups of the Asteraceae. The present paper summarizes our own generic concepts of the Eupatorieae for Nueva Galicia.

The following key to genera relies on obvious characters where possible without fragmenting genera. In a few cases, the key is simplified to take advantage of the limited flora of the area. The key includes only the typical subgenus of Neomirandea, only alternate leaved species of Decachaeta, and only the species of Koanophyllon with a long setose pappus. Due to the emphasis on obvious characters there is little significance to the order of genera in the key. The list of genera following the key is alphebetical. Actual relationships of the genera are discussed in other papers dealing with individual genera.

Two genera are presented in the key that were not included in the McVaugh list. The relationship of Isocarpha to the Ayapana series of the Eupatorieae is covered in our paper on the latter genus (King & Robinson, 1970). We also agree with Rzedowski (1970) regarding the eupatorian nature of Microspermum, though we do not consider the genus in any way close to the Heliantheae.

Map showing the region of Nueva Galicia in Mexico.

1. Individual heads with 1 or rarely 2 flowers

2. Pappus of broad scales, achenes constricted above
Mexianthus

2. Pappus setose, achene not strongly constricted above Neohintonia

1. Individual heads with 3 or more flowers.

3. Inflorescence of large single heads on long scapes, scapes arising from subverticillate clusters of leaves. Hofmeisteria

3. Inflorescence usually branched, not arising from subverticillate clusters of leaves.

4. Minute annual herbs up to 4 cm tall; corollas with 4 lobes and 4 stamens. Piqueriopsis

4. Plants over 1 dm tall; corollas with 5 lobes and 5 stamens.

5. Style branches with stigmatic lines closely paired or fused along inner surface.
Carphochaete

5. Style branches with stigmatic lines widely separated on lateral margins.

6. Heads with 3-5 phyllaries and usually equal number of flowers.

7. Anther appendages minute to lacking; filaments of anthers with hairs or papillae; walls of achenes with sparse punctations internally.
Piqueria

7. Anther appendages distinct, as long as wide or longer; filaments of anthers without hairs or papillae; walls of achenes densely minutely punctate.

8. Plants scandent; heads with 4 flowers and 4 principle phyllaries; corollas glabrous inside, lobes smooth. Mikania

8. Plants erect herbs or subshrubs; heads with 5 flowers and 5 equal phyllaries; corollas with hairs inside, lobes papillose inside.
Stevia

6. Heads with more than 5 phyllaries.

9. Pappus of chaffy scales or short setae or lacking.

10. Heads with outer-most flowers bearing expanded outer lobes, forming rays. Microspermum

10. Heads without ray flowers.

11. Leaves sessile and auriculate at base; carpopodium with basal row of cells distinctly larger than upper cells. Trichocoronis

11. Leaves narrow or petiolate at base; carpopodium without row of larger thick-walled cells at base.

12. Anther appendages short, much wider than long.

13. Leaves alternate; style branches linear; with ca. 7-8 flowers and phyllaries. Erythradenia

13. Leaves opposite; style branches very broadly clavate; with 50 or more flowers, 30 or more phyllaries. Gymnocoronis

12. Anther appendages as long as wide or longer.

14. Receptacle conical; leaves with glandular punctations on or sunken into surface.

15. Style base distinctly enlarged; style branches laxly papillose with large papillae. Isocarpha

15. Style base not enlarged; style branches densely and evenly papillose. Ageratum

14. Receptacle convex; leaves without glandular punctations on surface.

16. Heads with 11-25 flowers; receptacles with paleae; style usually slightly enlarged at base. Jaliscoa

16. Heads with 40-50 flowers; receptacles without paleae; style not enlarged at base. Alomia

9. Pappus of 5 or more long slender setae over half as long as the corolla, sometimes plumose.

17. Style bases covered with numerous hairs.

18. Achenes with 10 ribs. Brickellia

18. Achenes with 5 ribs.

19. Leaves with prickles on tips of lobes; corolla lobes and style branches smooth. Barrotea

19. Leaves without prickles on tips of lobes; corolla lobes and style branches covered with small papillae. Phanerostyles

17. Style bases glabrous.

20. Pappus setae plumose. Carminatia

20. Pappus setae not plumose.

21. Anther appendage short, wider than long.

22. Leaves alternate, receptacle hairy. Decachaeta

22. Leaves opposite, receptacle without hairs.

23. Heads with 150 or more flowers, with paleae. Eupatoriastrum

23. Heads with 50 flowers or less, without paleae. Koanophyllon

21. Anther appendage about as long as wide or longer.

24. Phyllaries not spreading when mature, all phyllaries deciduous with age. Chromolaena

24. Phyllaries spreading at maturity, at least outer phyllaries persistent.

25. Corolla lobes papillose on inner surface.

26. Stems with leaves absent at anthesis. Pachythamnus

26. Stems with leaves present at anthesis.

27. Corolla lobes longer than wide, smooth on back; style base usually swollen; cells of anther collars without distinct annular thickenings in walls; pappus setae often easily deciduous.

28. Achenes without distinct carpopodium. Piptothrix

28. Achenes with distinct carpopodium of sclerotized cells. Ageratina

27. Corolla lobes not longer than wide, strongly papillose on back, style base not swollen, cells of anther collars with distinct annular thickenings in walls; pappus setae not normally deciduous.

29. Receptacle conical; apical cells of pappus setae blunt; carpopodium indistinct. Conoclinium

29. Receptacle flat or slightly convex; apical cells of pappus setae acute; carpopodium very distinct. Fleischmannia

25. Corolla lobes smooth on inner surface.

30. Style base much enlarged.

31. Terrestrial shrubs; corollas glabrous on inner surface. Piptothrix

31. Epiphytic or climbing rather succulent plants; corollas with hairs on inner surface. Neomirandea

30. Style base not enlarged.

32. Achenes densely covered with long-stalked glandular hairs. Dyscritogyne

32. Achenes with non glandular hairs or short glandular punctations, sometimes glabrous.

33. Corollas with glandular punctations or hairs on outer surface.

34. Leaf bases cordate; heads with 10-16 flowers; corollas tubular; corollas with only glands externally. Kyrsteniopsis

34. Leaf bases rounded to cuneate; heads with 20-150 flowers; corollas narrowly funnelform; corollas often with hairs on lobes. Bartlettina

33. Corollas without glandular punctations or hairs on the outer surface.

35. Achenes with 5 ribs; moist leaves with lacticifers evident in areoles as pellucid spots; shrubs or small trees. Critonia

35. Achenes with 6-10 ribs; leaves without lacticifers in areoles; sparsely branched herbs or subshrubs.

36. Leaves sessile, linear or squamulose; phyllaries in 4 or more series. Asanthus

36. Leaves petiolate, ovate to lanceolate; phyllaries in 2-3 series. Steviopsis

The following list of the genera of Eupatorieae of Nueva Galicia includes citation of significant recent literature. The species given under each genus include all those cited from Nueva Galicia by McVaugh in his letter.

Ageratella A.Gray ex S.Watson, Proc. Amer. Acad. 22: 419. 1887. The following 1 species occurs in Nueva Galicia: A. microphylla (Schultz-Bip.) A.Gray.

Ageratina Spach, Hist. Veg. Phan. 10: 286. 1841. Grashoff, J.L. & J.H.Beaman. 1969. Studies in Eupatorium (Compositae), 1. Revision of Eupatorium bellidifolium and allied species. Rhodora 71: 566-576. King, R.M. & H.Robinson. 1970. Studies in the Eupatorieae (Compositae). IXX. New combinations in Ageratina. Phytologia 19: 208-229. King, R.M. & H.Robinson. 1972. Studies in the Eupatorieae (Asteraceae). LXXXV. Additions to the genus Ageratina with a key to the Costa Rican species. Phytologia 24(2): 79-104. McVaugh, R. 1972. Compositarum Mexicanarum Pugillus. Contr. Univ. Mich. Herb. 9(4): 359-484. The following 38 species occur in Nueva Galicia: A. adenophora (Spreng.) K. & R., A. arsenei (B.L.Robinson) K. & R., A. aschenborniana (Schauer) K. & R., A. bellidifolia (Benth.) K. & R., A. blepharilepis (Schultz-Bip.) K. & R., A. brevipes (DC.) K. & R., A. calaminthifolia

(H.B.K.) K. & R., A. calophylla (B.L.Robinson) K. & R., A. campyloclada (B.L.Robinson) K.& R., A. cardiophylla (B.L.Robinson) K. & R., A. cerifera (McVaugh) K. & R., A. chiapensis (B.L.Robinson) K.& R., A. choricephala (B.L.Robinson) K. & R., A. crenaea (B.L.Robinson) K. & R., A. cylindrica (McVaugh) K. & R., A. dolichobasis (McVaugh) K. & R., A. espinosarum (A.Gray) K. & R., A. geminata (McVaugh) K. & R., A. halbertiana (McVaugh) K. & R., A. lasioneura (Hook. & Arn.) K. & R., A. lemmonii (B.L.Robinson) K. & R., A. leptodictyon (A.Gray) K. & R., A. mairetiana (D.C.) K. & R., A. malacolepis (B.L.Robinson) K. & R., A. muelleri (Schultz-Bip. ex Klatt) K. & R., A. pazcuarensis(H.B.K.) K. & R., A. petiolaris (Moc. & Sesse ex D.C.) K. & R., A. prunellifolia (H.B.K.) K. & R., A. purpursii(T.Brand.) K. & R., A. rhomboidea (H.B.K) K. & R., A. rubricaulis (H.B.K.) K. & R., A. schaffneri (Schultz-Bip. ex B.L. Robinson) K. & R., A. scorodonioides (A.Gray) K. & R., A. subintegra (E.L.Greene) K. & R., A. thyrsiflora (E.L.Greene) K. & R., A. triniona (McVaugh) K. & R., A. viscosissima(Rolfe) K. & R., A. wrightii (A.Gray) K. & R.

Ageratum L. , Sp. Pl. 2: 838. 1753. Johnson, M.F. 1971. A monograph of the genus Ageratum L. (Compositae-Eupatorieae). Ann. Missouri Bot. Gard. 58(1): 6-88. King, R.M. & H.Robinson 1972. Studies in the Eupatorieae (Asteraceae). LXXXVIII. Additions to the genus, Ageratum. Phytologia 24(2): 112-117. The following 7 species occur in Nueva Galicia: A. conyzoides L., A. corymbosum Zuccag. ex Pers., A. echioides (Less.) Hemsl., A. houstonianum Miller, A. lucidum B.L.Robinson, A. paleaceum (DC.) Hemsl., A. platypodium B.L.Robinson.

Alomia H.B.K., Nov. Gen. et Sp. 4: 151. 1820. King, R.M. & H.Robinson 1972. Studies in the Eupatorieae (Asteraceae). LXXXVII. The genus, Alomia. Phytologia 24(2): 108-111. The following species occurs in Nueva Galicia: A. callosa (Watson) B.L.Robinson.

Asanthus R.M.King & H.Robinson, Phytologia 24: 66. 1972. King, R.M. & H.Robinson 1972. Studies in the Eupatorieae (Asteraceae). LXXIX. A new genus, Asanthus. Phytologia 24(2): 65-66. The following species occurs in Nueva Galicia: A. thrysiflorus (A.Gray)K. & R.

Barroetea A.Gray, Proc. Amer. Acad. 15: 29. 1880. The following species occurs in Nueva Galicia: B. subuligera A.Gray

Bartlettina R.M.King & H.Robinson. Phytologia 22(3): 160. 1971. King, R.M. & H.Robinson 1971. Studies in the Eupatorieae (Asteraceae). XXXVI. A new genus, Neobartlettia. Phytologia 21(5): 294-297. King, R.M & H.Robinson 1971 . Studies in the Eupatorieae (Asteraceae) LXI. Additions to the Hebeclinium complex with Bartlettina, a new generic name. Phytologia 22(3):160-162. The following species occurs in Nueva Galicia: B. oresbia (B.L.Robinson) K. & R.

Brickellia S. Ellioitt, Sketch Bot. S. Car. and Ga. 2: 290. 1822 ? ("1824"). The following 23 species occur in Nueva Galicia: B. cardiophylla B.L.Robinson, B. corymbosa (DC.) A.Gray, B.coulteri A. Gray, B. cuspidata A.Gray, B. diffusa (Vahl) A.Gray, B. extranea McVaugh, B.filipes B.L.Robinson, B. glandulosa (Llave) McVaugh, B. glomerata Fernald, B. jaliscensis McVaugh, B. lanata (DC.) A.Gray, B. magnifica McVaugh, B. monocephala B.L.Robinson, B. oliganthes (Less.) A.Gray, B. paniculata (Miller) B.L.Robinson, B. schaffneri (A.Gray) Shinners, B. scoparia (DC.) A.Gray, B. secundiflora (Lag.) A.Gray, B. seemannii A.Gray, B. spinulosa A.Gray, B. squarrosa (Cav.) B.L.Robinson, B. verbenacea (Greene) B.L.Robinson, B. veronicaefolia (H.B.K.) A.Gray.

Carminatia Mocino ex DC. Prodr. 7: 267. 1838. The following 2 species occur in Nueva Galicia: C. recondita McVaugh, C. tenuiflora DC.

Carphochaete A.Gray, Mem. Amer. Acad. n.s. 4: 65. 1849. The following 2 species occur in Nueva Galicia: C. grahamii A.Gray, C. gummifera McVaugh.

Chromolaena DC. Prodr. 5: 133. 1836. King, R.M. & H. Robinson 1970. Studies in the Eupatorieae (Compositae). XXIX. The genus, Chromolaena. Phytologia 20(3) : 196-209. The following 9 species occur in Nueva Galicia: C. collina (DC.) K. & R., C. glaberrima (DC.) K. & R. , C. haenkeana (DC.) K.& R., Chromolaena misella (McVaugh) R.M.King & H.Robinson, comb. nov. Eupatorium misellum McVaugh, Contr. Univ. Mich. Herb. 9: 400. 1972., C. odorata (L.) K.& R., C, ortegae (B.L. Robinson) K. & R., C. ovaliflora (Hook. & Arn.) K. & R., C. pulchella (H.B.K.) K. & R., C. sagittata (A.Gray) K. & R.

Conoclinium DC. Prodr. 5: 135. 1836. King, R.M. & H. Robinson. 1970. Studies in the Eupatorieae (Compositae). XII. The genus Conoclinium. Phytologia 19(5): 299-300. The following 1 species occurs in Nueva Galicia: C. betonicifolium (Miller) K. & R.

Critonia P. Browne, Civ. Nat. Hist. Jam. 490. 1756. King, R.M. & H.Robinson. 1971. Studies in the Eupatorieae (Asteraceae) XLVII. The genus Critonia. Phytologia 22(1): 46-51. The following 3 species occur in Nueva Galicia: C. hebebotrya DC., C. morifolia (Miller) K. & R., C. quadrangularis (DC.) K. & R.

Decachaeta DC. Prodr. 5: 133. 1836. King, R.M. & H. Robinson. 1969. Studies in the Compositae (Compositae). XVI. A monograph of the genus Decachaeta DC. Brittonia 21: 275-284. The following 4 species occur in Nueva Galicia: D. haenkeana DC., D. incompta (DC.) K. & R., D. ovatifolia (DC.) K. & R., D. scabrella (B.L.Robinson) K. & R.

Dyscritogyne R.M.King & H.Robinson, Phytologia 22(3): 158. 1971. Ibid. Studies in the Eupatorieae (Asteraceae). LX. A new genus, Dyscritogyne. The following species occur in Nueva Galicia: D. adenospermum (Schultz-Bip.) K. & R., D. dryophilum (B.L.Robinson) K. & R.

Erythradenia (B.L.Robinson) R.M.King & H.Robinson, Brittonia 21: 285. 1969. Ibid. Studies in the Eupatorieae (Compositae). XVII. The genus Erythradenia (B.L.Robinson)R.M.King & H.Robinson. The following 1 species occurs in Nueva Galicia: E. pyramidalis (B.L. Robinson) K. & R.

Eupatoriastrum Greenman, Proc. Amer. Acad. 39: 93. 1893. King, R.M. & H.Robinson. 1971. Studies in the Eupatorieae (Asteraceae). XLI. The genus, Eupatoriastrum. Phytologia 21(5): 306-307. The following 1 species occurs in Nueva Galicia: E. triangulare (DC.) B.L.Robinson.

Fleischmannia Schultz-Bip., Flora 33: 417. 1850. King,, R.M. & H.Robinson, 1970. Studies in the Eupatorieae (Asteraceae). XVIII. New combinations in

Fleischmannia. Phytologia 19(4): 201-207. The following 3 species occur in Nueva Galicia: F. arguta (H.B.K.) B.L.Robinson, F. pycnocephala (Lessing) K. & R., F. trinervia (Schultz-Bip.) K. & R.

Gymnocoronis DC., Prod. 5: 106. 1836. The following 1 species occurs in Nueva Galicia: G. latifolia Hook. & Arn.

Hofmeisteria Walpers, Walp. Rep. 6: 106. 1847. King, R.M. 1967. Studies in the Compositae-Eupatorieae IV. Rhodora 67: 352-371. King, R.M. & H.Robinson 1966. Generic limitations in the Hofmeisteria complex (Compositae-Eupatorieae). Phytologia 12: 465-476. The following 3 species occur in Nueva Galicia: H. dissecta (Hook. & Arn.) K. & R., H. schaffneri (A.Gray) K. & R., H. urenifolia (Hook. & Arn.) Walpers.

Isocarpha R. Brown, Trans. Linn. Soc. 12: 110. 1817. The following 1 species occurs in Nueva Galicia: I. oppositifolia (L.) R.Brown.

Jaliscoa S.Watson, Proc. Amer. Acad. 25: 153. 1890. King, R.M. & H.Robinson 1970. Studies in the Eupatorieae (Compositae). XXIII. New combinations in Jaliscoa. Phytologia 19(7): 427-428. The following 3 species occur in Nueva Galicia: J. goldmanii (B.L. Robinson) K. & R., J. paleacea (Cronquist) K. & R., J. pringlei S.Watson.

Koanophyllon Arruda de Camara, Discurso sobre utilidade da instituicao de jardins nas principaes provincias do Brasil,.... p. 38 ? 1810. King, R.M. & H.Robinson. 1971. Studies in the Eupatorieae (Asteraceae). LXIV. The genus, Koanophyllon. Phytologia 22(3): 147-152. The following 2 species occur in Nueva Galicia: K. albicaulis (Schultz-Bip. ex Klatt) K. & R., K. solidaginifolia (A.Gray) K. & R.

Kyrsteniopsis R.M.King & H.Robinson, Phytologia 22(3): 146. 1971. King, R.M. & H.Robinson. 1971. Studies in the Eupatorieae (Asteraceae). LXIII. A new genus, Kyrsteniopsis. Phytologia 22(3): 145-146. King, R.M. & H.Robinson. 1972. Studies in the Eupatorieae (Asteraceae). LXXVI. Additions to the genus, Kyrsteniopsis.

Phytologia 24(2): 57-59. The following 1 species occurs in Nueva Galicia: _K_. _nelsonii_ (B.L.Robinson) K. & R.

_Mexianthus_ B.L.Robinson, Contr. Gray Herb. n.s. 29: 5. 1925. The following 1 species occurs in Nueva Galicia: _M_. _mexicanus_ B.L.Robinson.

_Microspermum_ Lag., Gen. & Sp. Nov. p. 25, 1816. Rzedowski, J. 1970. Estudio sistematico del genero _Microspermum_ (Compositae). Bol. Soc. Bot. Mexico 31: 49-107. The following 2 species occur in Nueva Galicia: _M_. _debile_ Benth., _M_. _nummulariifolium_ Lag.

_Mikania_ Willdenow in Linnaeus, Sp. Pl. (ed. 4) 3(3): 1742. 1803. The following 2 species occur in Nueva Galicia: _M_. _cordifolia_ (L.f.) Willd., _M_. _micrantha_ H.B.K.

_Neohintonia_ R.M.King & H.Robinson. Phytologia 22(3): 143. 1971. King, R.M. & H.Robinson, 1971. Studies in the Eupatorieae (Asteraceae) LXII. A new genus, _Neohintonia_. Phytologia 22:143-144. The following 1 species occurs in Nueva Galicia: _M_. _monantha_ (Schultz-Bip.) K. & R.

_Neomirandea_ R.M.King & H.Robinson, Phytologia 19(5): 306. 1970. King, R.M. & H.Robinson, 1970. Studies in the Eupatorieae (Compositae). XXI. A new genus, _Neomirandea_. The following 1 species occurs in Nueva Galicia: _N_. _araliifolia_ (Less.) K. & R. (including _Eupatorium_ _altiscandens_ McVaugh).

_Pachythamnus_ (R.M.King & H.Robinson) R.M.King & H.Robinson, Phytologia 23(1):153. 1972. King, R.M. & H.Robinson, 1970. Studies in the Eupatorieae (Compositae) XIX. New combinations in _Ageratina_. Phytologia 19(4): 208-229. King, R.M. & H.Robinson. 1972. Studies in the Eupatorieae (Asteraceae). LXVI. The genus, _Pachythamnus_. Phytologia 23(1): 153-154. The following 1 species occurs in Nueva Galicia: _P_. _crassirameus_ (B.L. Robinson) K. & R.

Phanerostylis (A.Gray) R.M.King & H.Robinson, Phytologia 24(2): 70. 1972. King,R.M. & H.Robinson, 1972. Studies in the Eupatorieae (Asteraceae)LXXXI. The genus, Phanerostylis. Phytologia 24(2): 70-71. The following species occurs in Nueva Galicia: P. pedunculosa (DC.) K. & R. (Eupatorium longipes)

Piptothrix A.Gray, Proc. Amer. Acad. 21: 383. 1886. King, R.M. & H.Robinson, 1970. Studies in the Eupatorieae (Compositae) XXII. The genus, Piptothrix. Phytologia 19(7):425-426. The following species occur in Nueva Galicia: P. areolare (DC.) K. & R., P. jaliscensis B.L.Robinson, P. pubens A.Gray.

Piqueria Cavanilles, Ic. Desc. Pl. 3: 18. 1794. The following 4 species occur in Nueva Galicia: P. laxiflora, P. pilosa H.B.K., P. triflora Hemsl., P. trinervia Cav.

Piqueriopsis R.M.King, Brittonia 17: 352. 1965. King, R.M. 1965. Piqueriopsis, a new genus of Compositae from southwestern Mexico. Brittonia 17: 352-353. The following species occurs in Nueva Galicia: P. michoacana R.M.King.

Stevia Cavanilles, Ic. Desc. Pl. 4: 32. 1797. The following 32 species occur in Nueva Galicia: S. aschenborniana Schultz-Bip., S. caracasana DC., S. dictyophylla B.L.Robinson, S. elatior H.B.K., S. eupatoria (Spreng.) Willd., S. glandulosa Hook. & Arn., S. hirsuta DC., S. jaliscensis B.L.Robinson, S. jorullensis H.B.K., S. latifolia Benth., S. lucida Lag., S. micradenia B.L.Robinson, S. micrantha Lag., S. monardifolia H.B.K., S. myricoides McVaugh, S. nelsonii B.L.Robinson, S. origanoides H.B.K., S. ovata Willd., S. phlebophylla A.Gray, S. pilosa Lag., S. porphyrea McVaugh (purpurea) sensu B.L.Robinson not purpurea Pers., S. rosei B.L.Robinson, S. rzedowskii McVaugh, S. salicifolia Cav., S. scabrella Benth., S. seemannii Schultz-Bip., S. serrata Cav., S. subpubescens Lag., S. tomentosa H.B.K., S. trifida Lag., S. villaregalis McVaugh, S. viscida H.B.K.

Steviopsis R.M.King & H.Robinson, Phytologia 22(3): 156. 1971. King, R.M. & H.Robinson, 1971. Studies in the Eupatorieae (Asteraceae). LIX. A new genus, Steviopsis. Phytologia 22(3): 156-157. King, R.M. & H.Robinson, 1972. Studies in the Eupatorieae (Asteraceae) LXXVII. Additions to the genus Steviopsis. Phytologia 24(2): 60-62. The following 2 species occur in Nueva Galicia: S. adenolepis (B.L.Robinson) K.& R., S. rapunculoides (DC.) K. & R.

Trichocoronis A. Gray, Mem. Am. Acad. n.s. 4: 65. 1849. King, R.M. & H.Robinson, 1970. Studies in the Eupatorieae (Compositae). XXVII. A monograph of the genus, Trichocoronis. Phytologia 19(7): 497-500. The following 1 species occurs in Nueva Galicia: T. sessilifolia (Schauer) B.L.Robinson.

## References

King, R.M. & H.Robinson 1970. Studies in the Eupatorieae (Compositae). XXX. The genus, Ayapana. Phytologia 20: 210-212.

McVaugh, R. 1972. Compositarum Mexicanarum Pugillus. Contr. Univ. Mich. Herb. 9: 359-484.

Rzedowski, J. 1970. Estudio sistematico del genero Microspermum (Compositae). Bol. Soc. Bot. Mexico 31: 49-107.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). CI.

# NEW SPECIES OF FLEISCHMANNIA AND NEOMIRANDEA.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

The following one new species of Fleischmannia and two new species of Neomirandea are described from Central America.

Fleischmannia splendens R.M.King & H.Robinson, sp. nov. Herbae erectae pauce ramosae. Caules teretes minute villosi. Folia opposita longe petiolata, petiolis 1.5-4.5 cm longis villosis, laminis late cordatis 3-5 cm longis 3-4 cm latis breviter distincte acuminatis margine regulariter dentatis base trinervatis supra et subtus distincte pilosis. Inflorescentiae dense corymbosae, pedicellis villosis 1-3 mm longis. Capitula ca. 5 mm alta, floribus ca. 22; involucri squamae ca. 20 subimbricatae triseriatae inaequilongae ovatae vel oblongae extus glabrae 1.5-2.5 mm longae; corollae ca. 3 mm longae anguste infundibulares, lobis breviter triangularibus extus dense hirsutis non glanduliferis; filamenta antherarum in parte superiore ca. 300µ longa, thecae ca. 1 mm longae basi rotundatae, appendicibus vix longioribus quam latioribus; appendices stylorum leniter papillosi; achaenia glabra; carpopodia brevia valde distincta, cellulis parvis, parietibus distincte incrassatis; pappi setae ca. 30 non fragiles tenues. Grana pollinis ca. 18µ diam.

Type: GUATEMALA: without precise locality. (18)57. Warszewicz164. (Holotype P!). Additional specimens: COSTA RICA: without precise locality, 3-500 ft. (18)32. Warszewicz s.n.(P!) Donnesberg, Mai 1851, Warszewicz s.n.(P!).

The species is distinct from others of the genus by the broadly cordate leaves which are papyraceous with numerous hairs evenly distributed over both surfaces. The name of the species was apparently given by Schultz-Bip. and was on specimens as Eupatorium splendens in both Paris and Berlin. We have a photograph of the Berlin matieral which is a duplicate of one in Paris but the Berlin specimen has been destroyed. The name was passed by Klotsch to Polakowsky who published a listing without description. The photograph of the Berlin specimen shows an annotation as Eupatorium subcordatum by Klatt and more recently the name E. splendens has resided in the synonymy of E. subcordatum which is a totally different species belonging to the genus Ageratina. The specimen cited by Polakowsky from Costa Rica which has not been seen may actually have been A. subcordata. The three specimens seen have been cited as labelled but we doubt that the species is as widely distributed and that one collector would have been so fortunate to obtain a species in two countries of which we have seen no other material. For the present the actual locality must remain in doubt.

Neomirandea burgeri R.M.King & H.Robinson, sp. nov. Frutices usque ad 5 m alti erecti e stolonibus horizontalibus. Caules subteretes crassi subglabri fistulosi. Folia opposita majuscula longipetiolata petiolo usque ad 22 cm longo superne alato et 10-12 spinoso-dentato; lamina orbicularis cordata 4-6-lobata argute dentata, 3-7 palmato-nervatis usque ad 2.5-2.9 dm diam. supra obscure vel distincte glandulifera parce pubens subtus in venis reticulatis tomentosa. Inflorescentiae late corymbosae; pedicelli breviter tomentosi. Involucri squamae anguste tri-quadriseriatae ca. 15 valde inaequilongae ad apicem late rotundatae fimbriatae extus subglabrae; receptacula glabra. Flores 5-6 in capitulo 9-10 mm longi erubescentes; corollae anguste infundibulares intus glabrae, lobis oblongo-lanceolatis extus glanduliferis, glandulis sessilibus cellulis plerumque quadratis parietibus non sinuosis; appendices antherarum late ovatae; styli inferne inflati glabri; achaenia glabra vel superne pauce setifera; carpopodia distincta breviter cylindrica, cellulis subquadratis parvis 7-9 seriatis; pappi setae ca. 57 ad apicem vix scabrae. Grana pollinis 23-25$\mu$ diam.

Type: Costa Rica: San Jose: Cerro de La Muerte on the Pan-American Highway (route 2). Elevation 9400 ft. Uncommon shrubs in deep barranca. Plants erect but arising from a long stoloniferous stem. More than 3 meters tall. Flowers pink. 22 January 1972. Robert Merrill King 6413 (Holotype US!). Additional specimen: San Jose & Cartago: about 22 km SE of Empalme, Cerro de La Muerte, 2500-2600 m , Dec. 28, 1969, Burger & Liesner 7026 (F!, US!).

The new species is a member of the subgenus Neomirandea similar to N. angularis by the broad leaves and non branching erect stems. The strikingly distinctive features of the species include two that are macroscopic and one microscopic. The upper part of the petiole is winged and armed with a striking series of large spreading to recurved teeth. Observations in the field indicate the erect stems arose from a long horizontal stem held by prop roots rather than from an erect base as in other species. Also, the flowers lack hairs on the inner surface which makes the species distinct among those having swollen style bases. More subtle distinctions of the species are the number of pappus setae, greater than any other species in the genus, and the smaller compact phyllaries.

Neomirandea guevarii R.M.King & H.Robinson, sp. nov. Plantae herbaceae vel suffrutescentes erectae usque ad 4 m altae plerumque subglabrae. Caules subteretes crassi fistulosi. Folia opposita majuscula longipetiolata subcarnosa, petiolo gracili usque ad 12 cm longo; lamina ovata vel oblongo-ovata acuta ad 20 cm longa 14 cm lata penninervia margine grosse dentata et serrata. Inflorescentiae late corymbosae; pedicelli plerumque subglabri, lateralibus axillaribus et superioribus hirsutis. Involucri squamae amplae tri-quadriseriatae ca. 15 valde inaequilongae ad apicem late rotundatae distincte fimbriatae extus subglabrae; receptacula glabra. Flores 6-10 in capitulo 10-12 mm longi lavanduli; corollae anguste infundibulares intus hirsutae lobis aequilateraliter triangularibus vel longioribus extus glanduliferis, glandulis prominulis, cellulis plerumque quadratis parietibus non sinuosis; appendices antherarum late ovatae; styli inferne inflati glabri; achaenia glabra vel superne pauce setifera; carpopodia distincta breviter cylindrica, cellulis quadratis vel latioribus parvis ca. 6 seriatis; pappi setae ca. 50 ad apicem vix scabrae. Grana pollinis 25-27μ diam.

Type: COSTA RICA: Cartago. Steep mountain slopes in wet forest ca. 27 kms generally SE of Orosi. Elev. ca. 5600 ft. Uncommon succulent herbs up to 4 meters tall, partial shade, flowers lavender. 27 Janaury 1972. Robert Merrill King 6420 (Holotype 2 sheets US!) Paratype same locality, R.M.King 6421, 27 Jan. 1972. US!

The new species is a member of the subgenus Neomirandea and is very closely related to N. standleyi having the same habit and approximately the same number of pappus setae. The most obvious distinction of the species is the larger phyllary size, up to 10 mm long and 2.5 mm wide. Microscopically the species has glands on the corolla lobes on distinct stalks and pollen grains 25-27μ in diameter where N. standleyi has the glands nearly sessile and pollen grains 18-20μ in diameter.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 and A #2 to the senior author. Fieldwork in Costa Rica was supported by a grant from the Penrose fund of the American Philosophical Society to the senior author. Special thanks are due Dr. William Burger of the Field Museum who generously allowed the use of his jeep while in Costa Rica.

# TWO UNDESCRIBED GENERA IN THE ORCHIDACEAE-ONCIDIINAE

Calaway H. Dodson and Robert L. Dressler

Many species of "miniature" orchids grow on small twigs, whether in the upper layers of tall forest or in lower and more accessible cloud forests. Such orchids are easily overlooked, even when flowering, and they are very poorly represented in herbaria. In the present paper we will describe two genera of miniature orchids, one of which, we believe, has been collected only once, while the other is relatively well known, but has been treated as a subgroup of the large and rather ill-defined genus Oncidium.

CYPHOLORON FRIGIDA, gen. et sp. nov.

Pseudobulbis minutissimis, ovoideis, monophyllis; foliis equitantibus, ligulato-ensiformibus; pedunculo filiforme, 2-3-floro; sepalis petalisque similibus, liberis, elliptico-lanceolatis; labello unguiculato, basi cum columna breviter connato, cordato-ovato, apice retuso; columna longa, tenue, basi incrassata, apice bialata, alis porrectis, anthera dorsalis; glandula minuta, ovata; stipes longissimus; polliniis 2, ovoideis.

Dwarf epiphytic caespitose plants to 1.5 cm. tall; with ovoid pseudobulbs ca. 4 mm. long, 2.5 mm. wide, each bearing a single ensiform leaf, 7.5-10 mm. long, 1.5-2 mm. wide, the bases of the pseudobulbs enveloped by the distichously imbricate, conduplicate bases of 4-6 conspicuous, foliaceous bracts, the blades ligulate-ensiform, acute, 7-12 mm. long, 1.5-2.5 mm. wide. Inflorescences 1-4, erect, filiform, 2-3 flowered peduncles produced from the axils of the foliaceous bracts, 1.5-2.5 cm. long; floral bracts ovate when spread, pink, apiculate, 1.5 mm. long. Flowers very large for the size of the plant, 12-14 mm. wide, white with pink lines; the sepals free, spreading, the dorsal sepal elliptic-lanceolate, slightly concave, 7 mm. long, 1.5-2 mm. wide; the lateral sepals obliquely elliptic-lanceolate, concave, acuminate, 7.5 mm. long, 2-2.5 mm. wide, conspicuously 3-nerved, white with pink nerves; petals spreading, linear-oblanceolate, acute, 6.5-7 mm. long, 0.5-1 mm. wide, with a single pink nerve, base pink; lip with an elongate claw at the base, the blade abruptly dilated, 2.5 mm. long, 0.5-0.8 mm. wide, ovate, cordate, the apex emarginate, with a depression running from the apex of the blade to the center and then branching to form a Y-shaped channel which extends to each side of the claw at the base; column basally adnate to the claw of the lip, slender, somewhat arcuate, ca. 5 mm. long, swollen and with a concavity dorsally at the base (the clinandrium), apex provided with a slender porrect wing on each side, stigma ovate, at the apex of the column; anther dorsal, elongate; pollinarium with simple ovate viscidium and extremely elongate stipe, this 5 mm. long, broader toward the apex; pollinia 2, compressed, ovoid, waxy, borne near the base of the column.

Holotype: ECUADOR: prov. Loja; km. 13, road from Loja to Zamora, 2750 m.; 10 December 1957; epiphytic on the outer twigs of fairly large trees in the fog forest; sepals and petals white with red lines; column white; lip white with red spots, C. H. Dodson 216 (US).

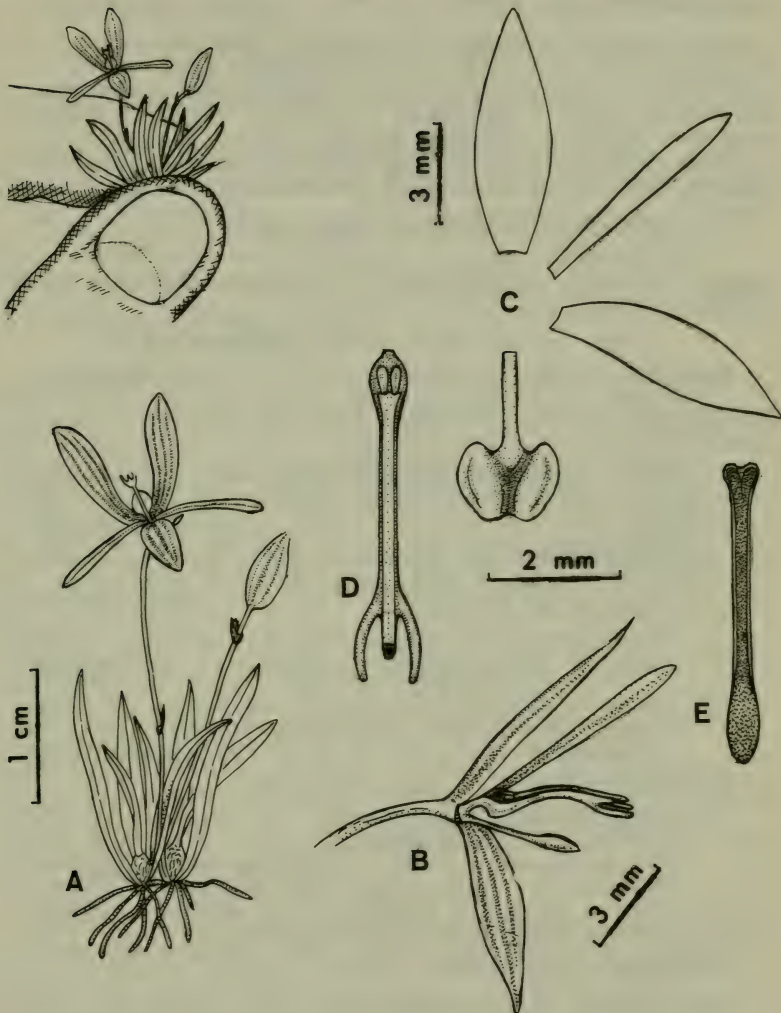
This remarkable little plant is related to the section Macroclinium of Notylia, from which it differs strikingly in the porrect column wings and in the exceedingly elongate anther, with the pollinia borne near the base of the column. The position of the pollinia recalls some genera of the Ornithocephalus complex, but the number and form of the pollinia, as well as the terminal position of the stigma, indicate that there is no close relationship with that group.

While each inflorescence bears only a single flower at a time, each also bears a bract with an axillary bud. This bud later develops a short branch with a second flower and another bud. Thus, several flowers may develop in sequence, just as some species of Notylia develop several flower clusters, one after another.

The generic name, meaning "bent strap," refers to the extremely long stipe, which becomes bent soon after removal from the flower. The specific epithet refers to the ambient temperature at the type locality.

- - - - - - - - - - - - - - - - - - - - - - - - - - -

Figure 1. Cypholoron frigida. A. Habit, B. Flower, lateral view with near petal and lateral sepal removed, C. Floral segments, flattened, the lip at the same magnification as D and E, D. Column, dorsal view with anther removed, showing the pollinarium in place, E. Anther, ventral view, Inset from a photograph.


3 mm
C
D
2 mm
1 cm
E
A
B
3 mm

PSYGMORCHIS, gen. nov.

Cauli brevi, monopodiali; foliis numerosis, ensiformibus, equitantibus; pedunculo axillaris, condensato; sepalis petalisque similibus, liberis, patentis; labello profunde 4-lobato, callo carnosulo basilari ornato; columna brevi, recta, bialata; anthera terminalis, triangularis; glandula minuta; stipes tenuis; polliniis 2; stigma 2-incisum.

Type species; Epidendrum pusillum L.

The generic name is derived from the Greek psygma, or fan, referring to the characteristic form of the plant.

Key to the Species of Psygmorchis

1. Margins of callus entire . . . . . . P. pusilla
1. Margins of callus deeply crenate, digitate or fimbriate
  2. Lateral lobes of lip quadrangular; lip longer than broad; flowers pure yellow, without brown spots . . . . . . . . . . . . . . . P. pumilio
  2. Lateral lobes of lip orbicular; lip as broad as long or broader than long; flowers yellow or spotted with brown
    3. Flowers yellow; lip broader than long, lobes usually overlapping; autogamous . P. gnomus
    3. Flowers spotted; lip about as broad as long, lobes usually not overlapping, not autogamous . . . . . . . . . . P. glossomystax

1. PSYGMORCHIS PUSILLA (L.) comb. nov.
Epidendrum pusillum L., Sp. Pl. ed. 2: 1352. 1763 - Cymbidium pusillum (L.) Sw., Nov. Act. Upsal. 6: 74. 1799 - Oncidium pusillum (L.) Reichb. f., Walp. Ann. Bot. Syst. 6: 714. 1863 - Tolumnia pusilla (L.) Hoehne, Iconografia Orch. Bras. 231. 1949.
Oncidium iridifolium HBK., Nov. Gen. & Sp. 1: 344. 1815.
Epidendrum ventilabrum Vell., Fl. Flum. Ic. 9: t. 32. 1827.
Oncidium allemanii Barb. Rodr., Genera et Sp. Orch. Nov. 2: 185. 1882.
Oncidium pusillum var. megalanthum Schltr., Repert. Sp. Nov. Beih. 27: 115. 1924.

2. PSYGMORCHIS PUMILIO (Reichb. f.) comb. nov.
Oncidium pumilio Reichb. f., Bot. Zeit. 10: 697. 1852 - Tolumnia pumilio (Reichb. f.) Hoehne, Iconografia Orch. Bras. 231. 1949.

Oncidium titania Schltr., Repert. Sp. Nov. Beih. 19: 67. 1923.
Oncidium oberonia Schltr., Repert. Sp. Nov. Beih. 27: 113. 1924.
Oncidium hondurense Ames, Bot. Mus. Leafl. 1(5): 3. 1933.

3. PSYGMORCHIS GLOSSOMYSTAX (Reichb. f.) comb. nov.
Oncidium glossomystax Reichb. f., Bot. Zeit. 10: 696. 1852.
?Oncidium articulatum E. S. Rand, Lindenia 5: 8. 1889.

4. PSYGMORCHIS GNOMUS (Kränzlin) comb. nov.
Oncidium gnomus Kränzlin, Pflanzenreich IV. 50, Heft 80: 98. 1920.

Psygmorchis is distinguished from all other members of the subtribe by a plethora of characteristics. Surprisingly, until now only Hoehne (1949) has treated this as a distinct genus, using the name Tolumnia Raf., which was based on a quite different plant. Kränzlin, in his unhappy attempt at a monograph of Oncidium (1920), treated this group merely as subsection Iridifolia of section Aphanobulbia, with the very different subsections Variegata and Miltoniastrum. Dodson elevated the group to sectional status (1957), a status with which Garay concurs (1970). In view of the many and basic differences, though, we feel that this small group should be entirely removed from Oncidium.

Habit - Oncidium normally shows a sympodial habit of growth with pseudobulbs and dorsoventrally flattened leaves. In some species of Oncidium the pseudobulbs are reduced, and the leaves may be very fleshy or subterete. In Psygmorchis, on the contrary, the stem growth is indefinite (monopodial), there are no pseudobulbs, and the leaves are laterally flattened and equitant.

Inflorescence - In Psygmorchis the inflorescence is a condensed raceme, arising from the lower leaf axils. Normally each raceme produces only one flower at a time, but a number of flowers may be produced successively over an extended period. Such an inflorescence is unusual in Oncidium, but similar condensed inflorescences do occur, for example, in O. lindenii Brongn. and in O. papilio Lindley and its close allies, all of these being rather aberrant but by no means similar to Psygmorchis.

Flower Structure - In over-all structure the flower of Psygmorchis is similar to that of Oncidium; the sepals and petals are small and spreading, while the lip is much larger and deeply lobed, diverges sharply from the base of the column and possesses a fleshy callus near the base. The column has a "tabula infrastigmatica," like most members of Oncidium, and has two broad, membranous, spreading wings. The rostellum divides the stigma into two notches apically, giving a form much like that of Cycnoches, and doubtless functioning in the same way, the notches serving to catch and hold the pollinia. The anther is distinctly triangular, a feature we have not seen in any Oncidium. The pollinarium, a feature of special importance in this subtribe (Williams 1970), is quite distinctive. The stipe is long and narrow, widest near the middle or subapically and folded over; the pollinia are laterally attached near the apex of the stipe.

Crossing - There have been a number of attempts to cross "Oncidium" pusillum with Oncidium species of various groups (Sanford 1964). As far as we know, the only successful cross has been with Oncidium X Java (O. flexuosum X O. varicosum). Kugust (1966) reported a high percentage of cripples in this cross, but did not mention the fertility of the hybrids. While this hybrid gives positive evidence of a relationship between Psygmorchis and Oncidium, the difficulty of crossing Psygmorchis and Oncidium, and the high percentage of cripples in the only known $F_1$ suggest that these plants are not congeneric.

Chromosome Number - The diploid chromosome number of Psygmorchis pusilla was found to be 10 (Dodson 1957), based on plants from Panama. This number was confirmed by Sinotô (1962), with material cultivated in Hawaii. More recently Withner and Ames (cited by Kugust 1966) found a diploid number of 14 in plants from Peru, and found the same number in P. glossomystax. These are much the lowest chromosome numbers known in the group. The known chromosome numbers of Oncidium range from 2n = 26 in Oncidium nanum up to 112 and 168 in O. varicosum. A slightly lower number is found in Trichocentrum (with 24 and 28), which appears to be very closely allied to Oncidium section Miltoniastrum, the section with the lowest chromosome numbers.

Both Garay (1963) and Sanford (1965) have suggested that seven may be the basic chromosome number for the Oncidiinae. This is, however, a very low number for the Orchidaceae, and we suspect that both seven and five represent reductions from a higher basic number. Stebbins (1958) has discussed the tendency for reduction in chromosome number (with resultant increase in linkage) in plants with a short life cycle. While these orchids are not strictly annual,* Allen (1953) has shown that they do have an unusually short life cycle. We believe that Psygmorchis represents another case of reduction in chromosome number associated with a short life cycle.

Psygmorchis pusilla is commonly found in coffee or citrus trees and on various vines in secondary forest. In undisturbed regions it is often found on Pithecellobium trees overhanging rivers. Psygmorchis pumilio, P. glossomystax and P. gnomus are almost exclusively found in guava trees (Psidium guajava). Dodson has suggested that P. glossomystax and P. gnomus may have arisen as hybrids between P. pusilla and P. pumilio (unpublished doctoral thesis, see also van der Pijl and Dodson, pp. 167-168).

A Comparison of Psygmorchis and Lockhartia

Garay (1963) has suggested that Lockhartia should be united with the section Iridifolia of Oncidium and that these species are the most primitive members of the tribe and of the genus Oncidium. In their morphology we can find no feature which suggests a primitive status for either group, and we consider both to be highly derived. While Psygmorchis and Lockhartia both have laterally flattened leaves without an abscission layer and both have low chromosome numbers, there are rather fundamental differences overlooked by Garay. Though the stems of Lockhartia are much longer than those of Psygmorchis, the growth of Lockhartia is distinctly sympodial. The inflorescence of Lockhartia is either upper axillary or terminal. Terminal inflorescences are not known to occur in Psygmorchis, Oncidium or any other member of the Oncidiinae. The nature of the inflorescence is even more strikingly different. The inflorescence of Lockhartia is determinate (or cymose). We know of no other orchid which has a cymose inflorescence, though this condition is approached in the reduced inflorescence of Cypholoron. Superficially, some species of Lockhartia have flowers much like those of Oncidium or Psygmorchis, but the details of the callus and column are always different. The very short column of Lockhartia lacks a "tabula infrastigmatica," and

- - - - - - - - - - - - - - - - - - - - - - - - - -

*We cannot settle the acrimonious debate over whether or not there are annual orchids. As to the possibility of a given species (or even clone) being either annual or perennial under different ecological conditions, we may mention Gossypium barbadense L., Lycopersicon esculentum Mill. and Ricinus communis L.

the stigma is deep and relatively narrow. The structure of the pollinarium is fundamentally very different in Lockhartia. The stipe is short and broad, of about the same size as the upper surface of the viscidium. After removal from the flower the stipe is soon appressed to the viscidium and is then very difficult to distinguish. Each pollinium is attached to a cylindrical, hyaline caudicle which is much longer than the stipe. These two caudicles may be distinct for most of their length or nearly completely joined. Such a pollinarium is quite unlike anything known in the Oncidiinae, but is quite similar to the pollinarium of Centropetalum (Pachyphyllinae).

In view of the very considerable morphological differences between Lockhartia and Psygmorchis, the similar chromosome number seems less significant. As far as we know, all attempts to cross Lockhartia with Psygmorchis or with other members of the Oncidiinae have been unsuccessful. We believe that the subtribe Lockhartiinae of Schlechter should be maintained for this genus, and that it is probably most closely allied to the Pachyphyllinae.

Literature Cited

Allen, P. H. 1953. The Dwarf Oncidiums. Orchid Jour. 2: 121-122.

Dodson, C. H. 1957. Oncidium pusillum and Its Allies. Amer. Orchid Soc. Bull. 26: 170-172.

Garay, L. A. 1963. Oliveriana and Its Position in the Oncidieae. Amer. Orchid Soc. Bull. 32: 18-24.

-----. 1970. A Reappraisal of the genus Oncidium Sw. Taxon 19: 443-467.

Hoehne, F. C. 1949. Iconografia de Orchidaceae do Brasil, 301 pp. & 300 plates.

Kränzlin, F. 1920. Orchidaceae-Monandrae, Tribus Oncidiinae-Odontoglosseae Pars II. Das Pflanzenreich IV. 50, Heft 80: 1-344.

Kugust, K. 1966. Hybridizing with Oncidiums. Proc. Fifth World Orchid Congr. 45-52.

Sanford, W. W. 1964. Sexual Compatibility Relationships in Oncidium and Related Genera. Amer. Orchid Soc. Bull. 33: 1035-1048 (part II, 36: 114-122. 1967).

Sinotô, Y. 1962. Chromosome Numbers in Oncidium Alliance. Cytologia 27: 306-313.

Stebbins, G. L. 1958. Longevity, habitat, and release of variability in the higher plants. Cold Spr. Harbor Symp. Quant. Biol. 23: 365-378.

Williams, N. H. 1970. Some Observations on Pollinaria in the Oncidiinae. Amer. Orchid Soc. Bull. 39: 32-43, 207-220.

A NEW HENRIETTELLA FROM VENEZUELA

John J. Wurdack
U. S. National Herbarium, Smithsonian Institution

HENRIETTELLA MANARAE Wurdack, sp. nov.

H. verrucosae Tr. affinis, foliis proportione angustioribus plus plinervatis petalis extus strigulosis ovarii apice setuloso differt.

Ramuli primum obscure quadrangulati mox teretes sicut petioli foliorum venae primariae subtus pedicellique modice strigulosi pilis 0.1-0.2(-0.3) X 0.1 mm. Petioli liberi 0.4-0.5 cm longi; lamina (6-)8-16 X (1.7-)2.5-3.5 cm anguste elliptica apice per 0.3-1 cm gradatim acuminato basi anguste acuta, subcoriacea et obscure serrulata, appresso-ciliolata, supra sparsiuscule strigulosa pilis 0.1-0.2 mm longis ad basim paulo expansis, subtus in superficie sparse strigulosa pilis ca. 0.2 mm longis, 5-plinervata pari interiore (1.5-)2-5.5 et pari exteriore 0.7-1.8 cm supra basim divergentibus nervis secundariis 2-3 mm inter se distantibus venulis subtus obscuris areolis ca. 0.5 mm latis. Flores 5-meri in nodis infra folia glomerati, pedicellis ca. 1 mm longis crassiusculis, bracteolis 1 X 0.4 mm anguste ovatis persistentibus. Hypanthium (ad torum) 2.1 mm longum extus modice strigulosum pilis plerumque ca. 0.6 mm longis; calycis tubus 0.3 mm altus, lobis interioribus 0.2 mm altis distantibus, dentibus exterioribus ca. 0.2 mm eminentibus. Petala 2 X 1-1.2 mm ovato-oblonga basim versus minute glanduloso-ciliolata extus infra apicem mucrone armata et per costam modice strigulosa pilis 0.1-0.15 mm longis conicis. Stamina glabra; filamenta 3-3.3 mm longa; antherarum thecae 1.7 X 0.6 X 0.5 mm poro apicali 0.15-0.2 mm diam., connectivo infra thecas circum filamenti apicem 0.3 mm prolongato. Stigma paulo expansum 0.7 mm diam.; stylus 7 X 0.4-0.5 mm glaber; ovarium 5-loculare omnino inferum, apice modice pilis 0.15 mm longis setuloso.

Type Collection: Bruno J. Manara 250 (holotype US 2639593; isotype VEN), collected in Fila de las Delicias 9 km west "de los tanques de la Electricidad de Caracas," Cerro Naiguatá, Distr. Federal, Venezuela, elev. 1500 m, 3 Sept. 1972. "Arbolito hasta arbol de unos 10 m altos; hojas verdes esmeralda arriba y verde claro debaho, subcoriaceas. Flores blancos; filamentos y anteras blancas."

Paratype (near-topotypical): J. A. Steyermark 92005 (US, VEN, in young fruit), from dense rainforest on north slopes of Naiguatá, Lomas de Las Delicias 9-12 km southwest of Hacienda Cocuizal, elev. 1500-1635 m, 15-19 Nov. 1963.

The Peruvian relative (Wurdack 2377, Loreto; Madison 10095, Cuzco) has leaf blades with length/width ratio 2.3-2.6 (rather than [3.2-] 3.8-4.4) and with the interior primary veins diverging 0.9-2 cm and the exterior ones 0.1-0.3 cm above the base, petals externally without setulae (but with an infra-apical mucro), and ovary apices glabrous, but similar stamens without a flaring pore. Henriettella tuberculosa Donn. Smith has leaf venation and petals similar to those of H. verrucosa, but shorter anthers (thecae only 1.2 mm long) with a broad emarginate pore; probably all of the collections from the Colombian Chocó which have been referred to H. verrucosa are actually H. tuberculosa. The only other reasonably close relative of H. manarae, H. lawrancei Gleason, has spreading hairs 1-1.5 mm long on the branchlets and primary leaf veins beneath, the external pair of primary leaf veins essentially basal, the hypanthia sparsely strigulose, the petals externally esetulose, and the ovary apices glabrous. Bruno Manara's illustrations have graced many Venezuelan botanical publications; after Steyermark's original fruiting collection, Manara made many arduous ascents of Naiguatá until flowering material of the Henriettella was obtained.

SUPPLEMENTARY STUDIES IN CHAETOCALYX I. (LEGUMINOSAE)

INCLUDING A NEW SPECIES FROM BRAZIL

Velva E. Rudd, Smithsonian Institution

Since my revision of Chaetocalyx (Contrib. U. S. Nat. Herb. 32: 207-245. 1958) relatively few new collections of the genus have come to my attention. However, there is one collection which I am now describing as a new species and three additional collections of C. klugii Rudd that provide fruit and support my decision to assign the species to Chaetocalyx rather than Nissolia. At this time I should also like to correct my error in citing the original description of the genus, de Candolle's Prodromus, volume 2 having actually been published earlier than the pertinent part of his Mémoires sur la Famille des Légumineuses:

CHAETOCALYX DC. Prodr. 2: 243. 1825; Mém. Leg. 6: 262. 1826.

CHAETOCALYX BRACTEOSA Rudd, sp. nov.

Herba volubilis cum leguminibus tenuis, C. acutifolia (Vog.) Benth., C. brasiliensis (Vog.) Benth., et C. longiflora A. Gray affinis sed bracteis amplis notabilis.

Stems, leaf, and floral axes crisp-puberulent with fulvous hairs and, sometimes, setose, glabrescent; stipules deltoid to ovate, acute, about 5 mm. long, 3-5 mm. wide, ciliate, otherwise glabrous; leaves 5-foliolate, the axis 5-8 cm. long; leaflets broadly ovate to suborbicular, 2.5-5 cm. long, 2-3.5 cm. wide, obtuse, mucronulate, the base obtuse to subcordate, the surfaces glabrous; inflorescences axillary, racemose, the axis tomentulose and setose, 15-20 cm. long, exceeding the leaves; pedicels 1.5 cm. long; bracts ovate, acute to acuminate, usually incised or laciniate, ciliate but otherwise glabrous, about 10-15 mm. long and 6-10 mm. wide, usually clasping at the base; flowers about 30 mm. long; calyx campanulate, slightly gibbous, puberulent and setose, 15 mm. long, 4-5 mm. in diameter, the teeth linear, 5 mm. long; petals yellow, the vexillum pubescent on the outer face; stamens with filaments glabrous; fruit linear, about 10-16-articulate, subterete, puberulent, to about 15 cm. long including glabrous stipe 4-5 mm. long, the articles 7-8 mm. long, 2.5 mm. wide; mature seeds not seen.

Type: A. Ducke 668, Brazil, Maranhao, Codo, Carrasco, 21 June 1907. Holotype MG.

This species, known only from the holotype, and the only collection of Chaetocalyx I have seen from the state of Maranhão, is notable for its conspicuous bracts.


Figure 1. CHAETOCALYX BRACTEOSA Rudd. a. Habit sketch showing leaf, inflorescence, flowers, and fruit. b. Bract. c. Map showing geographic location.

CHAETOCALYX KLUGII Rudd, Contrib. U. S. Nat. Herb. 32: 232. 1958.

Stems, leaf and floral axes glabrous to sparsely sordid-pubescent, sometimes setose; stipules deltoid-attenuate, 2-3 mm. long, about 1.5 mm. broad at the base, entire or ciliate, subglabrous; leaves 5-foliolate, the axis about 5-12.5 cm. long; leaflets 3-8 cm. long, 1.5-3.5 cm. wide, ovate, acuminate, mucronulate, the base rounded to cuneate, sometimes ciliate but otherwise glabrous or nearly so; inflorescences axillary, many-flowered, fasciculate or short-racemose, the bracts stipule-like but smaller, the pedicels 5-10 mm. long; flowers 15-20 mm. long; calyx 5-7 mm. long, campanulate, somewhat gibbous, the tube 4-5 mm. long, 3-3.5 mm. in diameter, ciliate otherwise glabrous, the teeth subulate, 1-2 mm. long; petals yellow, the vexillum pubescent on the outer face; stamens with filaments glabrous; fruit essentially sessile, oblong, compressed, acute, 6-10-articulate, glabrous except sometimes sparingly setose, 6-11 cm. long, 2-2.3 cm. wide, the central seminiferous portion about 4 mm. wide, the articles 8-12 mm. long; seeds tan or light brown, elongate, 5-8 mm. long, 1.5-2 mm. wide, the hilum lateral but subapical.

Type: G. Klug 3114, Peru, Loreto, Balsapuerto, June 1933. Holotype US; isotypes A, F, GH, NY.

Additional collections: PERU: Huánuco: Vicinity of Tingo Maria, Mathias & Taylor 5971 (UCLA). Honoria, Bosque Nacional de Iparia, J. Schunke 1937 (F, US), 2080 (F, US).

Local name: Frijolito chuncho.

# A NEW LANTANA FROM BRAZIL

Harold N. Moldenke

LANTANA CAATINGENSIS Moldenke, sp. nov.

Frutex; ramis ramulisque gracilibus obtuse tetragonis sulcatis minutissime griseo-puberulis senectute glabrescentibus; foliis decussatis parvis paucis; petiolis 1--8 mm. longis canaliculatis minutissime puberulis; laminis foliorum triangulari-ovatis parvis 1--2.5 cm. longis 7--19 mm. latis utrinque dense minutissimeque puberulis, ad apicem obtusis vel subacutis, margine antrorse serrulatis, ad basin truncatis vel subcordulatis; reticulo venarum venularumque supra plerumque plusminus impressis subtus plerumque valde prominentibus; capitulis parvis paucis parvifloribus.

Shrub; branches and branchlets slender, gray, obtusely tetragonal, sulcate on opposite sides, densely gray-puberulous with extremely minute hairs when young, glabrescent in age; internodes mostly much abbreviated on branchlets and twigs; leaves decussate-opposite, apparently few and crowded near the tips of the branchlets and twigs; petioles very slender, 1--8 mm. long, canaliculate above, puberulent with very minute hairs; leaf-blades lighter green beneath, triangular-ovate, small, 1--2.5 cm. long, 7--19 mm. wide, densely puberulent on both surfaces with extremely minute hairs, obtuse or subacute at the apex, regularly antrorsely serrulate along the margins from the widest part to the apex, truncate or slightly subcordate at the base; vein and veinlet reticulation very abundant and fine, mostly rather conspicuous and even subimpressed above, usually beautifully prominulous beneath; inflorescence capitate, in the uppermost axils, apparently few and small, few-flowered; peduncles less than 1 cm. long, densely puberulent with very minute hairs; bractlets elliptic, about 7 mm. long and 3 mm. wide, ascenting-erect and closely imbricate, sharply acute at the apex, very densely puberulent on the back with very minute hairs interspersed with golden resinous glands; corolla hypocrateriform, its tube equaling or very slightly surpassing the subtending bractlets, very densely puberulent with very minute hairs on the outside.

The type of this species was collected by H. S. Irwin, R. M. Hartley, and G. L. Smith (no. 30686) on sandy soil beneath shrubs beside outcrop fissures in caatinga scrub on sand with sandstone outcrops, about 22 km. west of Morro do Chapéu, altitude about 1000 meters, in the Serra da Tombadór, Bahia, Brazil, on February 20, 1971, and is deposited in my personal herbarium at Plainfield, New Jersey. The species is reminiscent of the West Indian *L. reticulata* Pers. and *L. involucrata* L. in its general appearance. It is easily distinguished from the little-known *L. bahiensis* Turcz. by the venation and character of the pubescence of its leaves and especially by the large size and imbricate position of its floral bractlets.

# TRIBAL REVISIONS IN THE ASTERACEAE. I.

## THE RELATIONSHIP OF GEISSOLEPIS.

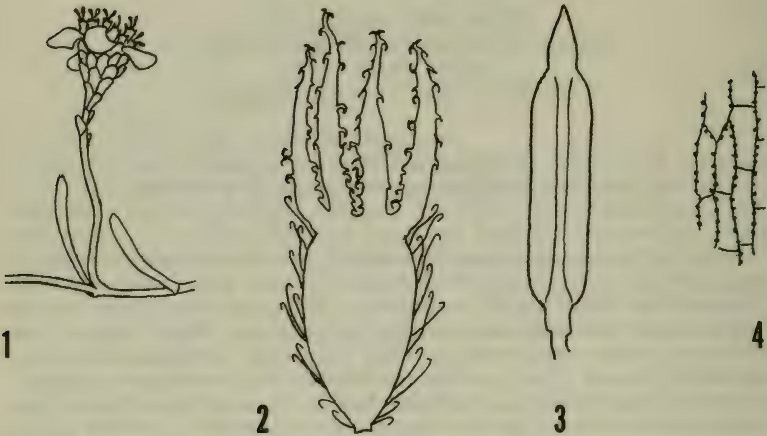
H. Robinson and B. D. Brettell
Smithsonian Institution, Washington, D.C. 20560.

In 1892 B. L. Robinson described a new genus and species, Geissolepis suaedaefolia, based on a Pringle collection from the state of San Luis Potosi in Mexico. The genus was placed in the Heliantheae-Galinsoginae near Blepharipappus. Significant features of the new genus included the heads heterogamous, radiate; flowers all fertile; involucre turbinate-campanulate, scales ovate, obtuse, closely imbricated in 4-5 rows, the outer regularly shorter (Fig. 1), receptacle paleaceous, paleae obovate, obtuse, ciliate; style divided nearly to the middle, the branches flattened, bearing short conical appendages; and achenes 4-angled, pubescent, crowned with 7-8 very acute awl-shaped minutely and retrorsely ciliated scales (Fig. 2). The well imbricated scales of the involucre were considered one of the distinctive characters of the genus. No more recent evaluation of the genus seems to have been attempted, and no additional species have been named.

The advent of the New Synantherology (King and Robinson, 1970) and the recognition of many significant microscopic characters has made possible the reevaluation of the relationships of many genera. Such investigation shows the need to transfer Geissolepis from the Heliantheae-Galinsoginae to the Astereae. The microscopic characters on which the conclusion is based are particularly clear though they are mostly unrecognized in previous literature. The characters of Geissolepis reviewed in this study are as follows.

The anther appendages are flat and narrowly triangular with narrow vertical rather thick-walled cells (Fig. 3). Such appendages being distinctly narrower than the thecae are characteristic of the Astereae and are also seen in the Senecioneae. The Heliantheae, in contrast, have broader and strongly keeled anther appendages with cells often in a radiating pattern.

The exothecial cells of the anther are longer than wide with the intercellular thickenings almost restricted to the vertical walls (Fig. 4). Such exothecial cells are characteristic of almost all genera of the Astereae, being definitely absent only in the subtribe Hinterhuberinae. Such cells also occur in most of the Senecioneae though exceptions are frequent.




Figures 1-4. <u>Geissolepis suaedaefolia</u> B.L.Robinson. 1. Single inflorescence. 2. Outline of achene with pappus. 3. Stamen. 4. Exothecial cells.

In the Heliantheae the exothecial cells are subquadrate to elongate with intercellular thickenings usually nearly restricted to the transverse walls. The rare exceptions in the Heliantheae such as one subgenus of the genus <u>Tridax</u> have the region of laterally thickened exothecial cells more restricted and have other totally non-asterean features of the anther appendage, style, and phyllaries.

<u>The stylar appendage</u> is broadly triangular with a smooth inner surface and a densely papillose outer surface. Such style appendages are the form most often represented in the fertile flowers of the Astereae. The description of the stylar appendages as conical by B.L.Robinson was unfortunate and inaccurate. The appendages of the Heliantheae are often truly conical or even linear with papillae usually more evenly distributed.

<u>The style base</u> is enlarged and seated directly on a truncated cylindrical nectary. Such style bases and nectaries are characteristic of Astereae and typical Senecioneae and are found in such groups as the Mutisieae. In the Heliantheae the style base and nectary are highly variable but the former is almost always sunken to some degree into the latter.

A confirming character of the plant proves to be the well imbricated involucre noted by B.L.Robinson. Such an involucre would be very distinctive among the Heliantheae but is very common among the Astereae.

The original assignment of *Geissolepis* to the Heliantheae might have been because of the combination of the receptacle with paleae and the non setose pappus. Both of these features are known to occur in other genera of the Astereae and in a few genera they are combined.

## References

King, R. M. and H. Robinson 1970. The new synantherology. Taxon 19 (1): 6-11.

Robinson, B. L. 1892. Descriptions of new plants collected in Mexico by C. G. Pringle, in 1890 and 1891, with notes upon a few other species. Proc. Amer. Acad. 27: 165-185.

TILIA RELICTA LAUGHLIN
HOT SPRINGS BASSWOOD

Species nova

Kendall Laughlin (1890-    )
Apartment 6E, Manor Drive, Hot Springs, Ark.

Arbor cylindrica, in cacumine fastigans, procero recto trunco et numerosis gracilibus aequis ramis in finibus leviter langidis, diametro 102 cm, fastigio 34 m, 360 annis aetatis adipiscens. Cortex fuscus cinereus et planus, in arboribus ultra 13 cm diametro sejunctus in segmenta ad perpendiculum directa circiter 1 cm lata cum fissuris .2-.8 cm latis. Praecedentis temporis ramuli glabri, plerumque viridi-brunnei aut pallidi cinereo-brunnei, interdum rufo-brunnei, 1.5-2.5 mm densi. Superae extremae hiemales gemmae 1-6, 2.5-5 mm longae, ovoidae, lucidae rufobrunneae, glabrae.

Matura supera folia 7.2-15.5 cm longa, 5.5-11.5 cm lata, tenuia, frequenterrime cordata, interdum ovata aut orbicularia, cum base plerumque cordata aut oblique cordata et apice acuminato, plerumque serrata latis dentibus cum acumine miniore quam 1 mm longo, supra plerumque hebetia fusca galbina, subtus pallidiora et hebetia, supra glabra, subtus glabra aut minutis axillaribus pilis cristata aut stellata puberula. Folia superorum juvenium expandentium foliorum fusca galbina, supra glabrata, subtus tomentulosa, cum puberulis petiolis. Angulus inter parem principalium venorum in base folii emergentium et costam mediam 38°-51°.

Petioli maturorum superorum foliorum 3.1-5.3 cm longi, graciles angulati glabri. Stipulae chartaceae, 7-8 mm longae, 2.5 mm latae, oblongae, caducae.

Inflorescentia, extrema aut axillaria, constat bractae, oscillante pedunculo, pedicellis, floribus, qui continent 5 sepala, 5 petala, 4 aut 5 staminodia, numerosa stamina, 1 pistillum. Bractea plerumque sessilis aut subsessilis, raro cum caudice 5-8 mm longo, glabra, plerumque oblonga, in apice obtusa, in base angustata, 47-122 mm longa, 13-30 mm lata.

Oscillans pedunculus florum glaber, 13-57 mm longus. Flores florentes 10 Junius ad 10 Julius in puberulis pedicellis in plerumque 7-9-floridis cymis, 6-7(-10) mm lati, 5-9 mm alti, poculoformes. Sepala lanceolata, 3-3.6 mm longa, 1.5-2 mm lata. Petala oblonga aut oblonga-lanceolata, 4-5 mm longa, 1-1.5 mm lata. Staminodia lanceolata, 2-3 mm longa. Stamina 1-2 mm longa. Antherae flavae aut luteo-flavae. Pistillum 4.6 mm longum, anthesi conclusum, maturatione producens ad 6 mm.

Fructus maturescens et plerumque cadens ex 13 Julius ad 1 Augustus, globosus aut subglobosus, cinereus aut viridi-brunneus tomentulosus, (3-)5-7 mm diametro, raro subglobosus et 9 mm lato tenus; exocarpos .5-1 mm densus; semen 1, raro 2, 3.5-4.8 mm longum, 3.5-4 mm latum, raro 5 mm longum et tum intra endocarpon conclusum.

Holotypus: US.

TILIA RELICTA LAUGHLIN

A cylindric tree, tapering at the top, with a tall straight trunk and numerous slender horizontal branches, slightly drooping at the ends, attaining a diameter of 102 cm, a hight of 34 m and an age of 360 years. Bark dark gray, flat and smooth, on trees more than 13 cm in diameter becoming separated into vertical segments about 1 cm wide with fissures .2-.8 cm wide. Last year's branchlets glabrous, usually greenish brown or light grayish brown, occasionally reddish brown, 1.5-2.5 mm thick. Crown terminal winter buds 1-6, 2.5-5 mm long, ovoid, lustrous reddish brown, glabrous.

Blades of mature crown leaves 7.2-15.5 cm long, 5.5-11.5 cm wide, thin, most commonly cordate, occasionally ovate or orbicular, with a base usually cordate or obliquely cordate and acuminate apex, usually serrate with broad teeth with a tip less than 1 mm long, usually dull dark yellow green above, paler and dull beneath, glabrous above, glabrous, tufted with minute axillary hairs or stellate puberulent beneath. Blades of young unfolding crown leaves dark greenish yellow, glabrate above, tomentulose beneath, with puberulent petioles. The angle between the pair of primary veins emerging at the base of the blade and the midrib ranges from 38° to 51°.

Petioles of mature crown leaves 3.1-5.3 cm long, slender, angled, glabrous. Stipules chartaceous, 7-8 mm long, 2-5 mm wide, oblong, caducous.

The inflorescence, terminal or axillary, consists of a bract, swinging peduncle, pedicels and flowers, which comprize 5 sepals, 5 petals, 4 or 5 staminodia, numerous stamens, and 1 pistil. Bract usually sessile or subsessile, rarely with a stalk 5-8 mm long, glabrous, usually oblong, obtuse at apex, narrowed at base, 47-122 mm long, 13-30 mm wide. Swinging peduncle of flowers glabrous, 13-57 mm long. Flowers blooming June 10 to July 10 on puberulous pedicels in usually 7-9-flowered cymes, 6-7(-10) mm wide, 5-9 mm high, bowl-shaped. Sepals lanceolate, 3-3.6 mm long, 1.5-2 mm wide. Petals oblong or oblong-lanceolate, 4-5 mm long, 1-1.5 mm wide. Staminodia lanceolate, 2-3 mm long. Stamens 1-2 mm long. Anthers yellow or orange yellow. Pistil 4.6 mm long, included in anthesis, lengthening to 6 mm in maturation.

Fruit ripening and usually falling from July 13 to Aug. 1, globose or subglobose, gray or greenish brown tomentulose, (3-)5-7 mm in diameter, rarely subglobose and up to 9 mm wide; exocarp .5-1 mm thick; seed 1, rarely 2, 3.5-4.8 mm long, 3.5-4 mm wide, rarely 5 mm long and then enclosed within endocarp.

## DISCUSSION

Whittington Park, in the northwest part of the city of Hot Springs, Arkansas, is an east-west park about 1000 yards long and 200 feet wide. The west fork of Hot Springs Creek flows thru the middle of it. The north and south roadways of Whittington Avenue border the park. Whittington Park has been a part of the Hot Springs National Park for more than fifty years. The area commonly understood to be the Hot Springs National Park is the mountainous area south of Whittington Park.

Whittington Park contains a colony of 19 Basswoods of a unique species, upon which I am bestowing the name <u>Tilia relicta</u>. These trees are arranged in a row on each side of the creek. Their linear arrangement and orderly spacing look artificial, but the information given me by the Chief of Maintenance is convincing that none of these trees were planted and that their arrangement near the creek is a consequence of the microclimate. _T_. _relicta_ is a monotopic species confined to Whittington Park.

A map of Whittington Park accompanies this article. I have given numbers to these 19 Basswoods. #1 is in the northeast corner of the colony and I am designating this tree as the type tree of the new species. The numbers run west along the north side of the creek and then east on the south side of the creek.

_T_. _relicta_ is the most magnificent and perfectly shaped deciduous tree that I have ever seen. The leader goes straight up, undaunted by overtopping foliage of Sycamores or other trees. The slender limbs spred out horizontally and complete the design of a tall, symmetric tree. The trunk is perfectly round and the flat, smooth bark is different from the furrowed bark of other species of _Tilia_ and different from anything that I have ever seen except Red Ash.

The largest of these 19 Basswoods is more than twice as big as any of the other 18 trees. This tree, No. 6 on the accompanying map, is about 50 feet north of the creek and 175 feet west of West Mountain Drive, which crosses the park. This tree, which I shall call "The Monarch," is now 10 feet 4 inches in circumference, 3 feet 4 inches in diameter and 93 feet tall. I mesured the hight of this tree with an Abney level 6 Dec. 1954 and found it was 111 feet tall. In the late 1960's the leader died, probably having been struck by lightning, and it was cut off. The leader is growing again, but of course the tree is not as tall as it once was. This tree has been shown in the American Forestry Association's champion tree list as "Florida Basswood, _Tilia_ _floridana_," for many years.

I have taken mesurements of the circumference of this tree for 22.3 years. The growth rate during this period, shown in Table 1, indicates that this tree is 346 years old.

About ten years ago a tornado moving southwest passed over this colony. During the last 57 years five tornadoes have passed thru Hot Springs. At this rate, it can be estimated that The Monarch has survived thirty tornadoes without injury.

Relicta has a remarkable stout and expansive horizontal root system, extending as much as ten feet from the trunk in all directions. None of these trees could ever be uprooted in a storm.

Some twenty years ago I corresponded with various authorities in efforts to identify The Monarch. I had no knowledge of the flowers at that time and my material was nearly all leaves. Consequently the results were somewhat uncertain. I was groping around at that time, trying to hook up this tree with something that had been described. After moving to Hot Springs in 1969, studying the trees in the colony thruout the year and getting adequate material for identification, I became convinced that they represented an undescribed species. I show below references to correspondence for the benefit of those persons that may wish to review the correspondence; these references may also be useful to locate the specimen of relicta in the herbarium, where it might have been labeled floridana, nuda or leucocarpa.

Lily M. Perry's letter of 7 Jan. 1950.
William A. Dayton's letter of 1 Mar. 1950, file RD Dendrology Identification Tilia.
Dwight M. Moore's letter of 24 June 1954.
G. N. Jones's letter of 13 Apr. 1960.

Table 1, Morphology of Tilia, herein shows the characters of Tilia relicta, americana L., caroliniana Mill., caroliniana var. rhoophila Sarg. and floridana Small. The figures shown are averages except those referenced "@" and "*." This table is of extreme importance in distinguishing the respective species.

The characters of relicta shown in Table 1 represent averages or actual mesurements of the 19 trees in the colony and not merely the type tree. The terminal winter buds are an average of 14 specimens from 7 trees. They wither away rapidly after the twigs are cut and herbarium specimens should not be used for a description. The dimensions of the leaves and petioles are an average of specimens from 9 trees. Number of flowers, peduncle and tract are an average of many inflorescences with flowers from 6 trees that bloomed in 1971.

The dimensions and characters of the leaves and petioles (vegetative) of americana var. americana in

Table 1 represent averages of 22 specimens collected by me from 19 localities in five states, viz: Warren Woods (Mich.), Ind. Dunes, Turkey Run (Ind.), Labagh Woods, Chechupinqua, River Grove, Miami Woods, W. Riverside Woods, Black Partridge Woods, White Pines, Brownfield Woods (Ill.), Swope Park, Mt. Washington Woods, Van Meter, Meramec, Bennett Spring, Roaring River (Mo.), Buffalo River and Delzie Demaree's #61784 from Fiftysix (Ark.). The dimensions of the flowers and fruits are taken from collections that I made in the Chicago region and Swope Park in 1951-1959.

The dimensions and characters of caroliniana var. caroliniana in Table 1 apply to the AFA champion at Bard Spring on Blaylock Creek in Polk County in the Ouachita National Forest of Arkansas with the exception of the fruit, which I have not seen. I collected leaves 12 Sep. 1970 and leaves and flowers 24 June 1971. This tree has a circumference of 3 feet 6 inches and a hight of 64 feet. I have taken the description of the fruit from Sargent's Manual of the Trees of North America. The diameter of the fruit shown therein, 1/8 inch, 3 mm, is also shown by Harrar & Harrar, Vines and Brockman for this species.

The dimensions and characters of caroliniana var. rhoophila in Table 1 are taken from 12 specimens collected in Glenwood and Bard Spring in 1939-1958.

There are two columns of data for floridana in Table 1. The first column shows the characters described for the species in Sargent's "Manual of the Trees of North America" and the second column shows the characters described in J. K. Small's "Manual of the Southeastern Flora" (1933); except that the figures preceded by an asterisk (shown in both columns) were furnished by Professor Ronald L. McGregor of the University of Kansas in his letter 3 July, 1972 and represent mesurements of an isotype of T. floridana Small from Jackson County, Florida in their herbarium.

The last line in Table 1 shows the growth rates of three taxa. The figures are the average annual increment in inches of the circumference of the trunk mesured at 54 inches above the ground over a period of years. The figure for americana is the average of three trees in Indiana, Illinois and Missouri. The latter tree, in Wildcat Hollow, Swope Park, Kansas City, Mo., has an annual growth rate of .66 inch with, a record of 28.8 years and is 156 years old. The figure on _caroliniana_ var. _rhoophila_ is based on a 7 year record of a tree on the Caddo-River at Glenwood, Ark., which was broken off in a storm in 1950. The equivalence of the growth rates of _americana_ and _caroliniana_ var. _rhoophila_, .57 inch, may be slightly coincidental, but the growth rate of _relicta_, .36, which is that of The Monarch, is much less.

In choosing material of _americana_ in Table 1 I have refrained from using leaves in the Kansas City area of the type described as _T. palmeri_ Bush ex F. C. Gates in Kan.Acad.Sci.Trans. 42:135. Mention is made on pages 45, 61 and 62 of G. N. Jones's Taxonomy of American Species of Linden, Ill.Biol.Mon. 39, of a similar type described as _T. velutina_ Mackenzie ex V. Engler and _T. americana_ var. _vestita_ (A. Braun) V. Engler. The leaves of this type are thicker and smaller than _americana_, unsymmetrically subcordate at the base, coarsely serrate, scabridulous above, pale or glaucous and never lustrous beneath with conspicuous cross-veins, and the left and right primary veins do not leave the midrib at the same point. Plate 4, page 125 of Jones's monograph, shows typical leaves of _palmeri_. Further study, particularly of the parts of its flowers, is needed to determine where it belongs.

Table 2 shows in the last two columns for _americana_ and _floridana_ percentages reflecting the differences between the figure in Table 1 for _americana_ or _floridana_ and the figure shown in Table 1 for _relicta_. The percentages are arrived at by ascertaining the difference between the figure for _relicta_ and the figure for _americana_ or _floridana_ in Table 1 and dividing this figure by the figure for _americana_ or _floridana_ in Table 1.

For example, Table 1 shows that the length of the petiole divided by the length of the blade of _relicta_ is .39; of _americana_, .46; of _floridana_, .26. .46 minus .39 equals .07. .07 divided by .46 equals 15%. .39 minus .26 equals .13. .13 divided by .26 equals 50%.

At the bottom of Table 2 there are totals of figures in the two columns where there are figures on the same line in both columns. These figures represent the accumulated differences of characters between _relicta_ on the one hand and _americana_ and _floridana_ on the other hand. The totals, 192 for _americana_ and 339 for _floridana_, show that _relicta_ is much

more closely related to americana than to floridana.
Some of the resemblances of relicta to americana are rather striking, such as the shape of leaf blades and base, angle of primary veins at base, and number of flowers to a bract.

In the Pleistocene epoch Tilia and other northern genera were forced southward. Tilia of this epoch prefers a northern climate, and after the ice sheets retreated and the climate warmed up, americana spred out in the North; but in the South Tilia was able to survive only under exceptionally favorable conditions. The condition in the Ouachita Mountain Region of Arkansas is an east-west valley north of a mountain range. Whittington Park is such; Bard Spring on Blaylock Creek is another.

My opinion is that the prototype of relicta was americana or its progenitor. The relationship of relicta to americana is mathematically substantiated by Table 2 and the totals at the bottom of the table. I assume that americana or its prototype was common in the Hot Springs area in the Pleistocene epoch; but after the climate warmed up americana or its prototype moved northward. Only the colony in Whittington Park remained. During the past hundred thousand years the population of relicta has been isolated from other Basswoods and has developed in orthogenetic evolution to produce the present species. Bees diligently serve the flowers of Tilia, and cross-pollination has effectively homogenized the characters of relicta's population.[1]

The southern boundary line of the range of americana is accurately shown on page 48 of Jones's monograph. The point on this boundary line that is closest to Hot Springs is approximately the town of Fiftysix, Arkansas, in Stone County in the Ozark National Forest 110 miles distant from Whittington Park. This colony of relicta is therefore 110 miles distant from the range of americana.

The keen sensitivity of americana to the microclimate of its habitat and its reliance thereon for survival are mentioned on page 694 of Agriculture Handbook 271, Silvics of Forest Trees. The restricted habitat of relicta strikingly displays its reliance on microclimate. These trees are confined to a distance of fifty feet from the west fork of Hot

Springs Creek and no trees can be found outside Whittington Park. Local authorities say that the temperature in Whittington Park is about ten degrees cooler than in the surrounding mountains. This microclimate accounts for the survival of _relicta_.

_Relicta_ does not sucker like _americana_. #6 and #11 are the only trees that send out suckers at the base. The sprout leaves and crown leaves are not significantly different.

In 45% of my specimens of leaves of _americana_ the undersurface is lustrous. The undersurface of the leaves of _relicta_ is never lustrous.

The following Table shows the variations in serration and pubescence of the undersurface of the leaf blades of ten trees of _relicta_.

TABLE SHOWING VARIABLE CHARACTERS OF THE LEAF BLADES OF INDIVIDUAL TREES OF TILIA RELICTA

| TILIA RELICTA | SERRATION | SHAPE OF BASE | PUBESCENCE OF UNDERSURFACE | |
|---|---|---|---|---|
| | | | MIDRIB | PARENCHYMA |
| #1 | Remotely crenulate serrulate | Obliquely cordate | Stellate puberulent | Stellate puberulent |
| #2 | Serrate with short broad teeth | Obliquely cordate | Glabrous | Stellate puberulent |
| #4 | Do. | Cordate | Glabrate | Glabrous |
| #6 | Do. | Obliquely cordate | Axillary tufts | Glabrous |
| #7 | Do. | Cordate | Axillary tufts | Glabrous |
| #10 | Do. | Obliquely cordate | Glabrous | Glabrous |
| #11 | Do. | Obliquely truncate | Glabrous | Glabrous |
| #13 | Do. | Cordate | Glabrous | Glabrate |
| #14 | Do. | Cordate | Axillary tufts | Glabrous |
| #17 | Do. | Cordate | Axillary tufts | Stellate puberulent |

The undersurface of the leaf blades may be glabrous or stellate pubescent or have minute tufts of axillary hairs. These variations show how absurd has been the practice of botanists for two hundred years in classifying the species of Tilia by the hairs on the undersurface of the leaves.

Taxonomists of Tilia must come to realize (1) that the pubescence of the undersurface of the leaf blades is a trivial and variable character and of no significant diagnostic value in distinguishing the glabrate species; (2) that the flowers are as important as in _Crataegus_ and the parts of _fresh_ flowers must be mesured; and (3) that the definitive mesurement of other organs should be the average of mesurements of a considerable number of typical and well developed pieces of each organ.

The glabrate species of _Tilia_ should be distinguished by substantial characters, such as bark, twigs, winter buds, leaves, flowers and fruit.

The flowers of _Tilia_ should be studied and dissected in the laboratory because of the difficulty of examining such crowded flowers in the field. Even tho excruciatingly difficult, each of the sepals, petals, staminodia, stamens and pistil, crowded together in a space less than a centimeter wide, must be mesured in a fresh flower. First the sepals are mesured and then clipped off; the petals are mesured and then clipped of; and so on. The flowers wilt fast, even under refrigeration, and they should be dissected within 48 hours after being plucked. Herbarium specimens are worthless for accurate study.

The high chromosome number of Tilia, 41, indicates the existence of many diagnostic characters.

The latest opus on _Tilia_ that I have seen is George Neville Jones's "Taxonomy of American Species of Linden (Tilia)," published by the University of Illinois Press as Illinois Biological Monograph 39 in 1968. On page 31, in comparing paleobotanists with neobotanists, he says, "Study of living trees in the field will not alter these conditions," i.e., herbarium specimens, and "It would appear that in this respect the neotaxonomist studying contemporary floras often has only a slight advantage over his paleobotanical colleagues." This sounds like a demonstration of meagerness in his material. Table 1 herein shows 34 characters useful in identification, some of which must be ascertained from material collected very recently.

Jones unites _floridana_ with _caroliniana_ and states on page 93 that _floridana_ is indistinguishable from _caroliniana_. Table 1 herein shows that in 13 cases the characters of _floridana_ differ from _caroliniana_ var. _caroliniana_ by more than 8%.

Jones disregards eight glabrate species in the South described by Sargent.

I accept no part of Jones's taxonomy of Tilia. In the first place, there is nothing to show that he studied Southern species; on page 31 he spurns the idea. In the second place, he bases his classification on pubescence, a trivial and variable character of no diagnostic value in distinguishing the glabrate species of Tilia. In the third place, the range of dimensions of organs in the description of his collective species caroliniana on page 86 is in some cases less than the dimensions of the AFA champion at Bard Spring. In the fourth place, in his determination to wipe out the Southern entities he has ignored distinctive characters, such as the lobed leaves of texana Sarg. In the fifth place, his union of floridana with caroliniana is untenable for many reasons.

Discrepancies between Jones's mesurements and the dimensions of the AFA champion at Bard Spring are shown in the following table.

| | TILIA CAROLINIANA VAR. CAROLINIANA | |
|---|---|---|
| | JONES | AFA CHAMPION |
| Length of winter buds mm | 3-4 | 6.5 |
| Length of petioles cm | 2-4 | 5-7.5 |
| Hight of flowers mm | 6-7 | 8.5-10 |
| Length of sepals mm | 4-5 | 5-7 |
| Length of petals mm | 5-6 | 6-7 |
| Length of staminodia mm | 4-5 | 5-6.5 |

Jones's monograph contains list of thousands of specimens examined by him but the names given to the material by the collectors are not shown. To explain his method, on page 2 praises C. R. Ball's "centripetal" method, where "the specimens should be sorted out by geographical areas without regard to the names which have been applied to them previously." If I were an inveterate collector, I would resent the author's idea of changing my identification of the material to conform to his idea of what should grow in that locality if I thought I knew more about it than he did.

Relicta differs from mexicana as described on page 98 of Jones's monograph in being larger, bark not furrowed, flowers smaller, bracts and peduncle glabrous, pedicels puberulous, sepals, petals, staminodia, pistils and fruit smaller.

Efforts to make the genus Tilia monotypic in the United States, as was done by George K. Brizicky in Journ.Arn.Arb. 46:291.1965, are too crude to be accepted by thorogoing taxonomists. Brizicky did not show that he studied any trees in the field. Certainly no one should unite species unless he has studied in the field both species as originally described, examined the flowers and mesured their parts and has convinced himself that the two species are identical.

Even if there be a continuum between americana, caroliniana and floridana, the characters of these species shown in Table 1 are distinctive enough to justify their recognition as distinct species.

Britton & Shafer in "North American Trees" state that the fruit of floridana is 5-6 mm in diameter. Sargent in "Manual of the Trees of North America" says it is ½ inch (13 mm) in diameter. One of them must be wrong.

I hypothetize a herbarium sheet correctly labeled floridana with fruit 6 mm in diameter, perhaps immature. A superficial worker, an ardent lumper, noting that the dimensions of the fruit given by Sargent are 13 mm for floridana and 3 mm for caroliniana and that 6 is intermediate, immediately asserts that caroliniana and floridana are conspecific and indistinguishable. But he has judged the specimen by only one character; many others should be considered.

Where there is a continuum, it is very essential that the descriptions of the recognized species correspond strictly to typical trees of the species, with no intermediates or deviatives.

To identify a specimen, a form should be made up with the organs (except the width of the bract) shown on the left side of Table 1 entered on the left side of the form. Then each organ of the specimen is mesured--preferably an average of mesurements of several pieces of each organ--and the figure or character is entered on the form opposite the name of the organ. Then, for each organ, the figure or character on the form is compared with the figures or characters for the various taxa in Table 1, and the name of the taxon whose figure or character in Table 1 comes closest to the figure or character on the form is entered on the form. Then the whole form is perused and the taxon whose name appears the greatest number of times is recognized as the identity of the specimen.

If it should develop that there is a group of specimens with similar characters whose characters are substantially different from any taxon in Table 1, that would create a suspicion that they represent a species yet to be ascertained.

I am indebted to Delzie Demaree for specimen material of Tilia from various parts of Arkansas.

Seeds for propagation have been furnished to Harold G. Hillier of Hillier & Sons, Winchester, England.

The holotype will be deposited in the United States National Museum of Natural History, Washington, D.C., and isotypes will be deposited in the Royal Botanic Gardens, Kew, England and the herbaria of the University of Kansas at Lawrence and the University of Illinois at Urbana.

---

[1]There is also a possibility that relicta represents the prototype of americana and that americana is the result of orthogenesis from the prototype. In any event, relicta and americana reflect a separation from the original type.

TABLE 1
MORPHOLOGY OF TILIA

| CHARACTER | TILIA RELICTA | TILIA AMERICANA VAR. AMERICANA | TILIA CAROLINIANA VAR. CAROLINIANA | TILIA CAROLINIANA VAR. RHOOPHILA | TILIA FLORIDANA SENSU SARGENT | TILIA FLORIDANA SENSU SMALL |
| --- | --- | --- | --- | --- | --- | --- |
| Bark................ | Smooth, narrowly fissured | Furrowed | Furrowed | Narrowly fissured | .......... | Furrowed |
| Branches............. | Slender horizontal | Ascending | Ascending | Spreding | .......... | .......... |
| Last year's Branchlets | Greenish brown | Light greenish brown | Mottled greenish brown | Mottled gray | Red-brown or yellow | Red-brown or yellow |
| Pubescence.......... | Glabrous | Glabrous | Glabrous | Densely pubescent | Glabrous | Glabrous |
| Length of Terminal Winter Buds mm........ | 3.7 | 6.5 | 6.5 | 4.7 | 4.2 | ......... |
| Leaf Blades of Crown Leaves.......... | | | | | | |
| Thickness.......... | Thin | Thin | Firm | Thin | Thin | ......... |
| Serration.......... | Serrate with short broad teeth | Serrate with broad apiculate teeth | Sharply serrate with apiculate teeth | Serrate-dentate | Coarsely serrate | Mucronate-crenate |
| Length cm.......... | 10.4 | 12.9 | 13.2 | 14.9 | *8.8 | *8.8 |
| Width cm........... | 8.6 | 11.3 | 9.2 | 11.4 | *6.1 | *6.1 |
| Width/Length............ | .83 | .88 | .70 | .77 | *.69 | *.69 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Shape............... | Cordate | Cordate | Ovate | Ovate | Broadly ovate | Broadly ovate |
| Base................ | Cordate or obliquely cordate | Cordate or obliquely cordate | Obliquely truncate | Subcordate | Cordate or obliquely truncate | Various |
| Angle That the 2 Primary Veins Emerging at the Base of the Blade Make with the Midrib......... | 45° | 47° | 29° | 34° | *32° | *32° |
| Pubescence of Lower Surface............ | Tufts of axillary hairs | Tufts of axillary hairs | Glabrous | Hoary pubescent | Glabrate | Glabrous |
| Petioles of Crown Leaves................ Length cm........... | 4.1 | 5.9 | 6.3 | 4.4 | *2.3 | *2.3 |
| Length of Petiole / Length of Blade .. | .39 | .46 | .48 | ........... | *.26 | *.26 |
| Pubescence.......... | Glabrous | Glabrous | Glabrous | Pubescent | Glabrous | .......... |
| Flowers......(Time of Blooming) | June 10 to July 10 | June 20 to July 30 | June 10 to July 10 | ........... | May 30 to-- | .......... |
| @Width mm........... | 6-7 | 8-16 | 9-10 | ........... | ........... | .......... |
| @Hight mm........... | 5-9 | ........... | 8.5-10 | ........... | 5-6 | .......... |
| @Sepals--Length mm... | 3-3.6 | 5 | 5-7 | ........... | ........... | .......... |
| @Petals--Length mm... | 4-5 | 7 | 6-7 | ........... | ........... | .......... |
| @Staminodia-Length mm | 2-3 | ........... | 5-6.5 | ........... | ........... | .......... |
| @Stamens--Length mm.. | 1-2 | ........... | 2-4 | ........... | ........... | .......... |
| @Pistil--Length mm | 4.6 | 4.5 | 5-7 | ........... | ........... | .......... |

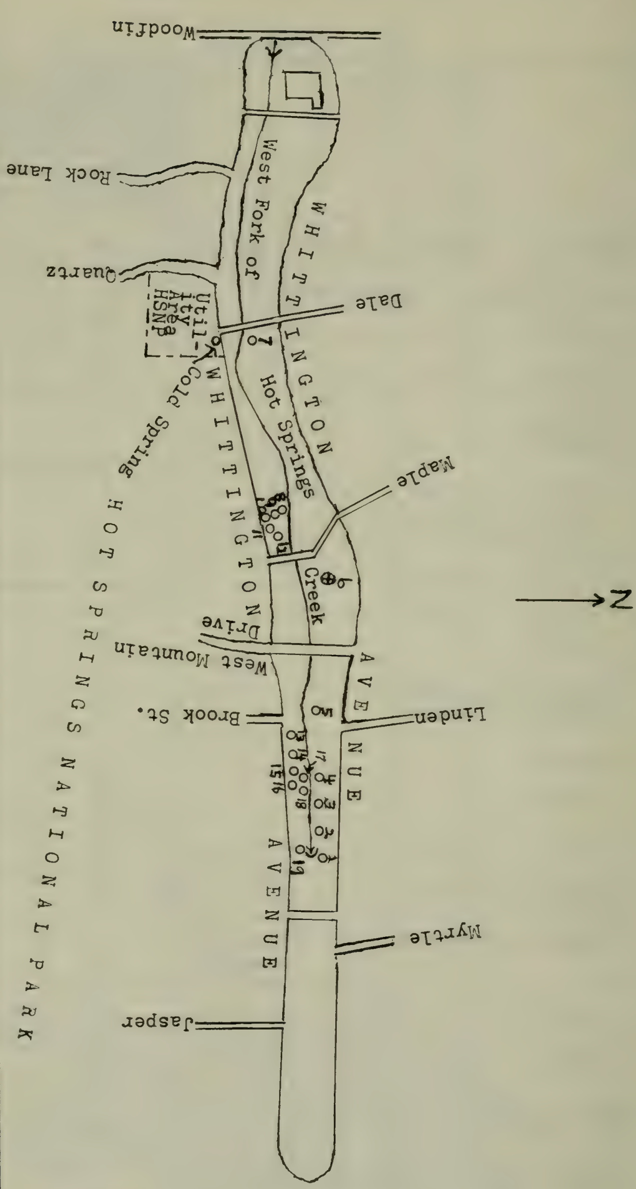
| CHARACTER | TILIA RELICTA | TILIA AMERICANA VAR. AMERICANA | TILIA CAROLINIANA VAR. CAROLINIANA | TILIA CAROLINIANA VAR. RHOOPHILA | TILIA FLORIDANA SENSU SARGENT | TILIA FLORIDANA SENSU SMALL |
|---|---|---|---|---|---|---|
| Flowers<br>Number of Flowers Attached to a Bract. | 7-9 | 8 | 11 | .......... | .......... | .......... |
| Swinging Peduncle of Flowers--Length mm.. | 30 | 25 | 34 | .......... | 51 | 30 |
| Pubescence of Pedicels........... | Puberulous | Glabrous | Puberulous | .......... | Hoary-tomentose | Hoary-tomentose |
| Bract.............. | Glabrous | Glabrous | Glabrous | .......... | Glabrous | Glabrous |
| Length mm ........ | 85 | 77 | 92 | .......... | 114 | 120 |
| Width mm.......... | 19 | 16 | 19 | .......... | 16 | 18 |
| Fruit Ripening and Usually Falling....... | July 13-Aug. 1 | Sep.-Oct. | July? | .......... | Aug.-Sep. | .......... |
| @Diameter mm | 5-7 | 6-9 | 3 | .......... | 13 | .......... |
| Average Annual Increment of Circumference inches............... | .36 | .57 | .......... | .57 | .......... | .......... |

@ Actual dimensions. All other figures are averages.

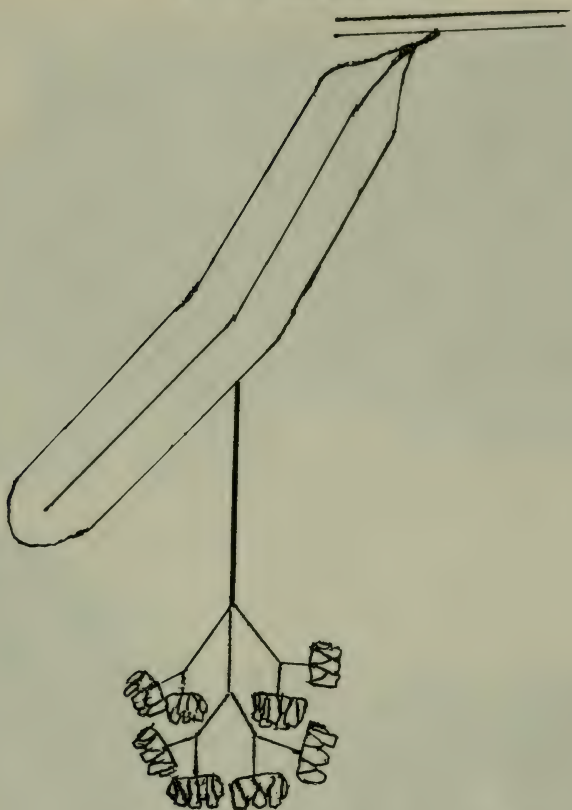
* These figures represent mesurements of leaves of an isotype of _T. floridana_ Small from Jackson County, Florida in the herbarium of the University of Kansas and were furnished by Prof. Ronald L. McGregor.

TABLE 2

| CHARACTER | PERCENTAGES OF DIFFERENCES BETWEEN TILIA RELICTA AND | |
|---|---|---|
| | TILIA AMERICANA | TILIA FLORIDANA |
| Length of Terminal Winter Buds. | 43 | 12 |
| Leaf Blades of Crown Leaves.... Length...................... | 19 | 18 |
| Width....................... | 24 | 41 |
| $\frac{\text{Width}}{\text{Length}}$..................... | 6 | 20 |
| Angle That the 2 Primary Veins Emerging at the Base of the Blade Make with the Midrib..................... | 4 | 41 |
| Petioles of Crown Leaves Length...................... | 31 | 78 |
| $\frac{\text{Length of Petiole}}{\text{Length of Blade}}$............ | 15 | 50 |
| Flowers Width...................... | 46 | .. |
| Sepals--Length.............. | 34 | .. |
| Petals--Length.............. | 36 | .. |
| Swinging Peduncle of Flowers Length | 20 | 0 |
| Length of Bract............. | 10 | 25 |
| Diameter of Fruit............ | 20 | 54 |
| Average Annual Increment of Circumference................. | 37 | .. |
| TOTALS WHERE THERE ARE FIGURES ON THE SAME LINE IN BOTH COLUMNS | 192 | 339 |




WHITTINGTON PARK, HOT SPRINGS, ARK.
The trees of Tilia relicta bear numbers.

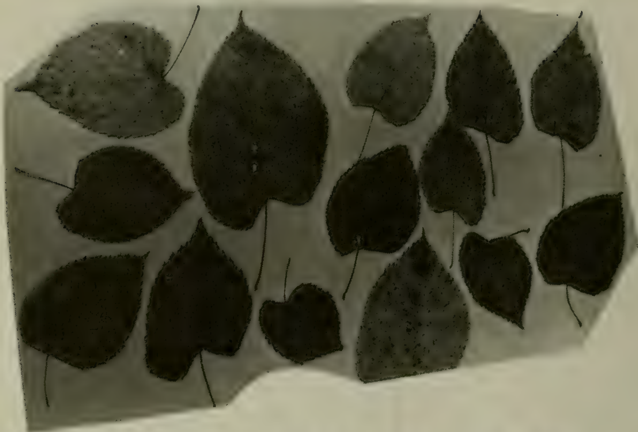


I N F L O R E S C E N C E

O F

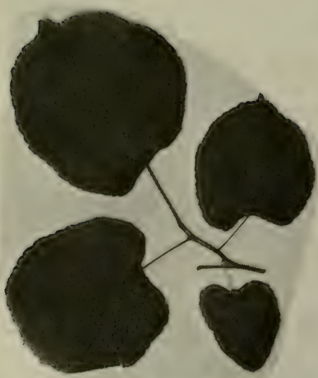
T I L I A   R E L I C T A

X 1



LEAVES OF TILIA RELICTA #6

X 2/9

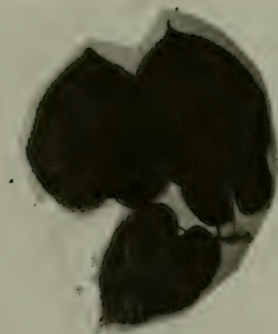


LEAVES X ¼ | X 2/9 FRUIT

TILIA RELICTA #1

FLOWERS OF
TILIA RELICTA #10

X 1/5

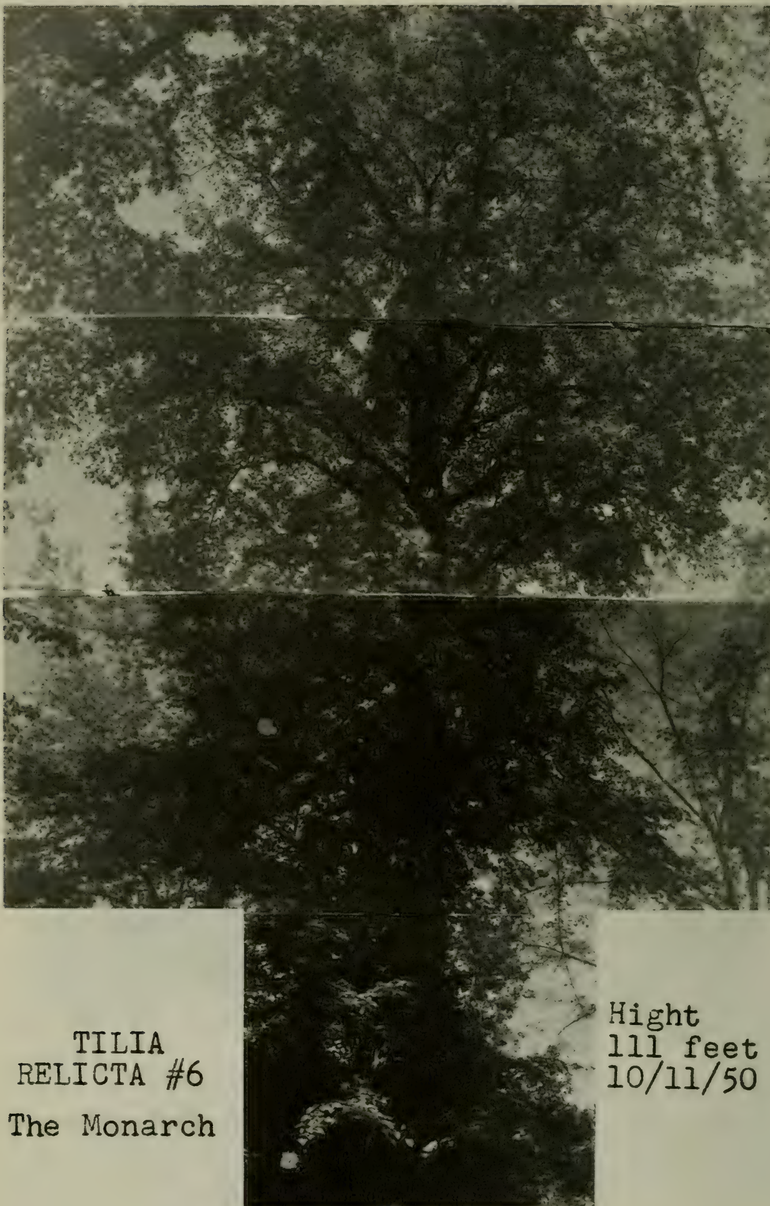


LEAVES OF
TILIA RELICTA #7

X 2/9

LEAVES OF TILIA RELICTA #13

X ¼



TILIA
RELICTA #6

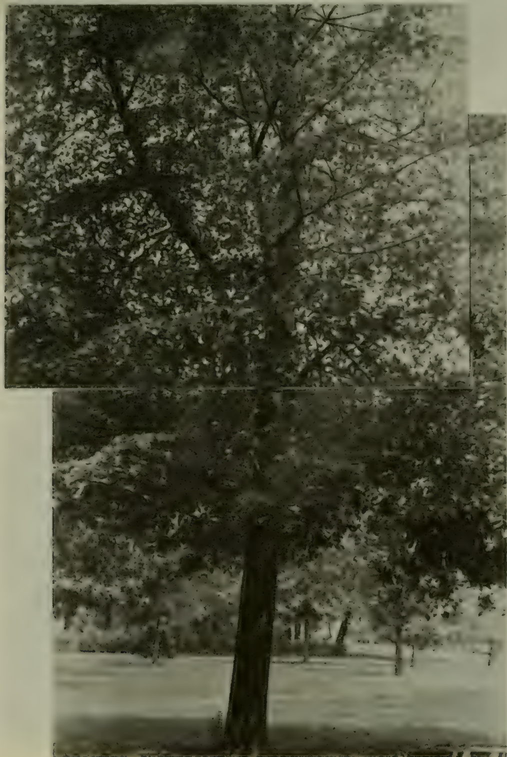
The Monarch

Hight
111 feet
10/11/50

12/10/71
The tree in the right background is a very large Sycamore covered with Hedera helix.

8/19/71

TILIA RELICTA #6
The Monarch
Circumference 10 feet 4 inches
Hight 93 feet
346 years old



8/19/71

TILIA
RELICTA #1

The type
tree

Circumfer-
ence 4'2"

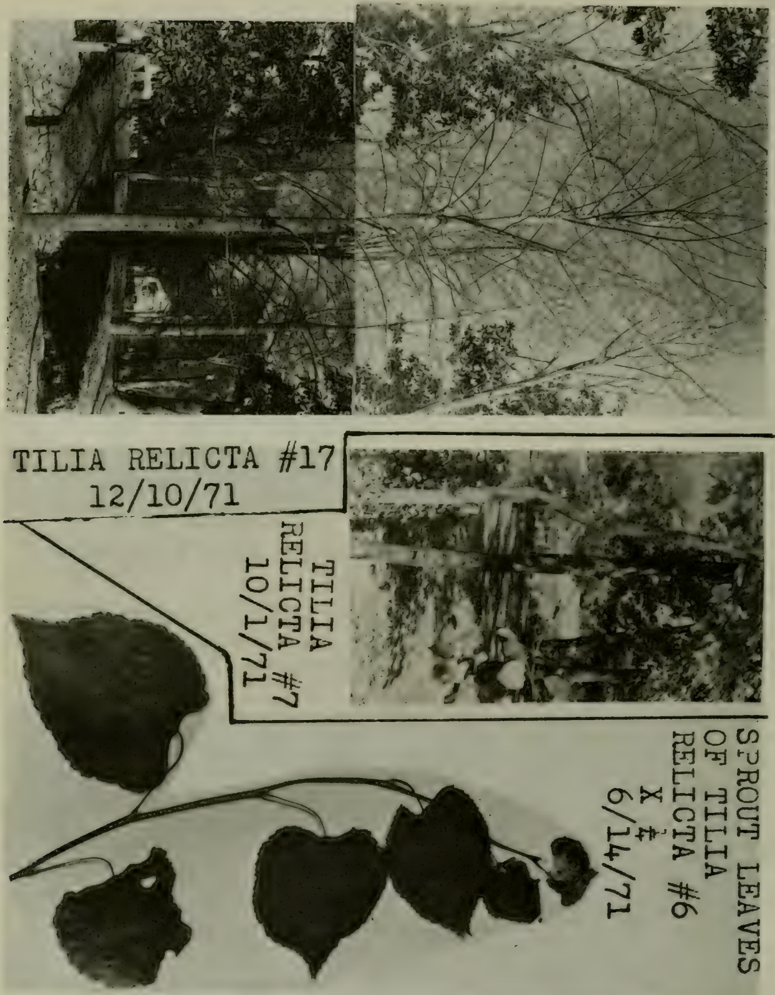
12/10/71

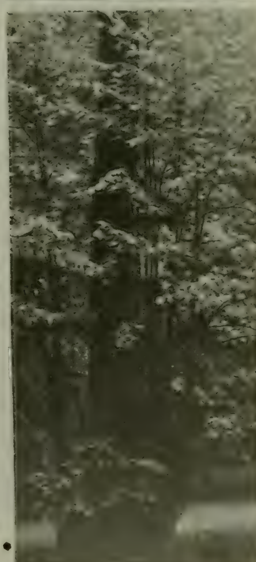
TILIA RELICTA #2

Circumference
4 feet 7 inches

10/1/71
This tree was struck by lightning. Its torn off leader appears, resting on limbs.
#1 is in the left background.

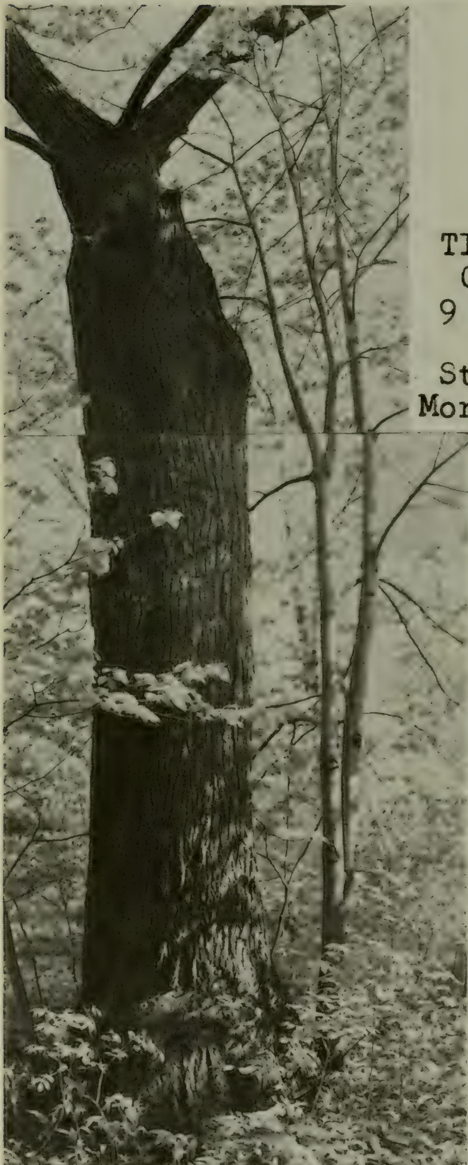
9/28/70


TILIA RELICTA #17
12/10/71
TILIA
RELICTA #7
10/1/71
SPROUT LEAVES
OF TILIA
RELICTA #6
X ¼
6/14/71



9/16/70
TILIA AMERICANA
Circumference 8'7"
Age 156 years
Wildcat Hollow,
Swope Park,
Kansas City, Mo.

9/20/50
TILIA AMERICANA
Circumference 9'10"
The Shades State Park, Ind.



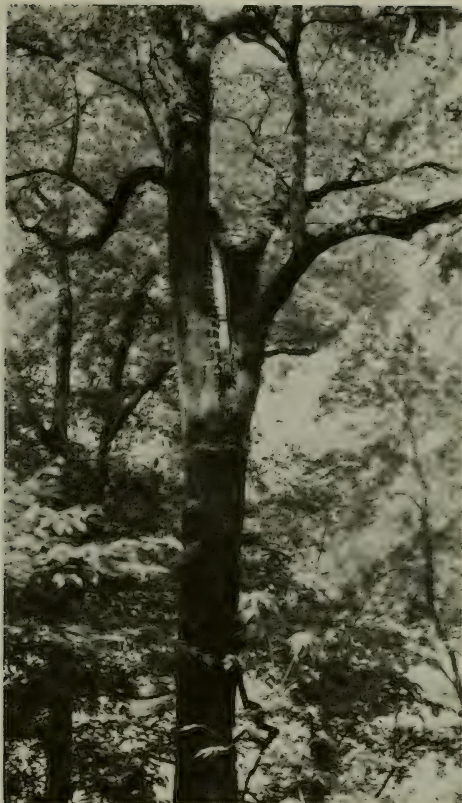
5/2/42
TILIA AMERICANA
Circumference
9 feet 4 inches

St. Paul Woods,
Morton Grove, Ill.

9/12/70 | X 2/9 6/24/71

TILIA CAROLINIANA VAR. CAROLINIANA
The left tree is the AFA champion
Circumference 3 feet 6 inches
Hight 64 feet

Bard Spring on Blaylock Creek in Polk
County in the Ouachita National Forest
of Arkansas



9/27/47
TILIA CAROLINIANA VAR. RHOOPHILA
Circumference 7 feet 3 inches
Hight 76 feet
West bank of Caddo River, Glenwood, Ark.
This tree was broken off in a storm in 1950.

ADDITIONAL NOTES ON THE ERIOCAULACEAE. XXXVIII

Harold N. Moldenke

ERIOCAULACEAE Lindl., Veg. Kingd. 122. 1847.

Additional synonymy: Erdiocaulaceae Anon., Biol. Abstr. 54 (1): B.A.S.I.C. S.184, sphalm. 1972.

Additional & emended bibliography: Pers., Sp. Pl. 1: 283—284 (1817) and 2: 464. 1819; Steud., Syn. Pl. Glum. 2: [Cyp.] 261, 267—283, 311, 332—334, 340, 342, & 347. 1855; Böck., Flora 56: 90—92. 1873; R. Schomb., Fl. S. Austr. 62. 1875; Benth. in Benth. & Hook. f., Gen. Pl. 3 (2): 863 & 1018—1025. 1883; Benth. & Hook. f., Gen. Pl. 3 (2): 1238, 1239, 1244—1246, 1249, 1250, 1252, & 1254—1256. 1883; T. R. Sims, Sketch & Check-list Fl. Kaffr. 80. 1894; Chiov. in Pirotta, Fl. Col. Erit. 1: [Ann. Inst. Bot. Roma 8:] 396. 1903; Wettst., Veg. Südbras. 54, pl. 56 & 57. 1904; Britton & Br., Illustr. Fl., ed. 2, pr. 1, 1: [iii], xxiii, 453—456, & [678]—680, fig. 1140—1145. 1913; Eames in Harger, Graves, Eames, Bissell, Andrews, & Weatherby, Rhodora 19: 126. 1917; Woodward, Rhodora 21: 116. 1919; Harger, Graves, Eames, Bissell, Andrews, & Weatherby, Bull. Conn. Geol. & Nat. Hist. Surv. 48: 35. 1930; Britton & Br., Illustr. Fl., ed. 2, pr. 2, 1: [iii], xxiii, 453—456, & [678]—680, fig. 1140—1145. 1936; Moldenke, Bull. Torrey Bot. Club 68: 67—70. 1940; Tharp, Veg. Tex. 47. 1939; Britton & Br., Illustr. Fl., ed. 2, pr. 3, 1: [iii], xxiii, 453—456, & [678]—680, fig. 1140—1145. 1943; A. C. Martin, Am. Midl. Nat. 36: 523, 533, 652, 654, & 659. 1946; Britton & Br., Illustr. Fl., ed. 2, pr. 4, 1: [iii], xxiii, 453—456, & [678]—680, fig. 1140—1145. 1947; Ohwi, Fl. Jap. [Jap. ed.] 261—267 & 1296. 1953; Goossens, Suid-Afrik. Blom. Pl. 224—225. 1953; Rambo, Sellowia 6: 130 & 156—158 (1954) and 7: 248, 263, 283, & 292. 1956; Darlington & Wylie, Chrom. Atl. 340. 1956; J. K. Jacks., Journ. Ecol. 44: 368. 1956; A. Robyns, Excerpt. Bot. A.1: 215. 1959; Reitz, Sellowia 13: 37, 52, 53, 72, & 90. 1961; Lind & Tallantire, Some Com. Flow. Pl. Uganda 198. 1962; Hylander, Fls. Field & Forest 54, 55, & 220, fig. 1. 1962; J. Hutchinson, Gen. Flow. Pl. 1: 41. 1964; W. K. Martin, Concise Brit. Fl. Pl. 90. 1965; Koyama in Ohwi, Fl. Jap. [Engl. ed.] 265—270. 1965; Batten & Bokelmann, Wild Fls. East. Cape Prov. 7, pl. 5.3. 1966; Rendle, Classif. Flow. Pl., ed. 2, 273—274, fig. 132. 1967; Rao & Kumari, Bull. Bot. Surv. India 9: 110 & 188—189. 1967; Ellis, Swaminathan, & Chandrabose, Bull. Bot. Surv. India 9: 3 & 15. 1967; Hotchkiss, Bur. Sports Fish. & Wildlife U. S. Dept. Int. Res. Publ. 44: [Underw. & Float. Pl.] 25. 1967; Mitra, Elem. Syst. Bot. Angiosp., ed. 2 abrdg., 165—166, fig. 78. 1967; Raynal, Adansonia, ser. 2, 8: 100. 1968; Leandri, Adansonia, ser. 2, 8: 144. 1968; Kapoor, Bull. Bot. Surv. India 10: 29. 1968; Das & Mukerjee, Bull. Bot. Soc. Bengal 23: 185. 1969; Anon., Pacif. Botanists Suppl. sub Moldenke. 1969;

Erdtman, Handb. Palynol. 102, 268, & 269, pl. 28: 6. 1969; Sandaru, Proc. 2nd Asian-Pacif. Weed Control Interchange 135--141. 1969; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 274. 1969; S. P. & R. N. Banerjee, Bull. Bot. Soc. Bengal 23: 170. 1969; C. C. Townsend, Excerpt. Bot. A.15 (6): 418. 1970; Jeanplong, Phyton 14: 94. 1970; Wise, Rhodora 72: 513. 1970; Dirven, Surinam. Landbouw 18 (2): 59. 1970; Britton & Br., Illustr. Fl., ed. 2, pr. 5, 1: [iii], xxiii, 453--456, & [678]--680, fig. 1140--1145. 1970; Soukup, Raymondiana 3: 32, 55, 74, 87, 89, & 95. 1970; Gaussen, Legris, Blasco, Meher-Homji, & Troy, Inst. Franç. Pond. Trav. Sec. Scient. & Techn., Hor. Ser., 10: 82 & 128. 1970; Reitz, Sellowia 22: 145. 1970; Thanikaimoni, Inst. Franç. Pond. Sec. Scient. & Techn. 11: [197], [199], [201], & 243. 1970; Blasco, Journ. Bombay Nat. Hist. Soc. 67: 525. 1970; Kulkarni & Desai, Journ. Bombay Nat. Hist. Soc. 67: 134--135, fig. 1--8. 1970; Hocking, Excerpt. Bot. A.16: 38--40. 1970; N. F. Good, Biol. Abstr. 52: 8223. 1971; "S. R. L.", Biol. Abstr. 52: 8223. 1971; Cusick, Castanea 35: 323. 1971; Guillarmod, Fl. Lesotho 39, 43, 48, 134, & 316. 1971; Brown & Wherry, Bartonia 40: 6. 1971; Inamdar & Patel, Indian Forest. 97: 330. 1971; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1970: 25. 1971; Podlech in K. Rech., Fl. Iran. 89: Erioc. [1]. 1971; Cuf., Bull. Jard. Bot. Belg. 41 (3): Suppl. 1506--1507. 1971; Blasco, Inst. Franç. Pond. Trav. Sec. Scient. & Techn. 10: 94, 115, 117, 121, 123, 124, 260, & 401, fig. 12. 1971; Dwyer, Raymondiana 4: 27. 1971; Hocking, Excerpt. Bot. A.19: 42--43. 1971; Moldenke, Excerpt. Bot. A.19: 43. 1971; I. K. & L. F. Ferguson, Watsonia 8: 400. 1971; Halliday, Watsonia 8: 401. 1971; Satake, Journ. Jap. Bot. 46: 109--111, fig. 1 & 2. 1971; Mueller-Dombois & Perera, Ceylon Journ. Sci. Biol. 9: 13 & 17. 1971; Moldenke, Phytologia 21: 426--432, 504--506, 508, 509, & 512. 1971; Moldenke, Biol. Abstr. 52: 5935, 9948, & 10547. 1971; Anon., Biol. Abstr. 52 (11): B.A.S.I.C. S.88 (1971), 52 (15): B.A.S.I.C. S.86 (1971), 52 (18): B.A.S.I.C. S.87 (1971), and 52 (19): B.A.S.I.C. S.143, S.196, & S.248. 1971; Pedley & Isbell, Proc. Roy. Soc. Queensl. 82 (5): 66. 1971; Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 156--160, fig. 9--12. 1971; Venter, Journ. S. Afr. Bot. 37 (2): 105. 1971; Long & Lakela, Fl. Trop. Fla. 31, 259--262, 930, 931, 938, 942, 944, & 958. 1971; Moldenke, Excerpt. Bot. A.18: 445 & 446. 1971; Hocking, Excerpt. Bot. A.18: 444 (1971) and A.19: 42--43. 1971; J. K. Jacks. in Eyre, World Veget. Types 102. 1971; Kemp, Weed Abstr. 20: 78. 1971; Koyama, Rhodora 73: 159. 1971; Adjanohoun, Bull. Jard. Bot. Nat. Belg. 41: 121. 1971; Satake, Journ. Jap. Bot. 46: 372--373. 1971; Balapure, Journ. Bombay Nat. Hist. Soc. 68: 365--366 & 374. 1971; Moldenke, Fifth Summ. 1: 2, 4, 7, 8, 14--26, 28--33, 36, 39--41, 47, 48, 52, 55, 64, 69, 72, 79, 81--83, 87--91, 95--99, 103, 111, 112, 116, 118--120, 123--134, 136, 137, 140, 142, 143, 148--150, 153--155, 157--169, 171--177, 180, 182--185, 187, 189, 192, 195, 200, 203, 208--219, 221, 222, 224--227, 230, 231, 233, 234, 237--241, 243, 244, 246--249, 251--254, 256, 257, 261, 262, 264, 265, 268, 270, 271, 273--276, 280, 281, 283, 285, 288, 289, 292--296, 300, 301, 305, 307--313, 316, 319, 320, 324, 330, 336, 338, 339, 341, 346, 349, 362, 366, 369, 375—377, 395, 397, 398, 403, 422, 424, 438, 468, 469, & 475—487 (1971) and 2: 491—518, 523, 525, 531, 533, 534, 546—549, 569, 571—573, 577—593, 600, 604, 614—616, 618, 619, 623, 632—639, 642—645, 738—749, 764, 765, 767, 769, 773, 774, 776—778, 784, 789, 791—794, 932—969, & 972—974. 1971; Moldenke, Phytologia 23: 181 & 211. 1971; C. D. Adams, Flow. Pl. Jam. 22, 41, & 816. 1972; Soukup, Biota 9: 19. 1972; A. L. Moldenke, Phytologia 23: 317 & 318. 1972; Seymour, Phytologia 23: 449. 1972; Moldenke, Phytologia 23: 181, 197, 211, 317, 318, 413, 414, 416—418, 420—422, 424, 425, 430, 431, 434, 449, 454, 506, 508, & 509. 1972; Anon., Biol. Abstr. 53 (9): B.A.S.I.C. S.87 (1972), 53 (10): B.A.S.I.C. S.29, S.39, S.85, S.178, S.189, & S.196 (1972), 54 (1): B.A.S.I.C. S.88 & S.184 (1972), and 54 (3): B.A.S.I.C. S.87, S.184, & S.189. 1972; Hotchkiss, Common Marsh Underw. & Float. Pl. [2]: 25. 1972; Mohlenbrock, Illustr. Fl. Ill. Grasses Brom. Pasp. 17. 1972; Moldenke, Biol. Abstr. 53: 5252 & 5263 (1972) and 54: 65, 1189, & 1725. 1972; Shehatz, Biol. Abstr. 53: 4689. 1972; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1971: 27. 1972; "D. J. P.", Biol. Abstr. 54: 75. 1972; Whitehead & Thirumalachar, Biol. Abstr. 54: 71. 1972; Whitehead & Thirumalachar, Mycologia 64: 124, 126, & 128, fig. 2. 1972; C. K. Shah, Biol. Abstr. 54: 1109. 1972; Tomlinson & Fawcett, Journ. Arnold Arb. 53: 389. 1972.

Erdtman (1969) says "This family, which belongs to the monocotyledons, has spirotreme pollen grains, i.e., the exine consists of one or more spiral pieces, held together by one of several thin, leptoma- or colpus-like bands (membranes). Pollen grains of somewhat similar type occur, *inter alia*, in the west-Mediterranean liliaceous genus *Aphyllanthes*."

Sims (1894) refers to this family as the *Eriocaulineae* in the *Liliaceae*; Rendle (1967) places it, as do most modern authors, in the Order *Farinosae*. He asserts that the male flowers are outside in the head [at the periphery] and the female inside [toward the center], or vice versa, the heads opening centripetally and either falling as a whole in the fruiting stage or else the individual florets scatter their fruit.

The genus *Reilia* Steud., Syn. Pl. Glum. 2: [Cyp.] 311 (1855) is reduced to *Eryngium* in the *Ammiaceae* by Bentham in Benth. & Hook. f., Gen. Pl. 3 (2): 863 (1883), but Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 956 (1966) says for it "Inc. sed. (?Juncac. ?Eriocaulac.), 1 Argentina". The only species is *R. eryngioides* Steud. To me it does not seem to be eriocaulaceous, but may very well belong in the *Juncaceae*.

BLASTOCAULON Ruhl. in Engl., Pflanzenreich 13 (4-30): 223. 1903.

Additional bibliography: Hocking, Excerpt. Bot. A.16: 38—40 (1970) and A.19: 43. 1971; Moldenke, Phytologia 21: 267—268, 426, & 504. 1971; Moldenke, Excerpt. Bot. A.18: 445 & 446. 1971; Moldenke, Biol. Abstr. 52: 9948. 1971; Anon., Biol. Abstr. 52 (18): B.A.S.I.C. S.29 & S.87. 1971; Moldenke, Fifth Summ. 1: 147, 397, 398, 477, & 484 (1971) and 2: 492, 511, 577, 589, 590, 600, 638, & 932. 1971; Anon., Biol. Abstr. 53 (10): B.A.S.I.C. S.29, S.39, & S.85. 1972; Moldenke, Biol. Abstr. 53: 5263. 1972.

BLASTOCAULON ALBIDUM (G. Gardn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 225. 1903.

Additional bibliography: Moldenke, Phytologia 20: 340. 1970; Hocking, Excerpt. Bot. A.16: 38 & 39 (1970) and A.19: 43. 1971; Moldenke, Fifth Summ. 1: 147, 397, & 477 (1971) and 2: 492, 577, 600, & 932. 1971.

Mexia describes this plant as an abundant herb with white flowers, forming colonies in damp sand under overhanging rocks at 1260 meters altitude, flowering in May. Pereira also describes it as forming pure-stand colonies.

Additional citations: BRAZIL: Minas Gerais: Hatschbach, Smith, & Ayensu 29028 (Z); Mexia 5779 (B, Ca—509143, Go, Mi, N, Ut—50252a, Vi, W—1571904); Pereira 2802 [Pabst 3638] (Bd—3847, Rf).

BLASTOCAULON PROSTRATUM (Körn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 224—225. 1903.

Additional bibliography: Hocking, Excerpt. Bot. A.16: 39 & 40. 1970; Moldenke, Phytologia 21: 426. 1971; Moldenke, Fifth Summ. 1: 147, 397, & 484 (1971) and 2: 589, 600, & 932. 1971; Anon., Biol. Abstr. 53 (10): B.A.S.I.C. S.29 & S.39. 1972; Moldenke, Biol. Abstr. 53: 5263. 1972.

The Pabst 3638 and Pereira 2802, previously cited by me as B. prostratum, seem actually to be B. albidum (G. Gardn.) Ruhl. instead.

Additional citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 27099 (N).

BLASTOCAULON RUPESTRE (G. Gardn.) Ruhl. in Engl., Pflanzenreich 13 (4-30): 223—224. 1903.

Additional bibliography: Hocking, Excerpt. Bot. A.16: 39 (1970) and A.19: 43. 1971; Moldenke, Phytologia 21: 268. 1971; Moldenke, Fifth Summ. 1: 147, 397, & 398 (1971) and 2: 511, 590, 600, 638, & 932. 1971.

The Mexia 5779, distributed as previously cited by me as B. rupestre, seems actually to be B. albidum (G. Gardn.) Ruhl. instead

BLASTOCAULON SPELEICOLA Alv. Silv., Fl. Mont. 1: 274—276, pl. 182. 1928.

Additional bibliography: Moldenke, Phytologia 18: 165. 1969; Hocking, Excerpt. Bot. A.16: 38 & 39. 1970; Moldenke, Fifth Summ. 1: 147 (1971) and 2: 932. 1971.

CARPTOTEPALA Moldenke in Steyerm., Fieldiana Bot. 28: 114. 1951.

Additional bibliography: Hocking, Excerpt. Bot. A.16: 38 (1970) and A.19: 43. 1971; Moldenke, Phytologia 21: 426. 1971; Moldenke, Fifth Summ. 1: 122, 129, & 422 (1971) and 2: 579, 584, 746, & 932. 1971; Moldenke, Excerpt. Bot. A.18: 446. 1971; Moldenke, Biol. Abstr. 52: 9948. 1971; Anon., Biol. Abstr. 52 (18): B.A.S.I.C. S.29, S.40, S.55, & S.87 (1971) and 53 (10): B.A.S.I.C. S.29, S.39, & S.85. 1972; Moldenke, Biol. Abstr. 53: 5263. 1972.

CARPTOTEPALA JENMANI (Gleason) Moldenke, Mem. Torrey Bot. Club 9: 278. 1957.
Additional bibliography: Hocking, Excerpt. Bot. A.16: 38. 1970; Moldenke, Phytologia 21: 426. 1971; Moldenke, Fifth Summ. 1: 122, 129, & 422 (1971) and 2: 579, 584, & 932. 1971; Anon., Biol. Abstr. 53 (10): B.A.S.I.C. S.39 & S.85. 1972; Moldenke, Biol. Abstr. 53: 5263. 1972.

COMANTHERA L. B. Sm., Contrib. Gray Herb., ser. 2, 117: 38. 1937.
Additional bibliography: Moldenke, Biol. Abstr. 51: 9023. 1970; Hocking, Excerpt. Bot. A.16: 38 & 39 (1970) and A.19: 43. 1971; Moldenke, Phytologia 21: 268 & 505. 1971; Moldenke, Fifth Summ. 1: 122, 129, 132, 148, 468, & 482 (1971) and 2: 585, 635, 637, 746, & 932. 1971; Moldenke, Biol. Abstr. 52: 9948. 1971; Anon., Biol. Abstr. 52 (18): B.A.S.I.C. S.29, S.40, S.55, & S.87. 1971.

COMANTHERA KEGELIANA (Körn.) Moldenke, Phytologia 13: 218. 1966.
Additional bibliography: Moldenke, Phytologia 20: 246. 1970; Hocking, Excerpt. Bot. A.16: 38 (1970) and A.19: 43. 1971; Moldenke, Fifth Summ. 1: 122, 129, 132, 148, 468, & 482 (1971) and 2: 585, 635, 637, & 932. 1971.

ERIOCAULON Gron. ex L., Sp. Pl., ed. 1, pr. 1, 1: 87. 1753.
Additional bibliography: Pers., Sp. Pl. 1: 283—284 (1817) and 2: 464. 1819; R. Schomb., Fl. S. Austr. 62. 1875; T. R. Sims, Sketch & Check-list Fl. Kaffr. 80. 1894; Chiov. in Pirotta, Fl. Col. Erit. 1: [Ann. Inst. Bot. Roma 8:] 396. 1903; Wettst., Veg. Südbras. 54, pl. 56 & 57. 1904; Eames in Harger, Graves, Eames, Bissell, Andrews, & Weatherby, Rhodora 19: 126. 1917; Woodward, Rhodora 21: 116. 1919; Harger, Graves, Eames, Bissell, Andrews, & Weatherby, Bull. Conn. Geol. & Nat. Hist. Surv. 48: 35. 1930; Tharp, Veg. Tex. 47. 1939; A. C. Martin, Am. Midl. Nat. 36: 533 & 652. 1946; Ohwi, Fl. Jap., [Jap. ed.], 261—267 & 1296. 1953; Goossens, Suid-Afrik. Blom Pl. 225. 1953; Rambo, Sellowia 6: 130 & 156—158 (1954) and 7: 248 & 283. 1956; Reitz, Sellowia 7: 124. 1956; Darlington & Wylie, Chrom. Atl. 340. 1956; J. K. Jacks., Journ. Ecol. 44: 368. 1956; Reitz, Sellowia 13: 52, 53, 72, & 90. 1961; Hylander, Fls. Field & Forest 54, 55, & 220, fig. 1. 1962; W. K. Martin, Concise Brit. Fl. pl. 90. 1965; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 265—270. 1965; Batten & Bokelman, Wild Fls. East. Cape Prov. 7, pl. 5.3. 1966; Mitra, Elem. Syst. Bot. Angiosp., ed. 2 abrdg., 165—166, fig. 78. 1967; Rao & Kumari, Bull. Bot. Surv. India 9: 110 & 188—189. 1967; Ellis, Swaminathan, & Chandrabose, Bull. Bot. Surv. India 9: 3 & 15. 1967; Kapoor, Bull. Bot. Surv. India 10: 29. 1968; Raynal, Adansonia, new ser., 8: 100. 1968; Adam, Adansonia, new ser., 8: 445. 1968; Bolkh., Grif, Matvej., & Zakhar, Chrom. Numb. Flow. Pl. 274. 1969; Erdtman, Handb. Palynol.

102, 268, & 269, pl. 28: 6. 1969; Jundaru, Proc. 2nd Asian-Pacif. Weed Control Interchange 135--141. 1969; S. P. & R. N. Banerjee, Bull. Bot. Soc. Bengal 23: 170. 1969; Das & Mukerjee, Bull. Bot. Soc. Bengal 23: 185. 1969; C. C. Townsend, Excerpt. Bot. A.15: 418. 1970; Hocking, Excerpt. Bot. A.16L 38--40. 1970; Britton & Br., Illustr. Fl., ed. 2, pr. 5, 1: 453--455, [678], & 679, fig. 1140--1143. 1970; Soukup, Raymondiana 3: 32 & 55. 1970; Gaussen, Legris, Blasco, Meher-Homji, & Troy, Inst. Franç. Pond. Trav. Sec. Scient. & Techn., Hor. ser., 10: 82 & 128. 1970; Reitz, Sellowia 22: 51. 1970; Blasco, Journ. Bombay Nat. Hist. Soc. 67: 525. 1970; Kulkarni & Desai, Journ. Bombay Nat. Hist. Soc. 67: 134--135, fig. 1--8. 1970; Podlech in K. Rech., Fl. Iran 89: Erioc. [1]. 1971; Brown & Wherry, Bartonia 40: 6. 1971; Inamdar & Patel, Indian Forest. 97: 330. 1971; Anon., Biol. Abstr. 52 (15): B.A.S.I.C. S.86. 1971; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1970: 25. 1971; Cusick, Castanea 35: 323. 1971; N. F. Good, Biol. Abstr. 52: 8223. 1971; Guillarmod, Fl. Lesotho 39, 43, 134, & 316. 1971; Moldenke, Phytologia 21: 426--432, 504, & 506. 1971; Moldenke, Biol. Abstr. 52: 5935 & 9948. 1971; Anon., Biol. Abstr. 52 (11): B.A.S.I.C. S.88 (1971) and 52 (18): B.A.S.I.C. S.40, S.55, & S.87. 1971; Pedley & Isbell, Proc. Roy. Soc. Queensl. 82 (5): 66. 1971; Cuf., Bull. Jard. Bot. Nat. Belg. 41 (3): Suppl. 1506--1507. 1971; Venter, Journ. S. Afr. Bot. 37 (2): 105. 1971; Long & Lakela, Fl. Trop. Fla. 259--261, 938, & 942. 1971; Hocking, Excerpt. Bot. A.18: 444 (1971) and A.19: 42--43. 1971; Moldenke, Excerpt. Bot. A.18: 445 & 446. 1971; Kemp, Weed Abstr. 20: 78. 1971; Adjanohoun, Bull. Jard. Bot. Nat. Belg. 41: 121. 1971; J. K. Jacks. in Eyre, World Veget. Types 102. 1971; Satake, Journ. Jap. Bot. 46: 109--111, fig. 1 & 2, & 372--373. 1971; Blasco, Inst. Franç. Pond. Trav. Sec. Scient. Techn. 10: 94, 115, 117, 121, 123, 124, 260, & 401, fig. 12. 1971; Dwyer, Raymondiana 4: 27. 1971; I. K. & L. F. Ferguson, Watsonia 8: 400. 1971; Halliday, Watsonia 8: 401. 1971; Balapure, Journ. Bombay Nat. Hist. Soc. 68: 365 & 374. 1971; Mueller-Dombois & Perera, Ceylon Journ. Sci. Biol. 9: 13. 1971; Moldenke, Fifth Summ. 1: 14--22, 24, 26, 28, 31--33, 36, 39--41, 47, 48, 52, 55, 64, 69, 79, 81, 83, 87, 90, 95, 96, 98, 99, 111, 116, 123, 129, 132, 133, 136, 140, 149, 150, 180, 182, 185, 189, 195, 203, 208--212, 214--219, 221--224, 226, 227, 230, 233, 234, 237. 239--241, 243, 246--249, 251, 253, 254, 256, 261, 264, 265, 268, 270, 271, 273--276, 280, 281, 283, 285, 288, 289, 292--296, 298, 300, 301, 305, 207--313, 316, 319, 320, 323, 324, 330, 336, 338, 339, 341, 346, 349, 362, 375, 376, 403, 424, 475, & 482 (1971) and 2: 491--518, 523, 525, 533, 546, 548, 571--573, 577, 580, 585--587, 590--594, 615, 616, 619, 623, 625, 632, 634--637, 645, 739--745, 764, 765, 767, 773, 774, 776--778, 784, 791, 792, 968, 969, & 972. 1971; C. D. Adams, Flow. Pl. Jam. 41 & 816. 1972; Soukup, Biota 9: 19. 1972; Seymour, Phytologia 23: 449. 1972; Moldenke, Phytologia 23: 413, 414, 416--418, 420--422, 424, 425, 430, 431, 449, & 506 (1972) and 24: 169. 1972; Moldenke, Biol. Abstr. 53: 5252 & 5263. 1972; Shehatz, Biol. Abstr. 53: 4689. 1972; Anon., Biol. Abstr. 53 (9):

B.A.S.I.C. S.87 (1972), 53 (10: B.A.S.I.C. S.39 & S.85 (1972), and 54 (1): B.A.S.I.C. S.88. 1972; "D. J. P.", Biol. Abstr. 54: 75. 1972; Whitehead & Thirumalachar, Biol. Abstr. 54: 71. 1972; Whitehead & Thirumalachar, Mycologia 64: 124, 126, & 128, fig. 2. 1972.

Martin (1946) confirms that the seeds of this genus contain endosperm. Guillarmod (1971) tells us that in Lesotho this genus inhabits marshy areas in the mountains rather than in the lowlands and also in boggy situations in the valley heads, growing with Kniphofia caulescens, Athrixia fontana, Anagallis huttonii, Lobelia galpinii, and a tall Carex. Tharp (1939) says that in Texas it occupies the longleaf pine, oak-hickory, and pine-oak associations. Long & Lakela (1971) give "hat-pins" as the common name for the genus as a whole. Adjanohoun (1971) asserts that it is found only in very special vegetation on granite domes in the Ivory Coast and is there in great need of conservation.

ERIOCAULON ABYSSINICUM Hochst., Flora 28: 341. 1845.

Additional synonymy: Eriocaulon richardi Körn. ex Schweinf., Beitr. Fl. Aethiop. 309, hyponym. 1867. Eriocaulon richardii Körn. apud Ruhl. in Engl., Bot. Jahrb. 27: 85, hyponym. 1899. Eriocaulon sexangulare Auct. ex Cuf., Bull. Jard. Bot. Nat. Belg. 41 (3): Suppl. 1506, in syn. 1971 [not E. sexangulare Auct. ex Ruhl., 1903, nor Burm. f., 1826, nor Fyson, 1959, nor Heyne, 1832, nor. L., 1753, nor (L.) Auct., 1969, nor Mart., 1893, nor Willd., 1841].

Additional & emended bibliography: Chiov. in Pirotta, Fl. Col. Erit. 1: [Ann. Inst. Bot. Roma 8:] 396. 1903; Moldenke, Biol. Abstr. 51: 9023. 1970; Hocking, Excerpt. Bot. A.16: 38 & 39 (1970) and A.19: 43. 1971; Moldenke, Excerpt. Bot. A.18: 445. 1971; Moldenke, Phytologia 21: 427. 1971; Moldenke, Fifth Summ. 1: 212, 222, 243, 254, & 256 (1971) and 2: 932. 1971; Guillarmod, Fl. Lesotho 134 & 316. 1971; Moldenke, Phytologia 23: 421, 430, & 431. 1972.

Guillarmod (1971) records the vernacular name "se-ea-le-metsi" for this plant, cites Dieter 777 in the herbaria at Kew, Maseru, Pretoria, and Strasbourg, and gives its overall South African distribution as "E. Cape, Natal, Transvaal, Swaziland: in marshy situations". Chiovenda (1903) cites Pappi 182, 782, & 2257 from Eritrea, growing at 1800—2300 m. altitude, and flowering in September and October.

ERIOCAULON ACANTHOCEPHALUM W. Griff., Notul. 3: 116—118. 1851.

Additional bibliography: Moldenke, Phytologia 20: 342. 1970; Hocking, Excerpt. Bot. A.16: 39. 1970; Moldenke, Fifth Summ. 1: 375 (1971) and 2: 932. 1971.

ERIOCAULON ACHITON Körn., Linnaea 27: 630—631. 1856.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50 & 53. 1919; Moldenke, Phytologia 20: 342. 1970; Hocking, Excerpt. Bot.

A.16: 39. 1970; Moldenke, Fifth Summ. 1: 268, 271, 273, 295, & 300 (1971) and 2: 511, 514, & 932. 1971.

Recent collectors have found this plant growing in evergreen forests in Thailand, flowering in November, and fruiting in October and November (in addition to months previously reported by me in this series of notes).

Additional citations: THAILAND: Charoenphol, Larsen, & Warncke 4232 (Ac), 4806 (Ac).

ERIOCAULON ADAMESII Meikle, Kew Bull. 1948: 472--473. 1948.

Additional bibliography: Moldenke, Phytologia 20: 342. 1970; Moldenke, Fifth Summ. 1: 214, 216, 218, & 219 (1971) and 2: 932. 1971.

ERIOCAULON AEQUINOCTIALE Ruhl. in Engl., Pflanzenreich 13 (4-30): 47. 1903.

Additional bibliography: Moldenke, Phytologia 17: 477--478. 1969; Moldenke, Fifth Summ. 1: 123 (1971) and 2: 932. 1971.

ERIOCAULON AFRICANUM Hochst., Flora 28: 340. 1845.

Additional bibliography: T. R. Sims, Sketch & Check-list Fl. Kaffr. 80. 1894; Moldenke, Phytologia 20: 6. 1970; Moldenke, Fifth Summ. 1: 247, 253, & 256 (1971) and 2: 932. 1971.

ERIOCAULON AFZELIANUM Wikstr. ex Körn. in Miq., Ann. Mus. Bot. Lugd. 3: 164. 1867.

Additional bibliography: Moldenke, Phytologia 20: 342. 1970; Moldenke, Fifth Summ. 1: 211, 214, 216, 218, 219, 222, & 226 (1971) and 2: 492, 493, 504, & 932. 1971.

It should be recorded here that the Adam 15887, cited by me in a previous installment of these notes as deposited in my personal herbarium, is now in the Aarhus University herbarium (Ac), while Adam 15922 is now in the Texas Research Foundation herbarium (Rf), and Adam 18527 is in the Fairchild Tropical Garden herbarium (Ft).

ERIOCAULON ALLEIZETTEI Moldenke, Phytologia 4: 177--178. 1953.

Additional bibliography: Moldenke, Phytologia 17: 478. 1969; Moldenke, Fifth Summ. 1: 261 (1971) and 2: 932. 1971.

ERIOCAULON ALPESTRE Hook. f. & Thoms. ex Körn. in Miq., Ann. Mus. Bot. Lugd. 3: 163. 1867.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50, 51, & 53, fig. 8. 1919; Moldenke, Phytologia 20: 342. 1970; Moldenke, Fifth Summ. 1: 271, 274, 288, 295, 300, 307, 309, 316, & 424 (1971) and 2: 492, 493, 500, 504, & 932. 1971.

Additional illustrations: Fyson, Journ. Indian Bot. 1: 51, fig. 8. 1919.

ERIOCAULON ALPESTRE var. AMPULLARIUM Van Royen, Blumea 10: [126]—129, fig. 1A. 1960.

Additional bibliography: Moldenke, Phytologia 20: 342. 1970;

Moldenke, Fifth Summ. 1: 316 (1971) and 2: 493 & 932. 1971.

ERIOCAULON ALPINUM Van Royen, Nov. Guin., new ser., 10: 39--40, fig. 1a. 1959.
Additional bibliography: Moldenke, Phytologia 20: 342. 1970; Moldenke, Fifth Summ. 1: 336 (1971) and 2: 932. 1971.

ERIOCAULON ALTOGIBBOSUM Ruhl. in Pilg., Engl. Bot. Jahrb. 30: 146. 1901.
Additional bibliography: Moldenke, Phytologia 19: 14. 1969; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 932. 1971.

ERIOCAULON AMANOANUM Koyama, Journ. Jap. Bot. 31: 9--11, fig. 3. 1956.
Additional bibliography: Moldenke, Phytologia 17: 479. 1969; Moldenke, Fifth Summ. 1: 309 & 311 (1971) and 2: 932. 1971.

ERIOCAULON AMBOENSE Schinz, Bull. Herb. Boiss., ser. 1, 4, app. 3: 35. 1896.
Additional bibliography: Moldenke, Phytologia 20: 342. 1970; Moldenke, Fifth Summ. 1: 214, 216, 243, 247, 253, & 256 (1971) and 2: 493 & 932. 1971.

ERIOCAULON ANDONGENSE Welw. ex Rendle, Cat. Afr. Pl. Welw. 2 (1): 100. 1899.
Additional bibliography: Moldenke, Phytologia 20: 342. 1970; Moldenke, Fifth Summ. 1: 243 & 253 (1971) and 2: 932. 1971.

ERIOCAULON ANGUSTIFOLIUM Körn., Linnaea 27: 600, nom. nud. (1856) and in Mart., Fl. Bras. 3 (1): 495--496. 1863.
Additional bibliography: Moldenke, Phytologia 20: 342. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 932. 1971.

ERIOCAULON ANGUSTISEPALUM H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 160, fig. 7 & 8, & 169--174, pl. 9, fig. 2, 6, & 7. 1955.
Additional bibliography: Moldenke, Phytologia 20: 342. 1970; Moldenke, Fifth Summ. 1: 243 & 247 (1971) and 2: 493 & 932. 1971.

ERIOCAULON ANNAMENSE H. Lecomte, Fl. Gén. Indo-Chine 7: 5--6. 1912.
Additional bibliography: Moldenke, Phytologia 20: 343. 1970; Moldenke, Fifth Summ. 1: 300 (1971) and 2: 932. 1971.

ERIOCAULON ANNUUM Milne-Redhead in Hook., Icon. Pl. 34: pl. 3389. 1939.
Additional bibliography: Moldenke, Phytologia 20: 343. 1970; Moldenke, Fifth Summ. 1: 216, 237, 239, 246, & 247 (1971) and 2: 932. 1971.

ERIOCAULON ANTUNESII Engl. & Ruhl. ex Ruhl. in Engl., Bot. Jahrb. 27: 76--77. 1899.
Additional bibliography: Moldenke, Phytologia 20: 343. 1970; Moldenke, Fifth Summ. 1: 210, 214, 219, & 243 (1971) and 2: 493 &

932. 1971.

ERIOCAULON APICULATUM H. Lecomte, Bull. Soc. Bot. France 55: 572. 1908.

Additional bibliography: Moldenke, Phytologia 18: 77. 1969; Moldenke, Fifth Summ. 1: 261 (1971) and 2: 493 & 932. 1971.

ERIOCAULON AQUATICUM (J. Hill) Druce, Pharmaceut. Journ. [London] 83 [ser. 4, 29]: 700. 1909.

Additional synonymy: Eriocaulon septangularae Sm. ex Patel & Patel, Vidya 7: [58] & 62--66. 1964.

Additional & emended bibliography: C. P. Clinton, Rhodora 3: 79--82, fig. 1 & 2. 1901; Fyson, Journ. Indian Bot. 1: 52 & 53, fig. 10 & 11. 1919; A. C. Martin, Am. Midl. Nat. 36: 533. 1946; Hylander, Fls. Field & Forest 54, 55, & 220, fig. 1. 1962; W. K. Martin, Concise Brit. Fl. pl. 90. 1965; Rendle, Classif. Flow. Pl., ed. 2, 1: 274, fig. 132. 1967; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 274. 1969: Britton & Br., Illustr. Fl., ed. 2, pr. 5, 1: 454, fig. 1140 (1970) and 3: 575 & 625. 1970; Wise, Rhodora 72: 513. 1970; Brown & Wherry, Bartonia 40: 6. 1971; I. K. & L. F. Ferguson, Watsonia 8: 400. 1971; Halliday, Watsonia 8: 401. 1971; Moldenke, Phytologia 21: 269--271. 1971; Anon., Biol. Abstr. 52 (18): B.A.S.I.C. S.55 & S.87. 1971; Hocking, Excerpt. Bot. A.19: 43. 1971; Moldenke, Biol. Abstr. 52: 9948. 1971; Moldenke, Fifth Summ. 1: 203, 362, 376, & 424 (1971) and 2: 493, 494, 498, 511, 517, 573, & 932. 1971; Whitehead & Thirumalachar, Mycologia 64: 124, 126, & 128, fig. 2. 1972.

Additional illustrations: W. K. Martin, Concise Brit. Fl. pl. 90. 1965.

The Fergusons (1971) record this plant from two localities on the mainland of Scotland, commenting that theirs is the first record for the Scottish mainland. They state that it was first found on the mainland by W. Dolling in 1967. They themselves found it again in 1970 in another locality in Loch Caorach, where it "was found to be very abundant and flowering freely". A third locality found by them was in Loch Dubh where it "was locally abundant in small patches growing in about 1 ft of water with Littorella". They comment that "It would seem that Eriocaulon may be confined to the western third of the Ardnamurchan peninsula but there are a large number of lochs on Ardnamurchan, which to our knowedge remain to be investigated, both within the region where we have found Eriocaulon and further east." They cite Ferguson & Ferguson 2639 & 2667, deposited in the herbarium of the British Museum (Natural History) in London. Halliday (1971) searched for it in a half dozen more lochs, but with no success.

ERIOCAULON AQUATILE Körn., Linnaea 27: 600. 1856.

Additional bibliography: Moldenke, Phytologia 21: 271. 1971; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 577 & 932. 1971.

ERIOCAULON ARECHAVALETAE Herter, Revist. Sudam. Bot. 2: 125. 1935.

Additional bibliography: Moldenke, Phytologia 20: 343. 1970; Moldenke, Fifth Summ. 1: 189 (1971) and 2: 493, 504, & 932. 1971.

ERIOCAULON ARENICOLA Britton & Small ex N. L. Britton, Bull. Torrey Club 44: 31. 1917.
Additional bibliography: Moldenke, Phytologia 20: 343. 1970; Moldenke, Fifth Summ. 1: 98 (1971) and 2: 932. 1971.

ERIOCAULON ARFAKENSE Van Royen, Nov. Guin., new ser., 10: 26--28, fig. 1B. 1959.
Additional bibliography: Moldenke, Phytologia 20: 343. 1970; Moldenke, Fifth Summ. 1: 336 (1971) and 2: 932. 1971.

ERIOCAULON ARISTATUM H. Hess, Bericht. Schwiez. Bot. Gesell. 65: 160, fig. 11 & 12, & 162--164, pl. 9, fig. 5. 1955.
Additional bibliography: Moldenke, Phytologia 20: 343. 1970; Moldenke, Fifth Summ. 1: 243, 248, & 253 (1971) and 2: 516 & 932. 1971.

ERIOCAULON ARUPENSE Van Royen, Nov. Guin., new ser., 10: 33--34, fig. 1C. 1959.
Additional bibliography: Moldenke, Phytologia 20: 247. 1970; Moldenke, Fifth Summ. 1: 336 (1971) and 2: 933. 1971.

ERIOCAULON ATABAPENSE Moldenke, Known Geogr. Distrib. Erioc. 5 & 32, hyponym (1946) and Phytologia 2: 132. 1948.
Additional bibliography: Moldenke, Phytologia 20: 343. 1970; Moldenke, Fifth Summ. 1: 116 & 123 (1971) and 2: 933. 1971.
Steyermark & Bunting found this plant growing "on mounds by water" and describe it as having recurved flaccid leaves which are pale- or rich-green and white flowers. They found it at 100--125 meters altitude, flowering and fruiting in April and May.
Additional citations: VENEZUELA: Amazonas: Steyermark & Bunting 102998 (Ft), 103228 (Z).

ERIOCAULON ATRATUM Körn., Linnaea 27: 610--611. 1856.
Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 20: 247. 1970; Moldenke, Fifth Summ. 1: 280, 308, & 312 (1971) and 2: 494 & 933. 1971.

ERIOCAULON ATRATUM var. MAJOR Thwaites in Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864.
Additional synonymy: Eriocaulon caulescens Steud. ex Fyson, Journ. Indian Bot. 1: 50 & 51, fig. 4. 1919 [not E. caulescens Kunth, 1971, nor Poir., 1813, nor Salzm., 1863, nor Willd., 1841]. Eriocaulon robustum Hook. f. ex Fyson, Journ. Indian Bot. 1: 50. 1919 [not E. robustum Mak., 1959, nor Steud., 1855]. Eriocaulon robustum var. caulescens Hook. f. & Thoms. ex Fyson, Journ. Indian Bot. 2: 312, pl. 30. 1921.
Additional bibliography: Fyson, Journ. Indian Bot. 1: 50 & 53. 1919; Moldenke, Phytologia 20: 343. 1970; Moldenke, Fifth Summ. 1:

280 (1971) and 2: 494, 496, 508, 510, & 933. 1971.
Additional illustrations: Fyson, Journ. Indian Bot. 1: 51, fig. 4. 1919.
The E. caulescens of Kunth, of Poiret, and of Salzmann, referred to in the synonymy above, are synonyms of Syngonanthus caulescens (Poir.) Ruhl., while E. caulescens Willd. is Paepalanthus pilosus (H.B.K.) Kunth; E. robustum Steud. is a valid species, but E. robustum Mak. is a synonym of E. robustius (Maxim.) Mak.

ERIOCAULON ATROIDES Satake in Nakai, Icon. Pl. As. Orient. 2: 173--176, pl. 65. 1938.
Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 263, 267, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266 & 269. 1965; Moldenke, Phytologia 20: 247. 1970; Moldenke, Fifth Summ. 1: 309 (1971) and 2: 933. 1971.

ERIOCAULON ATROIDES f. NANUM Satake in Nakai & Honda, Nov. Fl. Jap. 6: 73. 1940.
Additional bibliography: Moldenke, Phytologia 20: 247. 1970; Moldenke, Fifth Summ. 1: 309 (1971) and 2: 933. 1971.

ERIOCAULON ATRUM Nakai in Fedde, Repert. Spec. Nov. 9: 466. 1911.
Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 263, 267, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266, 269, & 270. 1965; Moldenke, Phytologia 20: 247--248, 408, & 409 (1970) and 21: 430. 1971; Satake, Journ. Jap. Bot. 46: 110 & 111. 1971; Moldenke, Fifth Summ. 1: 307 & 309 (1971) and 2: 933. 1971; Anon., Biol. Abstr. 54 (1): B.A.S.I.C. S.88. 1972.
Satake (1971) avers that this species resembles both E. nasuense Satake and E. nakasimanum Satake.

ERIOCAULON ATRUM var. INTERMEDIUM Nakai, Journ. Jap. Bot. 15: 142. 1939.
Additional bibliography: Moldenke, Phytologia 20: 247--248. 1970; Moldenke, Fifth Summ. 1: 309 (1971) and 2: 494 & 933. 1971.

ERIOCAULON ATRUM var. PLATYPETALUM Satake, Journ. Jap. Bot. 15: 632. 1939.
Additional bibliography: Moldenke, Phytologia 20: 248. 1970; Moldenke, Fifth Summ. 2: 501, 933, & 969. 1971.

ERIOCAULON AUSTRALASICUM (F. Muell.) Körn., Linnaea 27: 616--617. 1856.
Additional bibliography: Moldenke, Phytologia 20: 248. 1970; Moldenke, Fifth Summ. 1: 346 (1971) and 2: 491, 494, 499, & 933. 1971.

ERIOCAULON AUSTRALE R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 254. 1910.
Additional bibliography: R. Schomb., Fl. S. Austr. 62. 1875; Moldenke, Phytologia 20: 344. 1970; Moldenke, Fifth Summ. 1: 288,

300, 336, 346, & 349 (1971) and 2: 494 & 933. 1971; Moldenke, Phytologia 23: 425. 1972.

Recent collectors have found this plant growing in brown sandy soil, flowering in November, and describe it as an "erect herb, inflorescence white". Brass also describes the flower-heads as "white" and found the plant "frequent on old man-induced grasslands", at 300 meters altitude, flowering in September. Brass 28178 was previously regarded by me as representing E. willdenovianum, but this is not the case — its leaves are relatively far too short. A longhand note appended to the United States National Herbarium sheet of this number affirms that a duplicate was identified in Utrecht as E. australe and that it "somewhat combines the characters of E. australe & E. longifolium". It is the basis of my previous (1971) incorrect recording of E. willdenovianum from Sudest island.

Additional citations: AUSTRALIA: Queensland: Boyland & Gillieatt 55a (N). NEW GUINEAN ISLANDS: Sudest: Brass 28178 (W—2409103).

ERIOCAULON BARBA-CAPRAE Fyson, Journ. Indian Bot. 1: 50, nom. nud. (1919) and 2: 197. 1921.

Additional & emended bibliography: Fyson, Journ. Indian Bot. 1: 50 & 53. 1919; Moldenke, Phytologia 20: 344. 1970; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 494 & 933. 1971.

ERIOCAULON BARBEYANUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 73. 1903.

Additional bibliography: Moldenke, Phytologia 18: 79. 1969; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 933. 1971.

ERIOCAULON BASSACENSE Moldenke, Phytologia 3: 308—309. 1950.

Additional bibliography: Moldenke, Phytologia 17: 482. 1969; Moldenke, Fifth Summ. 1: 300 (1971) and 2: 933. 1971.

ERIOCAULON BAURI N. E. Br. in Thiselt.-Dyer, Fl. Cap. 7: 53—55. 1897.

Additional bibliography: Moldenke, Phytologia 20: 344. 1970; Guillarmod, Fl. Lesotho 134 & 316. 1971; Moldenke, Fifth Summ. 1: 254 & 256 (1971) and 2: 494 & 933. 1971; Moldenke, Phytologia 23: 421. 1972.

Guillarmod (1971) records for this species the vernacular names, "nyokoana-ea-likhoho" and "sekolana", and cites Stapleton 250 in the herbaria at Maseru and Pretoria, Dieter 1074 at Maseru, Pretoria, Strasbourg, and Zurich, Guillarmod 4057 at Kew, Maseru, Pretoria, Rhodesia, and his personal herbarium, Guillarmod 1656 in his own herbarium and at Pretoria, and Goetz 811 at Blomfontein and Pretoria. He gives its overall distribution as "E. Cape, Swaziland". He also cites for "E. sp. nr. E. baurii N. E. Br." Guillarmod 2228 in his own herbarium, Compton 21364 in the Compton Herbarium at Newlands, South Africa, and Guillarmod 100 & 770, both in his own herbarium and at Pretoria. He says that this unknown species is called "khala-betloa" by the natives.

ERIOCAULON BEAUVERDI Moldenke, Known Geogr. Distrib. Erioc. 62. 1946.
Additional bibliography: Moldenke, Phytologia 20: 344. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 501, 502, & 933. 1971.

ERIOCAULON BENTHAMI Kunth, Enum. Pl. 3: 545. 1841.
Additional bibliography: Rzedowski & McVaugh, Contrib. Univ. Mich. Herb. 9: 76 & 89. 1966; Moldenke, Phytologia 20: 344. 1970; Moldenke, Fifth Summ. 1: 48 & 69 (1971) and 2: 494, 792, & 933. 1971.

ERIOCAULON BIFISTULOSUM Van Heurck & Muell.-Arg. in Van Heurck, Observ. Bot. 105. 1870.
Additional bibliography: Moldenke, Phytologia 21: 271 & 276. 1971; Moldenke, Fifth Summ. 1: 210, 211, 214, 216, 218, 219, 222, 226, 227, 230, 237, 240, 243, 246, 248, 251, 261, & 274 (1971) and 2: 494, 500, 504, 511, 512, & 933. 1971.

ERIOCAULON BILOBATUM Morong, Bull. Torrey Bot. Club 19: 226. 1892.
Additional bibliography: Moldenke, Phytologia 21: 271. 1971; Moldenke, Fifth Summ. 1: 69 & 79 (1971) and 2: 503 & 933. 1971.
McVaugh found this plant "abundant in drying seepage areas under oaks on rocky rhyolitic hills in sparse forest of Quercus resinosa with a mixture of Pinus lumholtzii", at an altitude of 2200 meters, and tells us that the "over-mature heads" are black.
Additional citations: MEXICO: Jalisco: R. McVaugh 24333 (Mi).

ERIOCAULON BIPETALUM Good, Geogr. Flow. Pl. 277 & 483, nom. nud. 1964.
Additional bibliography: Moldenke, Phytologia 19: 20. 1969.

ERIOCAULON BLUMEI Körn. in Miq., Ann. Mus. Bot. Lugd. Bat. 3: 240. 1867.
Additional bibliography: Moldenke, Phytologia 19: 20. 1969; Hocking, Excerpt. Bot. A.16: 38. 1970; Moldenke, Fifth Summ. 1: 323 (1971) and 2: 933. 1971.

ERIOCAULON BOMBAYANUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 104. 1903.
Additional bibliography: Moldenke, Phytologia 19: 326. 1970; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 933. 1971.

ERIOCAULON BONGENSE Engl. & Ruhl. ex Ruhl. in Engl., Bot. Jahrb. 27: 75. 1899.
Additional bibliography: Moldenke, Phytologia 21: 271. 1971; Moldenke, Fifth Summ. 1: 209--211, 214--216, 222, 226, 240, & 246 (1971) and 2: 933. 1971.

ERIOCAULON BONI H. Lecomte, Journ. de Bot. 21: 108. 1908.

Additional bibliography: Moldenke, Phytologia 20: 344. 1970; Moldenke, Fifth Summ. 1: 300 (1971) and 2: 933. 1971.

ERIOCAULON BRACHYPEPLON Körn., Linnaea 27: 665—667. 1856.
Additional bibliography: Moldenke, Phytologia 20: 344. 1970; Moldenke, Fifth Summ. 1: 339 (1971) and 2: 933. 1971.

ERIOCAULON BREVIPEDUNCULATUM Merr., Philip. Journ. Sci. Bot. 2: 265. 1907.
Additional bibliography: Moldenke, Phytologia 20: 344—345 & 412. 1970; Moldenke, Fifth Summ. 1: 316 (1971) and 2: 495 & 933. 1971.

ERIOCAULON BREVIPEDUNCULATUM var. LONGIPES Moldenke, Phytologia 9: 350. 1963.
Additional bibliography: Moldenke, Phytologia 17: 453. 1968; Moldenke, Fifth Summ. 1: 336 (1971) and 2: 933. 1971.

ERIOCAULON BREVISCAPUM Körn., Linnaea 27: 676—677. 1856.
Emended synonymy: Eriocaulon breviscapon Körn. apud Fyson, Journ. Indian Bot. 1: 52 & 53. 1919.
Additional bibliography: Fyson, Journ. Indian Bot. 1: 52 & 53. 1919; Moldenke, Phytologia 20: 7. 1970; Moldenke, Fifth Summ. 1: 274 & 300 (1971) and 2: 495 & 933. 1971.

ERIOCAULON BROMELIOIDEUM H. Lecomte, Journ. de Bot. 21: 107. 1908.
Additional bibliography: Moldenke, Phytologia 20: 345. 1970; Moldenke, Fifth Summ. 1: 300 (1971) and 2: 495 & 933. 1971.

ERIOCAULON BROMELIOIDEUM var. LATIFOLIUM H. Lecomte, Fl. Gén. Indo-Chine 7: 17. 1912.
Additional bibliography: Moldenke, Phytologia 19: 21. 1969; Moldenke, Fifth Summ. 1: 300 (1971) and 2: 495 & 933. 1971.

ERIOCAULON BROWNIANUM Mart. in Wall., Pl. Asiat. Rar. 3: 25—26 & 28, pl. 248. 1832.
Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 20: 345. 1970; Blasco, Inst. Franç. Pond. Trav. Sec. Scient. & Techn. 10: 115, 117, 123, 124, & 401, fig. 12. 1971; Mueller-Dombois & Perera, Ceylon Journ. Sci. Biol. 9: 13. 1971; Moldenke, Fifth Summ. 1: 268, 274, 280, & 300 (1971) and 2: 495, 516, & 933. 1971.
Additional illustrations: Blasco, Inst. Franç. Pond. Trav. Sec. Scient. & Techn. 10: fig. 12. 1971.
Koyama & Herat found this plant growing on the wet margins of narrow streams at the bottom of a swampy depression in black Patana grassland with Fimbristylis monticola and Carex arnottiana, at 7200 feet altitude, flowering and fruiting in May.
Additional citations: CEYLON: Koyama & Herat 13640 (N).

ERIOCAULON BROWNIANUM var. LATIFOLIUM Moldenke, Phytologia 3: 411. 1951.

Additional bibliography: Moldenke, Phytologia 17: 454. 1968; Moldenke, Fifth Summ. 1: 280 (1971) and 2: 933. 1971.

ERIOCAULON BRUNONIS Britten, Journ. Bot. 38: 482. 1900.

Additional bibliography: R. Schomb., Fl. S. Austr. 62. 1875; Moldenke, Phytologia 20: 345. 1970; Moldenke, Fifth Summ. 1: 346 (1971) and 2: 495, 511, 616, & 933. 1971.

ERIOCAULON BUCHANANII Ruhl. in Thiselt.-Dyer, Fl. Cap. 7: 83. 1897.

Additional bibliography: Moldenke, Phytologia 20: 345. 1970; Raynal, Adansonia, new ser., 8: 100. 1971; Moldenke, Fifth Summ. 1: 214, 216, 237, 243, 246, 248, 249, & 253 (1971) and 2: 495, 774, & 933. 1971.

ERIOCAULON BUERGERIANUM Körn. in Miq., Ann. Mus. Bot. Lugd. Bat. 3: 163--164. 1867.

Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 262, 265, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266 & 268. 1965; Moldenke, Phytologia 20: 345. 1970; Satake, Journ. Jap. Bot. 46: 373. 1971; Moldenke, Fifth Summ. 1: 208, 288, 292, 300, 309, 312, 313, & 424 (1971) and 2: 507, 508, & 933. 1971.

ERIOCAULON BURCHELLII Ruhl. in Engl., Pflanzenreich 13 (4-30): 50. 1903.

Additional bibliography: Moldenke, Phytologia 20: 345. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 933. 1971.

Irwin & Soderstrom report that this plant is locally frequent at 700 to 1000 meters altitude in sun-exposed positions in gallery forests submerged in slow-running water, flowering and fruiting in August. Their collection exhibits the distinctly viviparous heads seen also on the type collection.

Additional citations: BRAZIL: Distrito Federal: Irwin & Soderstrom 5421 (Ft, N, Rf, Z).

ERIOCAULON CAAGUAZUENSE Ruhl. in Engl., Bot. Jahrb. 37: 519. 1906.

Additional bibliography: Moldenke, Phytologia 20: 345. 1970; Moldenke, Fifth Summ. 1: 185 (1971) and 2: 496 & 933. 1971.

ERIOCAULON CABRALENSE Alv. Silv., Archiv. Mus. Nac. Rio Jan. 23: 162, pl. 4. 1921.

Additional bibliography: Moldenke, Phytologia 20: 346. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 497. 1971.

ERIOCAULON CAESIUM Griseb., Fl. Brit. W. Ind., pr. 1, 526. 1864.

Additional bibliography: Moldenke, Phytologia 20: 346. 1970; Moldenke, Fifth Summ. 1: 111 (1971) and 2: 933. 1971.

ERIOCAULON CANDIDUM Moldenke, Bull. Torrey Bot. Club 77: 389. 1950.

Additional bibliography: Moldenke, Bull. Torrey Bot. Club 77: 389. 1950; Moldenke, Phytologia 19: 327. 1970; Moldenke, Fifth

Summ. 1: 149 (1971) and 2: 933. 1971.

ERIOCAULON CAPITULATUM Moldenke, Phytologia 2: 132--133. 1948.
Additional bibliography: Moldenke, Phytologia 21: 271. 1971; Moldenke, Fifth Summ. 1: 69 (1971) and 2: 933. 1971.

ERIOCAULON CARSONI F. Muell., Proc. Linn. Soc. New S. Wales, ser. 2, 5: 250. 1890.
Additional bibliography: Moldenke, Phytologia 20: 346. 1970; Moldenke, Fifth Summ. 1: 346 (1971) and 2: 496, 514, & 933. 1971.

ERIOCAULON CAULIFERUM Mak., Bot. Mag. Tokyo 24: 165. 1910.
Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 262, 264, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266 & 267. 1965; Moldenke, Phytologia 20: 346. 1970; Satake, Journ. Jap. Bot. 46: 372. 1971; Moldenke, Fifth Summ. 1: 309 (1971) and 2: 933. 1971.

ERIOCAULON CELEBICUM Van Royen, Blumea 10: 127--129, fig. 1B. 1960.
Additional bibliography: Moldenke, Phytologia 20: 346. 1970; Moldenke, Fifth Summ. 1: 323 (1971) and 2: 933. 1971.

ERIOCAULON CEYLANICUM Körn., Linnaea 27: 667--669. 1856.
Emended synonymy: Eriocaulon cristatum var. bracteis floralibus denticulatis et longiuscule cuspidato-acuminatis Thwaites & Hook., Enum. Pl. Zeyl., pr. 1, 341. 1864. Eriocaulon cuspidatum var. Thwaites apud Hook. f. in Trimen, Handb. Fl. Ceylon 5: 3--4, in syn. 1900.
Additional & emended bibliography: Thwaites & Hook. f., Enum. Pl. Zeyl., pr. 1, 341. 1864; Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 20: 346. 1970; Mueller-Dombois & Perera, Ceylon Journ. Sci. Biol. 9: 13. 1971; Moldenke, Fifth Summ. 1: 280 (1971) and 2: 496, 497, 514, 517, & 933. 1971.

ERIOCAULON CHINOROSSICUM Komarov ex Steinberg in Komarov & Schischkin, Fl. U.S.S.R. 3: 497--498, pl. 27, fig. 2 a--c. 1935.
Additional bibliography: Moldenke, Phytologia 20: 346. 1970; Moldenke, Fifth Summ. 1: 208 (1971) and 2: 496 & 934. 1971.

ERIOCAULON CHRISTOPHERI Fyson, Kew. Bull. Misc. Inf. 1914: 330. 1914.
Additional bibliography: Moldenke, Phytologia 20: 346. 1970; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 934. 1971.

ERIOCAULON CILIIPETALUM H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 263--265, fig. 1--3. 1955.
Additional bibliography: Moldenke, Phytologia 19: 25. 1969; Moldenke, Fifth Summ. 1: 239 (1971) and 2: 934. 1971.

ERIOCAULON CINEREUM R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 254. 1810.

Emended synonymy: Eriocaulon sexangulare Auct. ex Ruhl. in Engl., Pflanzenreich 13 (4-30): 21 & 287, in syn. 1903 [not E. sexangulare Auct. ex Cuf., 1971, nor Birm. f., 1826, nor Fyson, 1959, nor Heyne, 1832, nor L., 1753, nor Willd., 1841]. Eriocaulon cinereum var. sieboldianum (Sieb. & Zucc.) Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266. 1965. Eriocaulon sexangulare sensu auct. Japon. ex Koyama in Ohwi. Fl. Jap., [Engl. ed.], 266, in syn. 1965.

Additional & emended bibliography: R. Schomb., Fl. S. Austr. 62. 1875; Ohwi, Fl. Jap., [Jap. ed.], 262, 263, & 1296. 1953; Darlington & Wylie, Chrom. Atl., pr. 1, 340 (1956) and pr. 2, 340. 1961; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 265--267. 1965; Sundaru, Proc. 2nd Asian-Pacif. Weed Control Interchange 135--141. 1969; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 274. 1969; Jeanplong, Phyton 14: 94. 1970; Hocking, Excerpt. Bot. A.16: 40. 1970; Podlech in K. Rech., Fl. Iran. 89: Erioc. [1]. 1971; Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 159. 1971; Kemp, Weed Abstr. 20: 78. 1971; Moldenke, Fifth Summ. 1: 64, 237, 268, 270, 280, 283, 288, 292, 293, 295, 300, 308, 309, 312, 313, 316, 323, 346, & 349 (1971) and 2: 495--497, 500, 502, 507, 510, 512--514, 517, 548, & 934. 1971; Moldenke, Phytologia 21: 427 (1971) and 23: 421, 424, 425, & 431. 1972.

The Eriocaulon sexangulare accredited to "Auct." by Cufodontis (1971) is a synonym of E. abyssinicum Hochst.

Satake (1971) cites eight unnumbered collections of E. cinereum from Nepal, collected at altitudes of 200 to 2100 meters, flowering from October to December, gives the following overall distribution "Africa, India, Ceylon, Indo-China, Java, Philippines, China, and Japan", and comments "On examining the specimens of Nepal and Japan, I have observed many variations in flower parts. However, no specimens with villous receptacles are found. I think that the Asian plants are referred to E. Sieboldianum, until the other characters of E. cinereum will be verified based on the authentic specimens."

Jeanplong (1970) records E. cinereum from North Vietnam. Kemp (1971) refers to Eriocaulon cinereum as a "sedge" and describes several chemical herbicides used to eliminate it from ricefields with varying degrees of success. Panigrahi & Saran (1967) found it growing in muddy soil in Uttar Pradesh, India, and cite their nos. 1475, 1525, & 1525a.

Additional citations: RYUKYU ISLAND ARCHIPELAGO: Yoronjima: Tagawa & Iwatsuki 2416 (N).

ERIOCAULON CIPOENSE Alv. Silv., Fl. Serr. Min. 33, pl. 10. 1908.

Additional bibliography: Moldenke, Phytologia 20: 347. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 934. 1971.

ERIOCAULON COERULEUM Van Royen, Blumea 10: 128--130, fig. 1C. 1960.

Additional bibliography: Moldenke, Phytologia 20: 347. 1970; Moldenke, Fifth Summ. 1: 323 (1971) and 2: 934. 1971.

ERIOCAULON COLLETTII Hook. f., Fl. Brit. Ind. 6: 575. 1893.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 20: 347. 1970; Moldenke, Fifth Summ. 1: 274 & 283 (1971) and 2: 934. 1971.

Ruhland (1903) cites the original publication of this species as "1894", but pages 449—672 of Hooker's work were actually issued in 1893.

ERIOCAULON COLLINUM Hook. f., Fl. Brit. Ind. 6: 584. 1893.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50 & 52. 1919; Blasco, Inst. Franç. Pond. Trav. Sec. Scient. & Techn. 10: 121 & 401, fig. 12. 1971; Moldenke, Fifth Summ. 1: 274 & 280 (1971) and 2: 497, 499, 505, & 934. 1971; Moldenke, Phytologia 21: 271—272 (1971) and 23: 422. 1972.

Additional illustrations: Blasco, Inst. Franç. Pond. Trav. Sec. Scient. & Techn. 10: fig. 12. 1971.

Ruhland (1903) cites the original publication of this species as "1894", but pages 449—672 of Hooker's work were actually issued in 1893.

ERIOCAULON COMPRESSUM Lam., Encycl. Méth. 3: 276. 1789.

Additional bibliography: Pers., Sp. Pl. 1: 284. 1817; Hotchkiss, Bur. Sports Fish. & Wildlife U. S. Dept. Int. Res. Publ. 44: [Underw. & Float. Pl.] 25. 1967; Britton & Br., Illustr. Fl., ed. 2, pr. 5, 1: 454, fig. 1142. 1970; Hocking, Excerpt. Bot. A.16: 39. 1970; Brown & Wherry, Bartonia 40: 6. 1971; Moldenke, Phytologia 21: 427. 1971; Long & Lakela, Fl. Trop. Fla. 259, 260, & 938. 1971; Moldenke, Fifth Summ. 1: 18, 20, 22, 24, 26, 28, 31, 32, 48, & 55 (1971) and 2: 492, 496—498, 500, 501, 518, 573, 623, 625, & 934. 1971; Gantz, Naturalist South. Fla. 148, 149, & 254. 1971; Hotchkiss, Common Marsh Underw. & Float. Pl. [2]: 25. 1972.

Additional illustrations: Britton & Br., Illustr. Fl., ed. 2, pr. 5, 1: 454, fig. 1142. 1970.

Craighead found this plant growing in a patch of Stillingia, flowering in January, while MacElwee found it on floating islands of Sphagnum. Hotchkiss (1967) calls it "early pipewort".

Additional citations: NEW JERSEY: Atlantic Co.: Bassett s.n. [May 27, 1923] (Mi). Ocean Co.: MacElwee 658 [Herb. Dreisbach 5559] (Mi). FLORIDA: Collier Co.: Craighead s.n. [14 January 1966] (Ft—10951).

ERIOCAULON COMPRESSUM var. HARPERI Moldenke, N. Am. Fl. 19: 23. 1937.

Additional bibliography: Moldenke, Phytologia 20: 347. 1970; Moldenke, Fifth Summ. 1: 18, 20, 26, 28, 31, 32, & 48 (1971) and 2: 496 & 934. 1971.

ERIOCAULON COMPTONII Rendle, Journ. Linn. Soc. Lond. Bot. 45:

259. 1921.
Additional bibliography: Moldenke, Phytologia 20: 347. 1970; Moldenke, Fifth Summ. 1: 341 (1971) and 2: 934. 1971.

ERIOCAULON CONCRETUM F. Muell., Fragm. 1: 92--93. 1859.
Additional bibliography: Moldenke, Phytologia 18: 174. 1969; Moldenke, Fifth Summ. 1: 346 (1971) and 2: 934. 1971.

ERIOCAULON CONGOLENSE Moldenke, Résumé Suppl. 4: 7, nom. nud. (June 5, 1962); Phytologia 8: 386. December 10. 1962.
Additional bibliography: Moldenke, Phytologia 20: 347. 1970; Moldenke, Fifth Summ. 1: 230 (1971) and 2: 934. 1971.

ERIOCAULON CONICUM (Fyson) C. E. C. Fischer in Gamble, Fl. Presid. Madras 9: 1616--1617. 1931.
Additional bibliography: Moldenke, Phytologia 20: 347--348. 1970; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 497, 499, & 934. 1971.

ERIOCAULON CONIFERUM Herzog ex Lützelburg, Estud. Bot. Nordéste 3: 147 & 150, hyponym (1923); Herzog in Fedde, Repert. Spec. Nov. 20: 82. 1924.
Additional bibliography: Moldenke, Phytologia 19: 29. 1969; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 934. 1971.

ERIOCAULON CRASSISCAPUM Bong., Mém. Acad. Imp. Sci. St.-Pétersb., sér. 6, 1: 628. 1831.
Additional bibliography: Mitra, Elem. Syst. Bot. Angiosp., ed 2 abridg., 166, fig. 78. 1967; Moldenke, Phytologia 20: 348. 1970; Moldenke, Fifth Summ. 1: 149 & 195 (1971) and 2: 497, 506, & 934. 1971.
Additional illustrations: Mitra, Elem. Syst. Bot. Angiosp., ed. 2 abrdg., 166, fig. 78. 1967.
The _Krapovickas, Cristóbal, Arbo, Maruñak, Maruñak, & Irigoyen 17252_, distributed as _E. crassiscapum_, is actually _E. leptophyllum_ Kunth.

ERIOCAULON CRISTATUM Mart. in Wall., Plant. Asiat. Rar. 3: 28. 1832.
Emended synonymy: _Eriocaulon cristatum_ Heyne apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 84. 1903 [not _E. cristatum_ Mart. ex Körn., 1856].
Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 21: 272. 1971; Moldenke, Fifth Summ. 1: 268, 270, 274, 288, 305, & 309 (1971) and 2: 497, 509, & 934. 1971.
The variety of this species described by Thwaites & Hooker (1864) and referred to by me in Phytologia 19: 330--331 (1970) is now known as _E. ceylanicum_ Körn.

ERIOCAULON CRISTATUM var. BREVICALYX C. H. Wright, Journ. Linn.

Soc. Lond. Bot. 36: 199. 1903.

Additional bibliography: Moldenke, Phytologia 20: 348. 1970; Moldenke, Fifth Summ. 1: 293 (1971) and 2: 497 & 934. 1971.

ERIOCAULON CRISTATUM var. MACKII Hook. f., Fl. Brit. India 6: 574. 1893.

Additional bibliography: Moldenke, Phytologia 20: 348. 1970; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 497. 1971.

Ruhland (1903) erroneously dates the original publication of this variety as "1894".

ERIOCAULON CUBENSE Ruhl. in Fedde, Repert. Spec. Nov. 22: 29. 1925.

Additional bibliography: Moldenke, Phytologia 20: 348. 1970; Moldenke, Fifth Summ. 1: 98 (1971) and 2: 934. 1971.

ERIOCAULON CUSPIDATUM Dalz. in Hook., Kew Journ. 3: 281. 1851.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 20: 348. 1970; Moldenke, Fifth Summ. 1: 274 & 280 (1971) and 2: 934. 1971.

ERIOCAULON CUSPIDATUM var. BRACTEATUM Fyson, Journ. Indian Bot. Soc. 2: 318 [as "bracteata"]. 1921.

Additional bibliography: Moldenke, Phytologia 18: 83. 1970; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 497 & 934. 1971.

ERIOCAULON DALZELLII Körn., Linnaea 27: 605—606. 1856.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 52. 1919; Moldenke, Phytologia 21: 272. 1971; Moldenke, Fifth Summ. 1: 268, 274, & 280 (1971) and 2: 498, 510, & 934. 1971.

Ruhland (1903) dates this binomial as "1854", but pages 129—799 of volume 27 of Linnaea were not issued until 1856.

ERIOCAULON DAMAZIANUM Beauverd, Bull. Herb. Boiss., sér. 2, 8: 986—988, fig. 1 A—G. 1909.

Additional bibliography: Moldenke, Phytologia 19: 30—31. 1969; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 498 & 934. 1971.

ERIOCAULON DECANGULARE L., Sp. Pl., ed. 1, 1: 87. 1753.

Additional bibliography: Pers., Sp. Pl. 1: 284. 1817; Britton & Br., Illustr. Fl., ed. 2, pr. 5, 1: 455, fig. 1143. 1970; Hocking, Excerpt. Bot. A.16: 39 (1970) and A.19: 43. 1971; Cusick, Castanea 35: 323. 1971; Brown & Wherry, Bartonia 13: 6. 1971; Moldenke, Biol. Abstr. 51: 9023 (1970) and 52: 5935. 1971; Moldenke, Phytologia 21: 427. 1971; Long & Lakela, Fl. Trop. Fla. 259, 260, & 938. 1971; Moldenke, Fifth Summ. 1: 18—22, 24, 26, 28, 31, 32, 48, 55, & 69 (1971) and 2: 498, 500, 501, 505, 509, 512, 514, 516—518, 580, 615, 616, 634, 764, 792, & 934. 1971.

Additional illustrations: Britton & Br., Illustr. Fl., ed. 2, pr. 5, 1: 455, fig. 1143. 1970.

Additional citations: NEW JERSEY: Burlington Co.: Dreisbach 1029

[Herb. Dreisbach 162] (Mi).

ERIOCAULON DECANGULARE var. LATIFOLIUM Chapm. ex Moldenke, N. Am. Fl. 19: 21. 1937.

Additional bibliography: Moldenke, Phytologia 20: 404. 1970; Moldenke, Biol. Abstr. 52: 5935. 1971; Hocking, Excerpt. Bot. A. 19: 43. 1971; Moldenke, Fifth Summ. 1: 28, 31, & 32 (1971) and 2: 498 & 934. 1971.

ERIOCAULON DECANGULARE var. MINOR Moldenke, Phytologia 15: 462. 1968.

Additional bibliography: Moldenke, Phytologia 20: 404. 1970; Moldenke, Fifth Summ. 1: 48 & 55 (1971) and 2: 934. 1971.

Additional & emended citations: TEXAS: Leon Co.: F. A. Barkley 13556 (Au—26776). Milam Co.: Tharp 4434c (Au—26773), 44344b (Au—26778).

ERIOCAULON DECANGULARE f. PARVICEPS Moldenke, Phytologia 19: 333. 1970.

Additional bibliography: Moldenke, Biol. Abstr. 51: 9023. 1970; Moldenke, Phytologia 21: 272. 1971; Moldenke, Fifth Summ. 1: 55 (1971) and 2: 934. 1971.

Lonard found this plant growing in acid Sphagnum bogs.

Additional citations: TEXAS: Robertson Co.: Lonard 1956 (Au—267330).

ERIOCAULON DECEMFLORUM Maxim., Diagn. Pl. Nov. Asiat. 8: 7—9. 1893.

Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 262, 263, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266. 1965; Moldenke, Phytologia 20: 404. 1970; Satake, Journ. Jap. Bot. 46: 372—373. 1971; Moldenke, Fifth Summ. 1: 288, 308, 309, & 312 (1971) and 2: 498, 499, & 934. 1971; Moldenke, Phytologia 23: 424. 1972.

ERIOCAULON DECEMFLORUM f. ABERANS Satake, Journ. Jap. Bot. 46: 373. 1971.

Bibliography: Satake, Journ. Jap. Bot. 46: 373. 1971; Moldenke, Phytologia 23: 424. 1972.

Illustrations: Satake, Journ. Jap. Bot. 46: 373. 1971.

This appears to be a viviparous form of the species.

ERIOCAULON DECEMFLORUM f. COREANUM (H. Lecomte) Nakai in Matsum., Icon. Pl. Koisikav. 2: 47, pl. 108. 1914.

Additional bibliography: Moldenke, Phytologia 20: 404. 1970; Moldenke, Fifth Summ. 1: 308 & 312 (1971) and 2: 497, 498, & 934. 1971.

ERIOCAULON DECIPIENS N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 245. 1901.

Additional bibliography: Moldenke, Phytologia 20: 404. 1970;

Moldenke, Fifth Summ. 1: 246, 248, & 249 (1971) and 2: 499 & 934. 1971.

ERIOCAULON DEHNIAE H. Hess, Bericht. Schweiz., Bot. Gesell. 67: 84—87, fig. 1. 1957.

Additional bibliography: Moldenke, Phytologia 20: 404. 1970; Moldenke, Fifth Summ. 1: 248 (1971) and 2: 934. 1971.

ERIOCAULON DEIGHTONII Meikle, Kew Bull. 22: 143. 1968.

Additional bibliography: Moldenke, Phytologia 20: 405. 1970; C. C. Townsend, Excerpt. Bot. A.15: 418. 1970; Moldenke, Fifth Summ. 1: 216 & 218 (1971) and 2: 934. 1971.

ERIOCAULON DEMBIANENSE A. Chiov., Ann. Bot. Roma 9: 148. 1911.

Additional bibliography: Moldenke, Phytologia 20: 405. 1970; Cuf., Bull. Jard. Bot. Belg. 41 (3): Suppl. 1507. 1971; Moldenke, Fifth Summ. 1: 212 (1971) and 2: 934. 1971.

Cufodontis (1971) notes: "Syntypi: Chiovenda 1651 (M. Incedubà prope Gondar), 1912, 2573 (vallis Scintà supra Asosò).....Species porro indaganda."

ERIOCAULON DENSUM Mart. ex Colla, Herb. Pedem. 5: 483--484. 1836.

Synonymy: Eriocaulon densum Colla apud Moldenke, Résumé Suppl. 17: 3. 1968.

Additional bibliography: Moldenke, Phytologia 18: 84. 1969; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 934. 1971.

ERIOCAULON DEPAUPERATUM Merr., Philip. Journ. Sci. Bot. 5: 336. 1910.

Additional bibliography: Moldenke, Phytologia 19: 34. 1969; Moldenke, Fifth Summ. 1: 316 (1971) and 2: 934. 1971.

ERIOCAULON DEPRESSUM R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 255. 1810.

Additional bibliography: Moldenke, Phytologia 20: 10. 1970; Moldenke, Fifth Summ. 1: 346 (1971) and 2: 499, 615, 616, & 934. 1971.

ERIOCAULON DESLANDESII Alv. Silv., Fl. Mont. 1: 421, pl. 253. 1928.

Additional & emended bibliography: Alv. Silv., Fl. Mont. 1: [1] & 421, pl. 253. 1928; Reitz, Sellowia 22: 51. 1970; Moldenke, Phytologia 20: 405. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 934. 1971.

Emended illustrations: Alv. Silv., Fl. Mont. 1: pl. 253. 1928.

ERIOCAULON DIAGUISSENSE Bourdu, Bull. Soc. Bot. France 104: 156—158, fig. A--F. 1957.

Additional bibliography: Moldenke, Phytologia 20: 405. 1970; Moldenke, Fifth Summ. 1: 216 (1971) and 2: 934. 1971.

ERIOCAULON DIANAE Fyson, Journ. Indian Bot. 1: 50, hyponym (1919) and 2: 259, pl. 12. 1921.

Additional & emended bibliography: Fyson, Journ. Indian Bot. 1: 50, 52, & 52. 1919; Moldenke, Phytologia 21: 272 & 428. 1971; Inamdar & Patel, Indian Forest. 97: 330. 1971; Moldenke, Fifth Summ. 1: 274, 280, & 295 (1971) and 2: 499 & 934. 1971.

ERIOCAULON DIANAE var. LONGIBRACTEATUM Fyson, Journ. Indian Bot. 2: 259—260, pl. 13 [as "longi-bracteata"]. 1921.

Additional bibliography: Moldenke, Phytologia 21: 272 & 428. 1971; Moldenke, Fifth Summ. 1: 274, 280, & 295 (1971) and 2: 499 & 934. 1971.

The Stocks, Law, &c. s.n. [Malabar, Concan, &c.] in the Munich herbarium, cited by me as this variety in a previous installment of these notes, proves to be E. heterolepis Steud.

ERIOCAULON DIANAE var. PARVIFLORUM Fyson, Journ. Indian Bot. 2: 260 [as "parviflora"]. 1921.

Additional bibliography: Moldenke, Phytologia 18: 85. 1969; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 499 & 934. 1971.

ERIOCAULON DIANAE var. RICHARDIANUM Fyson, Journ. Indian Bot. 2: 260 [as "richardiana"]. 1921.

Additional bibliography: Moldenke, Phytologia 19: 334. 1970; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 499 & 935. 1971.

ERIOCAULON DICLINE Maxim., Diagn. Pl. Nov. Asiat. 8: 21—22. 1893.

Additional bibliography: Moldenke, Phytologia 19: 334. 1970; Moldenke, Fifth Summ. 1: 309 (1971) and 2: 513, 517, & 935. 1971.

ERIOCAULON DICTYOPHYLLUM Körn., Linnaea 27: 600. 1856.

Additional bibliography: Reitz, Sellowia 22: 51. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 499, 500, 580, & 935. 1971; Moldenke, Phytologia 21: 427 (1971) and 23: 418. 1972; Moldenke, Biol. Abstr. 53: 5252. 1972; Anon., Biol. Abstr. 53 (10): B.A.S. I.C. S.85. 1972.

The Smith & Reitz 9187, distributed as E. dictyophyllum and so cited by me in previous installments of this series of notes, is actually E. paranense Moldenke. The Ratter, Santos, Souza, & Ferreira R.1724 collection, cited below, was gathered "in a stream, leaves submerged, but flowerheads held above water surface" and was distributed with the comment "perhaps E. glaziovii Ruhl."

Additional citations: BRAZIL: Mato Grosso: Irwin, Souza, Grear, & Reis dos Santos 16797 (N); Ratter, Santos, Souza, & Ferreira R. 1724 (N).

ERIOCAULON DICTYOPHYLLUM f. VIVIPARUM Moldenke, Phytologia 22: 126. 1971.

Bibliography: Moldenke, Fifth Summ. 2: 935. 1971; Moldenke, Phytologia 22: 126 (1971) and 23: 418. 1972; Moldenke, Biol. Abstr. 53: 5252. 1972; Anon., Biol. Abstr. 53 (10): B.A.S.I.C. S.85. 1972.

The Eitens found this plant growing in "soaking soil at water level at the edge of a brook in a narrow gully in the shade of gallery scrub vegetation", flowering and fruiting in September.

Cutations: BRAZIL: Mato Grosso: Eiten & Eiten 8578 (W—2615849); Harley & Souza 10097 (N—type).

ERIOCAULON DIMORPHOELYTRUM Koyama, Journ. Jap. Bot. 31: 7—9, fig. 2. 1956.

Additional bibliography: Moldenke, Phytologia 20: 405. 1970; Moldenke, Fifth Summ. 1: 309 (1971) and 2: 499 & 935. 1971.

ERIOCAULON DIMORPHOPETALUM Moldenke, Phytologia 3: 323, hyponym (1950) and Fieldiana Bot. 28: 116—117. 1951.

Additional & emended bibliography: J. A. Steyerm., Act. Bot. Venez. 1: 195. 1966; Moldenke, Phytologia 20: 405. 1970; Moldenke, Fifth Summ. 1: 116 & 123 (1971) and 2: 935. 1971.

ERIOCAULON DIOECUM Ruhl. in Fedde, Repert. Spec. Nov. 22: 29. 1925.

Additional bibliography: Moldenke, Phytologia 20: 406. 1970; Moldenke, Fifth Summ. 1: 95 (1971) and 2: 935. 1971.

ERIOCAULON DISEPALUM Ridl., Journ. Fed. Malay States Mus. 10: 155. 1920.

Additional bibliography: Moldenke, Phytologia 18: 56. 1968; Moldenke, Fifth Summ. 1: 305 (1971) and 2: 935. 1971.

ERIOCAULON DREGEI Hochst., Flora 28: 341. 1845.

Additional bibliography: Moldenke, Phytologia 20: 406. 1970; C. C. Townsend, Excerpt. Bot. A.15: 418. 1970; Guillarmod, Fl. Lesotho 134. 1971; Moldenke, Fifth Summ. 1: 254 & 256 (1971) and 2: 935. 1971; Moldenke, Phytologia 23: 421. 1972.

Guillarmod (1971) cites "Kill. 2346" from Lesotho in the Pretoria herbarium and gives the overall distribution of the species in South Africa as "Natal, Swaziland".

ERIOCAULON DUTHIEI Hook. f., Fl. Brit. Ind. 6: 578. 1893.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 19: 37. 1969; Satake in Hara, Univ. Mus. Univ. Tokyo 2: 159. 1971; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 935. 1971.

Ruhland (1903) erroneously dates the original publication of this species as "1894", but pages 449—672 of Hooker's work were actually published in 1893.

ERIOCAULON EBERHARDTII H. Lecomte, Not. Syst. 2: 215. 1912.

Additional bibliography: Moldenke, Phytologia 20: 406. 1970; Moldenke, Fifth Summ. 1: 300 (1971) and 2: 935. 1971.

ERIOCAULON ECHINACEUM Van Royen, Blumea 10: 131—132, fig. 1D. 1960.

Additional bibliography: Moldenke, Phytologia 20: 406. 1970;

Moldenke, Fifth Summ. 1: 323 (1971) and 2: 935. 1971.

ERIOCAULON ECHINOSPERMOIDEUM Ruhl. in Fedde, Repert. Spec. Nov. 22: 31. 1925.

Additional bibliography: Moldenke, Phytologia 20: 406. 1970; Moldenke, Fifth Summ. 1: 96 (1971) and 2: 935. 1971.

ERIOCAULON ECHINOSPERMUM C. Wright ex Sauv., Anal. Acad. Ci. Habana 7: 716. 1871.

Additional bibliography: Moldenke, Phytologia 20: 406. 1970; Moldenke, Fifth Summ. 1: 96 (1971) and 2: 935. 1971.

ERIOCAULON ECHINULATUM Mart. in Wall., Plant. Asiat. Rar. 3: 29. 1832.

Additional synonymy: Eriocaulon echimulatum Heyne apud Ruhl. in Engl., Pflanzenreich 13 (4-30): 106. 1903.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 20: 406. 1970; Hansen, Dansk Bot. Arkiv 27: [31] & 33, fig. 2 d—f. 1969; Moldenke, Fifth Summ. 1: 283, 285, 288, 295, 300, 316, & 336 (1971) and 2: 499 & 935. 1971; Shehata, Biol. Abstr. 53: 4689. 1972; Anon., Biol. Abstr. 53 (9): B.A.S.I.C. S.87. 1972.

Additional illustrations: Hansen, Dansk Bot. Arkiv 27: 33, fig. 2 d—f. 1969.

Recent collectors have found this plant in flower and fruit in November (in addition to the months previously reported by me in this series of notes).

Additional citations: THAILAND: Charoenphol, Larsen, & Warncke 4693 (Ac).

ERIOCAULON EDWARDII Fyson, Journ. Indian Bot. 1: 50, hyponym (1919) and 2: 313, pl. 34. 1921.

Additional & emended bibliography: Fyson, Journ. Indian Bot. 1: 50 & 53. 1919; Moldenke, Phytologia 20: 406. 1970; Moldenke, Fifth Summ. 1: 271 & 274 (1971) and 2: 499 & 935. 1971.

ERIOCAULON EDWARDII var. CLARKEI Haines, Bot. Bihar & Orissa 6: 1071. 1924.

Additional bibliography: Moldenke, Phytologia 20: 406. 1970; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 935. 1971.

ERIOCAULON EHRENBERGIANUM Klotzsch ex Körn. in Mart., Fl. Bras. 3 (1): 491—492. 1863.

Additional bibliography: Moldenke, Phytologia 20: 406. 1970; Moldenke, Fifth Summ. 1: 69, 79, & 83 (1971) and 2: 493, 494, 506, 507, 512, 792, & 935. 1971.

ERIOCAULON EKMANNII Ruhl. in Fedde, Repert. Spec. Nov. 22: 30. 1925.

Additional bibliography: Moldenke, Phytologia 20: 407. 1970; Moldenke, Fifth Summ. 1: 96 (1971) and 2: 499 & 935. 1971.

[to be continued]

## BOOK REVIEWS

Alma L. Moldenke

"PREHISTORIC AGRICULTURE" edited by Stuart Struever, xi & 733 pp., illus., Doubleday /Natural History Press, Garden City, New York 11530. 1971. $9.95.

This is the fifteenth in the American Museum Sourcebooks in Anthropology series and it contains 33 papers by more than this number of authors, arranged according to the following five parts: (1) introduction, (2) hypotheses to explain the initial shift to agriculture, (3) beginnings of agriculture and its consequences in various world areas, (4) natural scientists' views of the beginning of agriculture, and (5) the role of agriculture in the development of civilization. Some of these still definitive papers are extracted from earlier issues of scientific journals of 1950, 1952, and 1959, often with forewords and/or footnotes to cover the time intervals.

A great deal of valuable information and access to more through a huge bibliography is available here. To this reviewer the two most interesting papers are Sauer's "Planters of the Old World and Their Household Animals" and Mangeldorf's "Review of 'Agriculture Origins and Dispersals' by Carl O. Sauer" because of their well explained opposing views.

"COMMON MARSH, UNDERWATER & FLOATING-LEAVED PLANTS OF THE UNITED STATES AND CANADA" by Neil Hotchkiss, v & 99 pp. & vii & 124 pp., illus., Dover Publications Inc., New York, N. Y. 10014. 1972. $3.00 paperback.

With a combined title and over 750 casual but accurate illustrations this book is an unabridged replication of "Common Marsh Plants of the United States and Canada" (1970) and "Underwater and Floating-leaved Plants of the United States and Canada" (1967), resource publications 93 and 44 of the Bureau of Sport Fisheries and Wildlife, U. S. Dept. of the Interior.

Many common plants of these habitats are grouped by size and obvious characteristics and simply described so that they can easily be identified by amateur naturalists and sportsmen.

The price is a bargain.

Northern pipewort is named <u>Eriocaulon septangulare</u>, with <u>E. lineare</u> and <u>E. parkeri</u> as synonyms. However, <u>E. septangulare</u> is actually a name for the genetically distinct European species for which Druce has shown that the correct name is <u>E. aquaticum</u>, while its American counterpart takes Michaux's name, <u>E. pellucidum</u>. Likewise many botanists in the United States recognize both <u>E. lineare</u> and <u>E. parkeri</u> as valid species, the former in fresh water from Georgia to Mississippi and Florida, the latter in tidal waters from Maine to North Carolina, with concomitant structural differences.

"MANUAL OF CLINICAL MYCOLOGY" 3rd edition by Norman F. Conant, David T. Smith, Roger D. Baker & Jasper L. Callaway, x & 755 pp., illus., W. B. Saunders Co., London WC 1A IDB, Toronto 7, & Philadelphia, Pa. 19105. 1971. $12.00, in flexible leatherette binding.

Like the 1944 and the 1954 editions have been, this book will be very important to medical and mycological personnel and students the world over for at least a decade. It has been completely revised with emphasis on immunology and therapy, and with new chapters on African histoplasmosis, lobomycosis, cladosporiosis and mycotic keratitis. Many of the perfect stages of such pathogenic fungi imperfecti (dermatophytes) have been supplied.

In the preface the authors remark about the increase in fungal diseases following widespread use of antibiotics, cortisone, etc., that have lowered the resistance of the patients' tissues to fungal pathogens.

The printing of the many photographic plates of microscopic organisms, fungal cultures, and patients with diseased areas is excellent and effective for diagnosis. There are an appendix of modern mycological methods, index, and bibliographies with each chapter.

"PLANT-GEOGRAPHY OF THE PACIFIC — As Based on a Census of Phanerogam Genera" by M. M. J. van Balgooy, 222 pp., illus., BLUMEA Supplement Volume VI. Order from Librarian, Rijksherbarium, Leyden, Netherlands. 1971. Dfl. 45 paperbound.

This provocatively interesting and thoroughly scientific study made its original appearance in 1960 as a preliminary analysis of the floristic distribution of the 1511 native phanerogam genera of the Pacific islands. It now covers 1666 genera, corrigienda and literature through July 1969. It carefully discusses the genus, rather than the species, as the working unit for phytogeographical study; floristic affinities, demarcations, and hierarchial subdivisions of this Pacific flora, and dispersal spectra; and historical geographic implications.

An appendix gives in chart forms the census of phanerogamic genera of the area. This represents a tremendous effort. A valuable bibliography and index are given. As so often happens when two works are published at about the same time, they miss reference (which would be mutually helpful) to each other. This book cites H. N. Moldenke's "The Known Geographic Distribution of the Members of the Verbenaceae" of 1949, but since that date thirteen supplements were published, a "Résumé" in 1959, 17 supplements to it, and, in 1971, a "Fifth Summary" bringing it all up-to-date.

# PHYTOLOGIA

*Designed to expedite botanical publication*



Vol. 24 December, 1972 No. 5

CONTENTS



Published by Harold N. Moldenke and Alma L. Moldenke

303 Parkside Road
Plainfield, New Jersey 07060
U.S.A.

Price of this number, $3; per volume, $8 in advance, or $8.50 at close of volume; 50 cents extra to foreign addresses

STUDIES IN THE HELIANTHEAE (ASTERACEAE). II.

A SURVEY OF THE MEXICAN AND CENTRAL AMERICAN SPECIES OF SIMSIA.

H. Robinson and R. D. Brettell
Smithsonian Institution, Washington, D.C. 20560.

The genus Simsia containing about 35 species is known from southern Texas and New Mexico southward to Argentina with 1 species in the West Indies. The genus has some complexity in South America, especially in the northern Andes, but the greatest concentration of species and greatest variation is in Mexico and Central America. Studies of the genus have occurred sporadically since the original description by Persoon (1807), with a lapse after the works of Bentham and Hooker (1873) and .sa Gray (1883) who reduced the genus to a section of Encelia. The genus Simsia was revived by Blake (1913) in his careful revision of Encelia and related genera. Blake in that treatment and in two later papers (1917, 1928) clarified many species concepts and named ten new species. Studies of Mexican and Central American species have again lapsed since Blake's work, but attempts to identify recent collections have proven the need for many additions and revisions. The present survey is intended to summarize results based on material in the U.S. National Herbarium and in many cases utilizes notes and material of types accumulated by Dr. Blake.

The generic limitations of Simsia are given best by Blake (1913) in his key to Encelia and related genera. The characters can be adapted as follows: Leafy stemmed, lower leaves opposite; paleae rigid, acute or acuminate, persistent; ray flowers not fertile; style branches attenuate, hispid-villous; disk achenes very flat, wingless, without squamellae, not villous-ciliate.

The present study has concerned primarily the delimitations of the species of Simsia. Many of the characters have been found to be reliable only within certain groups. Some of the groups and species cited below should be seen for further discussion. The lower nodes often bear foliaceous disks representing fused expanded petiole bases. These disks are consistently present in some groups of species (Group H) are variable between related species in other groups (Group G) and variable within some species (Group A). Leaf shape is particularly variable in some species (Group B) with lobing and the wings or lack of wings on the petioles often being totally unreliable (Group G). In some cases winged petioles seem more consistent (Group E, S. annectens; Group H, S. grayii). Pubescence of leaves and stems is one of the most reliable features and has been used extensively in deriving the concepts in this survey. Presence of glands is a useful character in some species (Group G, S. foetida; Group H, S. subsetosa) but it is variable along with other pubescence characters in at least one species (Group D, S. lagascaeformis). The useful inflorescence characters include differences in habit (Group F, fig. 1; Group H, S. steyermarkii, fig. 2), and differences in the shape of the phyllaries and paleae (Group G, figs. 4-5). Use of phyllaries is complicated by the need to properly distinguish the outer paleae from the phyllaries and by the tendency of the tips of many phyllaries to elongate as the head matures (Group G, figs. 9-10). Other floral features differ among the species primarily in size and number. Size of heads seems characteristic of S. setosa (Group H), size of achenes is apparently significant in S. guatemalensis but not in S. grandiflora (Group G). Number of phyllaries and ray flowers is distinctive for S. calva (Group E) and S. grandiflora (Group G), and complete lack of ray flowers distinguishes Group C, though the character requires very careful observation. Presence or absence of awns on achenes has been used to distinguish some species but proves unreliable in S. lagascaeformis (Group D) and many other species which produce individuals with glabrous awnless achenes. The value of the character is doubtful in Group A, but reduction of awns may be more consistent in S. calva (Group E).

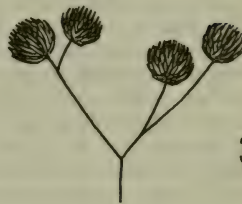
Microscopic characters of the flowers of Simsia have been examined but no consistent distinctive features between species have been noted. Characters are as follows. Ray achenes slender, elongating with age, bearing few or rarely many setae; disk corollas with short tube abruptly expanded into cylindrical throat being more expanded toward outer side in S. calva, outer surface scabrous with stiff antrorse spines which are broad at base and have sharply pointed short apical cells, some setae of lobes often long, tube and lower throat bearing scattered thin-walled scarcely capitate glands; corolla lobes 5, 1.5-2.0 times as long as wide, cells of outer surface smooth, cells of inner surface each bearing cylindrical papilla, papillae of upper and marginal cells larger and more contiguous; anther filament weak and capable of great elongation in lower part, upper filament

---

Figures 1-13. Simsia. 1-3. Inflorescences. 1. S. hintonii n.sp. 2. S. steyermarkii n.sp. 3. S. grandiflora Benth. ex Oersted. 4-5. Outer paleae. 4. S. chaseae (Millsp.) Blake. 5. S. lagascaeformis DC. 6-8. Corolla and stamens of S. amplexicaulis (Cav.) Pers. 6. Corolla showing distribution of glands and hairs. 7. Stamens showing distribution of glands and hairs. 8. Detail of hair from abaxial surface of stamen. 9-13. Heads showing involucres. 9-10. S. grandiflora. 9. Young. 10. mature. 11. S. molinae n.sp. 12. S. hintonii n.sp. 13. S. grayii Blake.

1

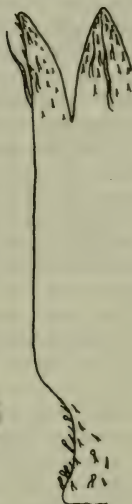
2



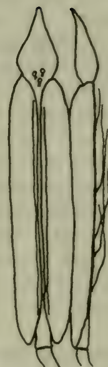
3

4

5



6



7

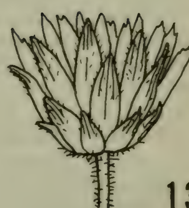
8

9

10

11

12



13

firm with mostly short oblong to subquadrate or shorter cells with walls variously collenchymatous sometimes weakly lined; anther connective usually bearing on outer surface few to many long slender firm-walled setae with very sharp pointed apical cells; exothecial cells quadrate with single small thickenings on each tranverse wall; anther appendage usually bearing on outer surface a cluster of thin-walled small capitate glands; nectary short cylindrical with thin upper margin, not lobed; style base bulbous, sunken about halfway into nectary; style branches densely haired on backs to near or just below base of branch, hairs pointed thin-walled 1-2 septate, grading into elongate pointed papillae on short slender appendage; achene smooth externally, usually with numerous appressed setae, walls of achene in transmitted light with minute punctations and 30-35 narrow longitudinal lines, carpopodium forming a pale bilobed margin pinched closed in mature achenes, with small mostly oblong cells in 2-3 rows, cell walls thin to slightly thickened, densely beaded.

The past placement of Simsia in the synonymy of Encelia seems to have misrepresented the true relationships of the genus. Viguiera H.B.K. is far more like Simsia in having often opposite leaves, flowers with similar form and pubescence, and achenes flat differing only in the presence of squamellae. A number of Viguiera species also show setae on the backs of the anther connectives though of different wall structure from those in Simsia.

The chromosome number has been reported for many species of Simsia, but voucher specimens have been seen for only S. amplexicaulis (Cav.) Pers. and S. pubescens Triana. All reports are for n = 17 or ca. 17. The number is common in many related genera (Turner, Ellison & King, 1961; Turner, Powell & King, 1962; Solbrig, Kyhos, Powell & Raven, 1972).

SIMSIA Pers., Syn. 2: 478. 1807 excl. S.? heterophylla.
(Lectotype Coreopsis amplexicaulis Cav.).
Armania Bert. in DC., Prod. 5: 576. 1836.
(Type Hopkirkia fruticulosa Spreng.).
Barrattia A.Gray & Engelm., Amer. Jour. Sci. ser. 2. 3: 274. 1847. (Type Barrattia calva A.Gray & Engelm.).

The genus was dedicated to Jacob Sims, editor of Curtis' Botanical Magazine from 1784 to 1816. The present treatment recognizes 24 species in the area of Mexico and Central America. The species can be distinguished by the following key and subkeys.

1. Leaves silky silvery-white with appressed pubescence below Group A

1. Leaves with erect or coarse pubescence below 2

2. Ray flowers prominently purple or pink throughout Group B

2. Ray flowers when present partially or completely yellow or whitish 3

3. Ray flowers absent Group C

3. Ray flowers or remnants of ray flowers present 4

4. Inflorescence rather strongly cymose with stiff widely diverging branches (Fig. 1) Group F

4. Inflorescence cymose-paniculate with heads densely clustered or on rather long erect pedicels (Figs. 2-3) 5

5. Phyllaries subequal in length, sometimes with narrow shorter outer phyllaries (Figs. 9-10) 6

5. Phyllaries distinctly unequal in length, outer phyllaries ovate (Figs. 11, 13) 7

6. Stems retrorsely scabrous Group E

6. Stems with erect or antrorse pubescence Group G

7. Bases of lower petioles not forming foliaceous disks, narrow or broad but not connate Group D

7. Bases of lower petioles connate, forming foliaceous disks on nodes Group H

GROUP A. The group contains the following two species.

Simsia ghiesbreghtii (A.Gray) Blake, Proc. Amer. Acad. 49 (6): 392. 1913.

Encelia (Barrattia) ghiesbreghtii A.Gray, Proc. Amer. Acad. 8: 658. 1873.

The range of the species includes southern Mexico (Chiapas) and Guatemala. The species is characterized by achenes being glabrous and awnless. The paleae have margins coarsely toothed and nearly glabrous as in species of Group G, but the unegual phyllaries and dense pubescence on the undersurface of the leaves indicate closer relationship to S. pubescens Triana and S. pastoensis Triana of Colombia. This group is also like the colombian species in the very variable development of foliaceous disks on the stem nodes. The disks vary from large to lacking on many specimens and are certainly not taxonomically significant.

*Simsia sericea* (Hemsl.) Blake, Proc. Amer. Acad. 49 (6): 393. 1913.

*Encelia sericea* Hemsl., Biol. Centr.-Am. 2: 185. 1881.

The type specimen and all subsequent collections seen are from Guatemala. The species is only a weak segregate of *S. ghiesbreghtii*, geing distinguished by the pubescent achenes with well-developed awns. Blake (1917) offers doubts of the value of the achene character citing the five other species in the genus where it is variable (*S. calva*, *S. setosa*, *S. exaristata*, *S. amplexicaulis* and *S. sanguinea*).

GROUP B. The group contains the following one species.

*Simsia sanguinea* A.Gray. Smiths. Contr. Knowl. 3: 107. 1852.

The range of the species includes Jalisco eastward to Veracruz and Oaxaca extending southward into Guatemala. The species is extremely variable in leaf form. Leaves are usually strongly trilobed but plants from Jalisco with leaves less lobed with sessile broad wings on the petiole and with paler flowers have been placed in var. *palmeri* (A.Gray) Blake. One specimen from Chiapas, about 36 miles west of Villa Flores, about 2500 ft., Nov. 1, 1965, *Cronquist* & *Sousa* *10461* (NY, US) has completely unlobed narrowly linear-lanceolate leaves and rather pale rays. Three further specimens from Guerrero, Mina: Placeres-Cigarillo, 450 m, *Hinton* *9818* (US); Mina: Jiotes, 500 m, *Hinton* *10647* (US); and Coyuca: Cutzamala, *Hinton* *6706* (US), have leaves very narrowly deeply and sometimes profusely lobed, petioles scarcely winged, and achenes usually large (6-7 mm long).

GROUP C. The group contains the following two species.

*Simsia eurylepis* Blake, Proc. Amer. Acad. 49 (6): 382. 1913.

Examination of specimens shows that the prominent expanded bases of the petioles sometimes fuse into distinct foliaceous disks. Expanded petiole bases are found also on one of the two stems on the type sheet of the closely related *S. submollicoma*. To the original collection from Ciudad del Maiz in San Luis Potosi (*Seler* *684*, US) should be added the following records: San Luis Potosi: 15 miles east of C. de Valles, flat brushy area, Aug. 23, 1957, *Waterfall* *14300* (US); Tamaulipas: vicinity of Tampico, alt. about 15 meters, March 10 to April 19, 1910, *Palmer* *250* (US, part of type of *S. submollicoma* Blake); Tampico, sandy empty lot toward bluff summit, rays orange-yellow, July 20, 1965, *R.Kral* *25003* (US).

*Simsia submollicoma* Blake, Proc. Amer. Acad. 49 (6): 381. 1913.

The species is known only from the type specimen from the vicinity of Tampico. The species seems too close to the preceding but it is retained here provisionally on the basis of the one stem of the type sheet which lacks auricles on the petiole bases.

GROUP D. The group contains the following three species.

1. Paleae puberulous or scabrous without long hairs (Fig. 4), phyllaries with little or no reddish coloration S. chaseae

1. Paleae with small fringe of hairs near tips, phyllaries often distinctly reddish at tips 2

2. Heads with 20-25 disk flowers; lower stems mostly 4-5 mm in diam; achenes usually without awns S. exaristata

2. Heads usually with 10-15 disk flowers, rarely 18 or 20; lower stems mostly 2-4 mm in diam; achenes usually with distinct awns S. lagascaeformis

Simsia chaseae (Millsp.) Blake, Proc. Amer. Acad. 49 (6): 385. 1913.

Encelia chaseae Millsp. in Millsp. & Chase, Field Mus. Pub. Bot. 3: 125. 1904.

The species is apparently restricted to Yucatan. The habit and paleae are like members of Group G and the numerous glands on the stems and leaves are somewhat reminiscent of S. foetida of that group. Simsia chaseae is distinct by the outer phyllaries being shorter and usually much broader.

Simsia exaristata A.Gray, Smiths. Contr. Knowl. 5, Art 6: 87. 1853.

The species is known from New Mexico, Texas, Sonora and Chihuahua. A specimen cited from Orizaba in Veracruz has not been seen in this study. Blake (1917) in his later note on the species named var. perplexa on the basis of a single specimen from Texas which had awns on the achene. Blake maintained the species as a weak segregate of S. lagascaeformis having a more northern range, generally fewer and larger heads, and leaves not glandular beneath. The leaf pubescence of S. lagascaeformis proves to be variable but the characters of the head with the greater number of disk flowers and the generally more robust form of the plants do seem distinctive.

Simsia lagascaeformis DC., Prod. 5: 577. 1836.

The species is known in Mexico from Colima eastward to San Luis Potosi, Puebla and Oaxaca. The pubescence of the leaves shows some variations in length of pubescence and occurrence of glands. Hairs on the leaves are very fragile and pubescence is sometimes nearly destroyed in older leaves, but careful observation shows that there are real differences in length of hairs from very short to rather long and pilose on different plants. Blake (1917) implied that the leaves were characteristically glandular beneath in S. lagascaeformis, but 6 of the 7 specimens seen in this study lack glands.

GROUP E. The group contains the following one species.

Simsia calva (A.Gray & Engelm.) A.Gray, Pl. Lindh. 2: 228. 1850.
Barrattia calva A.Gray & Engelm., Amer. Jour. Sci. ser. 2. 3: 275. 1847.

The distinctive species is one of the northernmost of the genus and one of two native in the United States. Distinguishing features include the retrorse scabrosity of the stem, the foliaceous disks on the nodes of the stem, and the 15-30 ray flowers per head. The most commonly noted feature of the species is the lack of awns on the achene. This character is apparently more significant in this species since awns are reduced or lacking even on the pubescent achenes of var. subaristata (A.Gray) Blake.

GROUP F. The group contains the following two species.

Simsia annectens Blake, Contr. Gray Herb. n.s. 52: 43. 1917.

Blake stated that S. annectens was "A species connecting the S. setosa group with that of S. amplexicaulis". This may have been based on the intermediate form of the phyllaries and the broad wings on the petioles continuous with the nodal disk. The species has very many distinctive features indicating more remote relationship such as the widely diverging branches of the inflorescence.

Simsia hintonii H.Robinson & R.D.Brettell, sp. nov.

Herbae erectae 4 m altae pauce ramosae. Caules rubescentes aliquantum striati minute puberuli et grosse hispide setiferi. Folia inferiora permagna, petiolis usque 12 cm longis superne late alatis, laminis 30 cm longis 31 cm latis valde trilobatis. Folia superiora minora, petiolis 2-5 cm longis distincte alatis, alis e base sensim latioribus ad laminas continuis, basibus petiolorum in discis 1.0-1.5 cm latis conjunctis, laminis 3.5-11.5 cm longis 1.5-7.4 cm latis plus minusve trilobatis aliquantum ficiformis ad apices anguste acuminatis margine serratis vel crenato-dentatis base late truncatis vel cordatis abrupte in alis petiolorum cuneatis, supra basin valde trinervatis, supra distincte piliferis et minute aliquantum dense puberulis, subtus aliquantum dense puberulis in nervis et nervulis distincte piliferis. Inflorescentiae parce cymoso-paniculatae, pedicellis penultimis late divaricatis usque ad 4.5 cm longis, pedicellis ultimis paucis 0.3-1.0 cm longis dense hispidis et minute puberulis sparse glanduliferis. Capitula 1.3-1.5 cm alta 1.0-1.2 cm lata. Involucri squamae ca. 16-18 inaequilongae 2-3-seriatae lanceolatae 7-13 mm longae 1.5-2.0 mm latae anguste acutae vix attenuatae extus et margine dense hispidae; radii ca. 5 flavi ca. 1.0 cm longi; paleae margine scariosae integrae vel grosse serratae apice acute non scariosae hirsutae extus ad medium hirsutae, paleae exteriores in partibus mediis induratibus latiores extus puberulae superne hirsutae; corollae disci ca. 7.5 mm longae; thecae antherarum ca. 3.5 mm longae; achaenia ca. 5.5-6.0 mm longa appresso-setifera; pappus distincte bisetosus, setis perfragilis facile caducis. Grana pollinis ca. 27μ diam. longe spinosa.

Type: MEXICO: Guerrero: Mina. Puerto Rico, 1800 m, by forest stream, 4 m high, flower pale yellow, 12-10-39, Hinton et al. 14976 (Holotype US).

The species has much of the habit and leaf shape of Simsia annectens including the widely divaricate pedicels of the inflorescence, but the wings of the petioles do not reach the basal disk in the lower leaves, the phyllaries are hirsute on the outer surface, the leaves are puberulous rather than densely minutely scabrellous on the upper and lower surfaces, and the stems have less glands.

GROUP G. The group contains the following six species. Since phyllaries are an important character in the group, care should be taken in distinguishing phyllaries with their linear-oblong strongly scabrous rather blunt tips from the more membraneous scarious-margined sharply pointed outer paleae. Coloration of exposed parts of phyllaries and outer paleae is often the same.

1. Stems, leaves and phyllaries densely glandular pubescent 2

1. Stems, leaves and phyllaries sparsely or not glandular pubescent 3

2. Petioles of lower leaves narrow at bases, not fused into nodal disk S. foetida

2. Petioles of lower leaves very broadly winged at base, fused into disk surrounding node S. cronquistii

3. Undersurfaces of leaves densely and finely pilose S. panamensis

3. Undersurfaces of leaves with setae sparse or coarse 4

4. Heads with ca. 40 phyllaries and ca. 20 rays S. grandiflora

4. Heads with ca. 20-25 phyllaries and ca. 10-12 rays 5

5. Lower nodes of stem with scarcely to broadly clasping but not conjoined bases of petioles; setae on leaves distinctly antrorse, appearing combed; achene 3.0-5.0 mm long S. amplexicaulis

5. Lower nodes of stem usually with distinct foliar disks on sides between bases of petioles; setae on leaves very long erect or irregular, most prominent on veins; achene 5.0-6.0 mm long. S. guatemalensis

Simsia amplexicaulis (Cav.) Pers., Syn. 2: 478. 1807.
Coreopsis amplexicaulis Cav., Descrip. 226. 1802.

The species is distributed from northern Mexico southward into Guatemala. Included here is the concept initially treated as S. foetida by Blake (1913) but later corrected (1917). To the many synonyms we add S. triloba Blake which was originally distinguished by the larger achenes (5-6 mm long). Achenes of the isotype specimen that have been seen are all 5 mm long and within the size range noted for S. amplexicaulis in this study. Variations in S. amplexicaulis include specimens from Guatemala with longer setae on the leaves causing some confusion with the related S. guatemalensis n.sp., and one specimen with conjoined petiole bases (Coahuila: Sept. 1898, Palmer 422, US). The conjoined bases tend to be bilobed and broadly attached to the petioles and less like the foliaceous disks of related species. Specimens with glabrous and awnless achenes are referred to var. decipiens Blake, but at least one isotype of var. decipiens is not of the variety.

Simsia cronquistii H.Robinson & R.D.Brettell, sp. nov.

Herbae erectae ca. 1 m altae pauce ramosae. Caules flavi teretes distincte striati sparse longe piliferi glandulis longiuscule stipitatis dense obsiti. Folia inferiora opposita petiolata, superiora alternata sessilia, petiolis 4-5 cm longis superne anguste marginatis base late marginatis in discis 2-3 cm latis conjunctis, laminis foliorum inferiorum 9-10 cm longis 7-8 cm latis late ovatis vel deltoideis breviter acutis margine crenato-dentatis base truncatis trinervatis utrinque distincte glanduliferis et minute scabrellis supra sparse setiferis, laminis foliorum superiorum 3-11 cm longis 0.7-5.5 cm latis anguste oblongis vel panduriformibus base rotundatis vel auriculatis. Inflorescentiae laxe cymoso-paniculatae pauce capitatae, pedicellis 1-9 cm longis distincte breviter glanduliferis et longe hispidis. Capitula 1.3-1.5 cm alta, ca. 1.5 cm lata. Involucri squamae ca. 22-24 subaequilongae ca. 2-seriatae lineari-lanceolatae 10-13 mm longae usque ad 2 mm latae superne oblongo-lineares attenuatae ad apices obtusae margine et extus valde hispido-setiferae; radii (7)-8-(10) pallidi 8-9 mm longi; paleae flavo-virides margine scariosae integrae vel pauce serrulatae, apicibus et partibus mediis induratibus minute puberulis; corollae discis ca. 7 mm longae; thecae antherarum ca. 3.5 mm longae; achaenia ca. 5.0 mm longa appresso-setifera; pappus distincte bisetosus. Grana pollinis ca. 23-25µ diam. longe spinosa.

Type: MEXICO: Oaxaca: 97 miles southeast of Oaxaca and 54 miles northwest of Tehuantepec. Elev. about 3100 ft. Roadside weed along the Pan-American highway in small-forest region dominated by Lysiloma, Bursera, Euphorbia, and other deciduous angiosperms. Heads rather light yellow, tending to nod at anthesis, later becoming erect. Rays 7-10, most commonly 8, neutral, epappose. Disk achenes strongly flattened but scarcely winged, with a pappus of 2 paleaceous awns. Chromosome number det. by B.L.Turner as n=ca. 17. October 13, 1962, Cronquist 9661 (Holotype US).

The new species is very close to Simsia foetida in habit, leaf pubescence, and in structure of phyllaries and paleae, but it is strikingly different in the foliaceous disks at the bases of the lower leaf pairs. The new species also occurs to the east of the known range of S. foetida.

Simsia foetida (Cav.) Blake, Proc. Amer. Acad. 49 (6): 385. 1913.
Coreopsis foetida Cav., Icon. 1: 55, t. 77. 1791.

The species occurs in Mexico from Nayarit eastward to central Oaxaca. The concept is that initially treated as S. adenophora (Greenm.) Blake by Blake (1913) but later corrected (1917).

Simsia grandiflora Benth. ex Oersted, Vidensk. Medd. Kjöbenh. 1852: 92. (1853).

The concept of the species is expanded here to include all members of the group having or being cited as having approximately 20 rays per head. Included here is S. polycephala Benth. ex Oersted., described at the same time as S. grandiflora with the comment "Affinis S. grandiflorae, sed caulis multo tenuior, corymboso-ramosus, foliis (Quae valde imperfecta vidi) basi raro dilatata, capitula paulo minora, involucri squamae obtusiora, ligularum lamina vix 2 lin. longa. An tamen S. grandiflorae var?" The differences cited by Bentham are almost entirely those characteristic of younger plants. Only the dilatate leaf bases are significant and material seen indicates the character is variable in S. grandiflora as it is in the related S. amplexicaulis.

Simsia megacephala Sch. Bip. ex Blake, Proc. Amer. Acad. 49 (6): 391. 1913, described from cultivated material, seems very close to or the same as S. grandiflora. The species was separated by Blake primarily on the basis of the achenes being 6.0-7.3 mm long and all the leaves rather than just the upper ones having broadly margined clasping bases.

*Simsia guatemalensis* H.Robinson & R.D.Brettell, sp. nov.

Herbae erectae 1.0-1.5 m altae pauce ramosae. Caules obscuro-flavi teretes leniter striati minute puberuli et longe hispido-setiferi. Folia inferiora opposita distincte petiolata, superiora alternata breviter petiolata vel sessilia, petiolis usque ad 5 cm longis plerumque emarginatis ad discos distinctos 0.5-1.0 cm latos non conjunctis, laminis inferioribus usque ad 9 cm longis 8 cm latis late ovatis cordatis, breviter acutis margine serratis base trinervatis, laminis superioribus ovatis vel anguste ovatis 2.5-3.0 cm longis 1.0-2.3 cm latis base rotundatis vel cuneatis, laminis supra dense puberulis et sparse longe setiferis subtus puberulis et plerumque in nervis longe hispidis. Inflorescentiae laxe cymoso-paniculatae multicapitulatae, pedicellis 1-8 cm longis dense glandulo-puberulis et longe hispido-setiferis. Capitula ca. 1.3 cm alta ca. 1.5 cm lata. Involucri squamae ca. 25 subaequilongae 2-3-seriatae lanceolatae 7-10 mm longae breviter acutae margine et extus longe hispidae; radii 10-12 flavi 7-8 mm longi; paleae exteriores extus in partibus mediis plus minusve obscuro-virides margine scariosae superne serratae vel laciniatae, apicibus abrupte acutis non scariosis scabris; corollae discis 6-7 mm longae; thecae antherarum ca. 3.5 mm longae; achaenia 5.0-5.5 mm longa appresso-setifera; pappus distincte bisetosus. Grana pollinis ca. 23-25μ diam. longe spinosa.

Type: GUATEMALA: Amatitlán: Amatitlán, alt. 1200 m, Oct. 1904, Tuerckheim 8701 (Holotype US). Additional specimens seen: GUATEMALA: Chiquimula: vicinity of Chiquimula town, dry thickets along Chiquimula river, herb 1-1.5 m, rays & disk yellow, common, Dec. 4, 1969, Molina & Molina 25110 (US); Santa Rosa: Chupadero, alt. 1600 m, Oct. 1892, Heyde & Lux 3810 (US); Cerro Redondo, alt. 4500 pp. Oct. 1894, Heyde & Lux 6160 (US). EL SALVADOR: Chalatenango: Highway to La Palma, dry thickets along Tejutla creek, herb 0.5-1.5 m, heads yellow, common, Feb. 22, 1968, Molina & Montalvo 21575 (US); Santo Domingo, "Chichinguaste" ? 1922, Calderón 1209 (US). NICARAGUA: Estelí: 4 kms on way to San Juan Limay, common in thickets along road, Fls. & rays yellow, alt. 1000 m, Nov. 6, 1968, Molina 23157 (US).

The new species is close to *Simsia amplexicaulis* but is distinct by the small disks on the lower nodes of the stems which are not or scarcely attached to the bases of the petioles. The hairs on the leaves are also more erect or irregularly spreading and not "combed" as in *S. amplexicaulis*. All achenes of disk flowers seen are 6-7 mm long while those of *S. amplexicaulis* are 3.5-5.0 mm long.

*Simsia panamensis* H.Robinson & R.D.Brettell, sp. nov.

Herbae erectae 1-3 m altae varie ramosae. Caules parum rubescentes teretes leniter striati puberuli et sparse pilosi. Folia inferiora opposita distincte petiolata, superiora alternata breviter petiolata vel sessilia, petiolis usque ad 7.5 cm longis plerumque emarginatis in foliis superioribus base raro breviter alatis amplexicaulibus non conjunctis, laminis ovatis vel deltoideis inferioribus usque ad 15 cm longis 14 cm latis plerumque 4-10 cm longis 2-5 cm latis acutis vel breviter acuminatis margine serratis vel serrulatis base truncatis vel leniter cordatis trinervatis supra breviter puberulis et ubique subtiliter pilosis subtus dense subtiliter pilosis. Inflorescentiae laxe cymoso-paniculatae pauce capitatae, pedicellis plerumque 2-9 cm longis dense puberulis et hispido-setiferis pauce glanduliferis. Capitula ca. 1.3 cm alta 1.3-1.5 cm lata. Involucri squamae ca. 30 subaequilongae 2-3-seriatae oblongo-lanceolatae 6-10 mm longae breviter acutae demum longiores margine et extus hispido-setiferae; radii ca. 15 flavi 6-11 mm longi; paleae flavo-virides margine scariosae superne serratae vel breviter laciniatae, apicibus abrupte acutis non scariosis puberulis vel scabrellis; corollae discis ca. 6 mm longae; thecae antherarum ca. 3.0 mm longae; achaenia 3.0-4.5 mm longa appresso-setifera; pappus distincte bisetosus. Grana pollinis ca. 23-25μ diam. longe spinosa.

Type: PANAMA: Panama: Bella Vista, "Sirvulaca," brushy field; herb 4-8 ft., abundant, rays yellow, Nov. 28, 1923, Standley 25386 (Holotype US). Additional specimens seen: PANAMA: Coclé: Aguadulce, in savannas, near sea level, Dec. 3-6, 1911, Pittier 4847 (US); Penonome and vicinity, 50-1000 ft. elev., 1-2 ft. high, fls. yellow, Feb. 23-March 22, 1908, R.S.Williams 242 (US); Rio Hato airstrip, herb to 4 ft.; heads yellow, Dec. 23, 1966, Burch, Oliver and Robertson 1146 (US); Herrera: Road from La Avena to outskirts of Pese, alt. ca. 200 ft; herb, erect to 7 ft., heads yellow, Dec. 25, 1966, Burch, Oliver & Robertson 1312 (US); Los Santos: 17.8 miles S of Macaracas, alt. 1100 ft., roadside and secondary woods; stems to 1 m, heads yellow, May 25, 1967, Lewis, MacBryde, Oliver & Ridgway 1616 (US); Panama: vicinity of Panama, Feb. 24, 1923, Macbride 2604 (US); Punta Paitilla, herb 10 ft., Feb. 22, 1923, Piper 5427 (US); Punta Paitilla, roadside, herb 2.5 m, Nov. 17, 1921, Heriberto 222 (US); Sabanas, north of Panama City, Bro. Paul 595 (US); Tumba Muerto Road, near Panama, moist thicket, branching herb 3-6 ft., common, flowers bright yellow, Jan. 6, 1924, Standley 29788 (US); Canal Zone: Ancón Hill, open grassy slope; erect herb 4 ft., rays bright yellow, Nov. 26 - Dec. 9, 1923, Standley 26385 (US); Balboa, moist thicket, branching herb 4-8 ft., common, flowers yellow, Nov., 1923 - Jan., 1924, Standley 27148 (US); Thicket, bushy herb 4-8 ft., abundant, flowers yellow, Nov., 1923 - Jan., 1924, Standley 32098 (US); Along the old Las Cruces Trail, between Fort Clayton and Corozal; in thicket, herb 4-8 ft., common, flowers bright yellow, Dec. 31, 1923, Standley 29209 (US).

The new species is what has been called Simsia grandiflora in Panama but it differs by the softly piliferous leaves and by the smaller number of phyllaries and rays. Simsia dombeyana DC.

of South America is also closely related but has shortly puberulous leaves and fewer phyllaries and rays.

GROUP H. The group contains the following seven species.

1. Heads sessile in clusters ... S. steyermarkii

1. Heads with short to long pedicels ... 2

2. Leaves with rather dense erect pilosity beneath ... 3

2. Leaves only short puberulent or glanduliferous beneath ... 4

3. Leaves without two distinct sizes of setae on the upper surface, phyllaries without hirsute fringe ... S. holwayi

3. Leaves with two distinct sizes of setae on the upper surface, margins of phyllaries with distinct hirsute fringe ... S. molinae

4. Stems, leaves and pedicels with only non glandular hairs; phyllaries without distinct hirsute fringe on lower part ... S. grayi

4. Pedicels and usually stems and leaves with distinct short glandular hairs; phyllaries with distinct hirsute fringe on margins and base ... 5

5. Heads 1.2-1.5 cm high; stems with numerous long setae (Sonora, Chihuahua) ... S. setosa

5. Heads about 1.0 cm high; stems with setae rather sparse and short (Central Mexico) ... 6

6. Heads with 10-15 disk flowers; stems sparsely glandular-haired ... S. tenuis

6. Heads with 20-30 disk flowers; stems densely glandular-haired ... S. subsetosa

Simsia grayi Blake, Jour Wash. Acad. Sci. 18 (2): 26. 1928.

Two specimens are cited by Blake in his description of the species, but a note accompanying the photograph and type fragments in the U.S. National Herbarium indicates no. 561 is the type. An additional specimen has been seen in this study which differs only in having coarser scabrosity on the leaves, MEXICO: Michoacan: Distr. Zitacuaro, Zitacuaro-San Jose Purua; alt. 1650 m, edge of banana orchard in barranca; 2 m high; flower light greenish-yellow, Hinton et al. 13260 (US 2 sheets).

Simsia holwayi Blake, Contr. Gray Herb. n.s. 52: 46. 1917.

The species is known only from the type collection, GUATEMALA: Agua Caliente, on Barrios-Guatemala City Railway, 4 Feb. 1917, Holway 854 (GH, US).

Simsia molinae H.Robinson & R.D.Brettell, sp. nov.

Herbae erectae 1-2 m altae pauce ramosae. Caules rubescentes teretes vix striati sparse minute puberuli, setis longioribus distinctis sparsioribus. Folia opposita distincte petiolata, petiolis anguste marginatis 0.5-2.0 mm longis base in discis 1.0-1.5 cm latis conjunctis, laminis 3.0-6.5 cm longis 1.5-4.5 cm latis deltoideis vel distincte trilobatis base truncatis vel cordatis distincte trinervatis apice sensim anguste acutis vel acuminatis margine leniter crenulatis supra dense minute scabrellis et sparse longius setiferis subtus dense minute piliferis in nervis etiam sparse setiferis. Inflorescentiae laxe cymosae, pedicelli 0.1-3.0 mm longi sparse setiferi, minute puberuli et glanduliferi, glandulis distincte breviter stipitatis. Capitula 1.0-1.2 cm alta 0.8-1.0 cm lata. Involucri squamae ca. 18-22 valde inaequilongae 3-4-seriatae lanceolatae vel oblongo-lanceolatae 5-11 mm longae 1-2 mm latae anguste breviter acuminatae extus minute puberulae et glanduliferae base et margine dense longe hirsutae; radii 6-9 flavi ca. 1.2 cm longi; paleae margine scariosae dentatae vel lacinatae apice acute vel acuminatae non scariosae hirsutae, paleae exteriores in partibus mediis induratibus latiores extus puberulae; corollae disci ca. 6-7 mm longae; thecae antherarum ca. 3.5 mm longae; achaenia ca. 5.9 mm longa appresso-setifera; pappus distincte bisetosus. Grana pollinis ca. 25-27μ diam. longe spinosa.

Type: NICARAGUA: Estelí: Vicinity of Guava 20 kms from Estelí, common along Estelí river, Fls. & rays yellow, herb 1-2 m tall, Nov. 5, 1968, Molina 23122 (Holotype US). Additional specimen seen: HONDURAS: Morazán: Río de La Orilla, southeast of El Zamorano, base of Cerro Majicarán, 750-800 m; moist thicket, herb 1-2 m, rare, heads bright yellow, Nov. 1948, Standley 14009 (US).

The new species is like Simsia holwayi Blake in the fine dense pubescence on the lower leaf surface but is different by the more broadly deltoid less deeply lobed leaves with more crenulate margins, by the two distinct sizes of setae on the upper leaf surface and by the distinct hirsute fringe on the phyllaries.

Simsia setosa Blake, Proc. Amer. Acad. 49 (6): 379. 1913.

The species is known only from Sonora and Chihuahua in northern Mexico.

Simsia steyermarkii H.Robinson & R.D.Brettell, sp. nov.

Herbae erectae mininum 1 m altae non vel pauce ramosae. Caules rubescentes teretes sparse minute puberuli, setis longioribus distinctis sparsioribus. Folia opposita breviter petiolata, petiolis anguste marginatis 5-8 mm longis base in discis ca. 1.0 latis conjunctis, laminis 1.5-3.2 cm longis 0.8-2.0 cm latis deltoideis anguste acutis argute serratis base truncatis vel leniter cordatis trinervatis supra dense minute scabrellis et sparse longius setiferis subtus dense breviter horridis. Inflorescentiae subpaniculatae pauce capitatae in glomerulis breviter pedicellatae; pedicelli plerumque 1 mm longi. Capitula 1.0-1.2 cm alta 0.8-1.0 cm lata. Involucri squamae ca. 16-20 valde inaequilongae 3-4-seriatae lanceolatae vel oblongo-lanceolatae 3-8 mm longae 0.5-2.0 mm latae anguste breviter acuminatae extus minute puberulae margine et ad medium longe hirsutae; radii ca. 9 flavi ca. 8-10 mm longi; paleae margine scariosae serratae vel laciniatae apice acute non scariosae dense hirsutae extus ad medium hirsutae, paleae exteriores in partibus mediis induratibus latiores; corollae disci 6.5 mm longae; thecae antherarum 3.5 mm longae; achaenia ca. 4.0 mm longa appresso-setifera; pappus distincte bisetosus. Grana pollinis ca. 25-27µ diam. longe spinosa.

Type: GUATEMALA: Zacapa: Trail between Santa Rosalía de Mármol and Vegas, Sierra de Las Minas; flowers yellow, Jan. 19, 1942, Steyermark 42931 (Holotype US).

The new species may be closest to *Simsia molinae* n. sp. but the present species has heads in distinctive compact glomeruli, has phyllaries hirsute on the outer surface, has leaves more serrate and less lobed, and has much more coarse pubescence on the undersurface of the leaves.

*Simsia subsetosa* H.Robinson & R.D.Brettell, sp. nov.

Herbae erectae 3-4 m? altae pauce ramosae. Caules rubescentes teretes leniter striati minute glandulo-puberuli sparse breviter setiferi. Folia plerumque opposita petiolata, superiora alternata breviter petiolata vel sessilia, petiolis usque ad 2 cm longis superne sensim anguste alatis base in discis ca. 1.0 cm latis conjunctis, laminis plerumque 4-6 cm longis 2.0-4.5 cm latis deltoideis vel trilobatis acutis margine serrulatis base rotundatis vel truncatis abrupte anguste cuneatis supra basin trinervatis utrinque perminute puberulis et glanduliferis sparse breviter setiferis; folia superiora 1-4 cm longa ovata vel rhomboidea. Inflorescentiae laxe cymoso-paniculatae, pedicellis 0.5-3.0 cm longis dense glandulo-puberulis sparse breviter setiferis. Capitula ca. 1.0 cm alta 0.8-0.9 cm lata. Involucri squamae ca. 18-20 inaequilongae 2-3-seriatae lanceolatae 5-8 mm longae anguste breviter acuminatae margine et base profuse longe hirsutae; radii 8-10 pallidi ca. 5 mm longi; paleae exteriores extus in partibus mediis obscuro-virides pauce setiferae margine scariosae superne serrulatae dense setiferae; corollae discis ca. 20-30 ca. 5.5 mm longae; thecae antherarum ca. 3.0 mm longae; achaenia 4.0 mm longa appresso-setifera; pappus distincte bisetosus fragiles. Grana pollinis 23-25µ diam. longe spinosa.

Type: MEXICO: Mexico: Temascaltepec: Rincon del Carmen, 1340 m, woods; 3 m high, Nov. 23, 1932, Hinton 2693 (Holotype US). Additional specimen seen: Temascaltepec: Ixtapan, 1000 m, hill; 4 m high, Dec. 13, 1932, Hinton 2935 (US).

The pubescence of the lower leaf surface in the new species is very short and relationship is closest to Simsia setosa Blake S. tenuis (Fernald) Blake and S. grayi Blake. Of the related species S. setosa has larger heads, more setose stems and unwinged petioles, S. grayi has phyllaries only puberulous or shortly setiferous and stems and leaves non glandiferous, S. tenuis has unwinged petioles, sparsely glandular stems, less densely puberulent leaves and heads with only 10-15 disk flowers.

Simsia tenuis (Fernald) Blake, Proc. Amer. Acad. 49 (6): 380. 1913.

Encelia tenuis Fernald, Proc. Amer. Acad. 33: 94. 1897.

The species is known only from the type collection, MEXICO: Guerrero: Edge of cornfield, Nov. 1894, Palmer 96 (GH, US).

## References

Bentham, G. and J. D. Hooker. 1873. Genera plantarum. 2: 1-554.

Blake, S. F. 1913. II. A revision of Encelia and some related genera. Proc. Amer. Acad. 49 (6): 346-396, pl. 1.

______. 1917. III. New and noteworthy Compositae, chiefly mexican. Contr. Gray Herb. n.s. 52: 16-59.

______. 1928. Twelve new american Asteraceae. Jour. Washington Acad. Sci. 18 (2): 25-37.

Gray, A. 1883. I. Contributions to north american botany. Proc. Amer. Acad. 19: 1-96.

Persoon, C. H. 1807. Synopsis Plantarum seu enchiridium botanicum, complectens enumerationen systematicam specierum hucusque cognitarum. vol. 2. Paris. 1-657.

Solbrig, O. T., D. W. Kyhos, M. Powell and P. H. Raven 1972. Chromosome numbers in Compositae VIII: Heliantheae. Amer. J. Bot. 59: 869-878.

Turner, B. L., W. L. Ellison and R. M. King 1961. Chromosme numbers in the Compositae. IV. North American species, with phyletic interpretations. Amer. J. Bot. 48: 216-223.

Turner, B. L., M. Powell and R. M. King 1962. Chromosome numbers in the Compositae. VI. Additional Mexican and Guatemalan species. Rhodora 64: 251-271.

# A NEW VARIETY OF SALVIA BETULIIFOLIA (LABIATAE)

James L. Reveal

University of Maryland, College Park 20742
and
Smithsonian Institution, Washington, D.C. 20560

&

William J. Hess

Newark State College, Union, New Jersey 07083

During recent botanical explorations into northern Mexico in search of *Eriogonum* (Polygonaceae), we made small collections of additional species which were of interest to us, or from areas that seemed to be botanically unusual. Amongst our material obtained in 1971 and 1972 is a large-flowered variant of *Salvia betuliifolia* Epl. It may be known as:

**Salvia betuliifolia** Epl. var. **chasmema** Reveal & Hess, var. nov.

A var. *betuliifolis* corolliis longioribus 4-5.5 cm longis (nec 3.4-4 (4.5) cm longis), calycibus grandioribus 17-25 mm longis (nec 13-19 mm longis) differt.

TYPE.--MEXICO: Durango: Along the dirt road from Hidalgo del Parral to El Vergel, about 47 miles west of Parral and 11.5 miles west of Ojito, Sierra Madre Occidental, among lava rocks and volcanic outcrops near the road and old wagon trail above the road, associated with *Pinus cembroides*, *P. leiophylla*, *Juniperus deppeana*, *Quercus*, and *Arbutus*, at 8000 feet elevation, 12 September 1972, *Reveal & Hess 3037*. Holotype, US! Isotypes, 15 isotypes to be distributed from US. See figure. Illustration by D.E. Barger.

ADDITIONAL COLLECTIONS SEEN: MEXICO: Durango: Along the road from Hidalgo del Parral to El Vergel, 12.6 miles west of Ojito, 11 August 1971, *Reveal, Hess & Kiger 2748* (MEXU, NY, US).

The var. *chasmema* (Greek, yawn or gape - as to the large and conspicuous flowers) occurs at a slightly higher elevation (8000 to 8500 feet) in the Sierra Madre Occidental than var. *betuliifolia* (6000 to 7500 feet) and flowers somewhat earlier (August to September) than the typical variant (September to November). The leaves of var. *chasmema* are somewhat larger and more densely pubescent, but these features appear to be highly variable in the field. The new variety may be recognized most readily by its larger flowers which have long, narrow upper and lower lips giving the illusion to a yawn.

Field work in Mexico is supported by National Science Foundation Grant GB-22645 to the senior author.


**Salvia betuliifolia var. chasmema**

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CII.

A NEW GENUS, CONDYLIDIUM.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

A group of species distributed in Central America, the West Indies and Andean South America is recognized here as a new genus Condylidium. The genus is one of the most easily recognized in the Eupatorieae by the extreme development of the widely divaricate cymes and by the regular orginization of the phyllaries into five ranks each with three bracts.

The genus seems rather isolated among the Eupatorieae with possible relationship to both the Ayapanoid and Brickellioid series. The enlarged pubescent stylar node is common to both groups but the slender papillose style branches of Condylidium indicate closer relationship to the Ayapanoid series. The contorted tapering carpopodium of Condylidium with smaller subquadrate thick-walled cells below is similar to those found in the Ayapanoid genus Heterocondylus, but distorted carpopodia of different cellular structure are also known in the Brickellioid genera Flyiella and Alomia. The chromosome number of Condylidium X = 10 is like known counts of the Ayapanoids and not like counts X = 9 presently recorded for Brickellioids.

Condylidium R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae herbaceae, suffrutescentes, erectae, scandentes vel decumbentes, laxe ramosae. Folia opposita distincte breviter petiolata, petiolis plerumque fere ad basim anguste alatis, laminis ovatis breviter acuminatis obtuse serratis vel subintegris. Inflorescentiae laxe ramosae cymosae, cymis saepe valde divaricatis. Involucri squamae 15 subimbricatae valde inaequilongae 3-seriatae plerumque quinquefariae ovatae vel oblongae; receptacula plana glabra. Flores 5-6 in capitulo; corollae inferne breviter tubulares superne anguste campanulatae, lobis vix latioribus quam longioribus, extus interdum glanduliferis, margine interdum parce breviter pilosis; filamenta antherarum in parte inferiore brevia, in parte superiore vix breviora superne sensim angustiora, cellulis plerumque subquadratis, parietibus vix ornatis, appendicibus parum longioribus quam latioribus; styli inferne leniter nodulosi densi breviter hirsuti, appendicibus linearibus dense antrorse longe papillosis; achaenia prismatica 5-costata distincte setifera; carpopodia valde contorta inferne distincte angustiora, cellulis inferioribus parvis subquadratis superioribus sensim elongatis, parietibus distincte incrassatis; pappus setiformis uniseriatus, setis 30-40 tenuibus scabrellis, cellulis apicalibus anguste obtusis vel argute acutis.

Species typica: Eupatorium iresinoides H.B.K.

Our studies of the genus indicate that it contains the following two species.

Condylidium cuatrecasasii R.M.King & H.Robinson, sp. nov. Plantae usque ad 40 cm altae. Caules teretes parce pilosi. Folia parce pilosa, petiolis 0.7-1.7 cm longis, laminis anguste ovatis 2.0-6.0 cm longis 0.8-1.2 cm latis serrulatis vel subintegris. Capitula ca. 6 mm alta. Involucri squamae interiores ca. 4 mm longae. Corollae ca. 3 mm longae non vel raro glanduliferae non vel perbreviter setiferae. Achaenia 1.8-2.0 mm longa.

Type: COLOMBIA: Cordillera Oriental; Departamento de Boyaca: Hoya del rio Chicamocha, vertiente izquierda, entre Soata y Tipacoque, matorrales xerofitos, 1700-2000 m. alt., 18 Julio 1940, Cuatrecasas & Garcia Barriga 9821 (Holotype US!). Additional specimens: COLOMBIA: Boyaca: Soata; alt. 2130 meters; arid slopes. September 6, 1938, Cuatrecasas 1015 (US!), Santander: 40 kilometros al sur de Bucaramanga; altura aproximada 600 metros, 16 Diciembre 1948, Molina & Barkley 18 S322 (US!).

Condylidium iresinoides (H.B.K.) R.M.King & H.Robinson, comb. nov. Eupatorium iresinoides H.B.K., Nov. Gen. et Sp. 4: 83. 1818 ed. folio. Guatemala, Honduras, Nicaragua, Panama, Cuba, Lesser Antilles, Venezeula, Colombia, Peru, Bolivia.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). CIII.

## A NEW GENUS, AYAPANOPSIS.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

A new genus, *Ayapanopsis*, is described here for a series of primarily Andean species with habit and carpopodial structure as in *Ayapana* and *Polyanthina* but with smooth style branches and only 50-100 flowers per head. Leaves of most species have short or narrowly winged petioles with prominent cuneate bases of the leaf blades, and carpopodia of all species show the characteristic evenly thickened walls and greatly enlarged basal tier of cells found in the related genera. Some species of *Ayapanopsis* have numerous hairs on the stylar node, a feature not found in the related Andean genera.

The new genus is the predominant representative of the Ayapanoid series in the region of Peru and Bolivia where only single species of *Ayapana*, *Polyanthina* and *Hetercondylus* are found. The geographic distribution of the genus as well as the various characteristics of the style suggest an intermediate position of *Ayapanopsis* in the Ayapanoid series between the primarily northern and the primarily brazilian genus complexes.

*Ayapanopsis* R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Herbae vel frutices erecti pauce ramosi. Caules teretes pubescentes vel subglabri. Folia opposita distincte vel indistincte petiolata, petiolis saepe alatis, laminis ellipticis vel cordatis ad apicem acutis vel acuminatis. Inflorescentieae corymboso-paniculatae, pedicellis brevibus vel elongatis. Involucri squamae 30-50 subimbricatae 3-4-seriatae valde inaequilongae anguste oblongae vel lanceolatae; receptacula leniter convexa glabra vel minute pilosa pustulata. Flores 35-150 in capitulo; corollae anguste infundibulares, lobis longe triangularibus extus plerumque glanduliferis saepe setiferis; filamenta in parte superiore elongata, cellulis quadratis vel longioribus, parietibus annulate ornatis, appendices 2/3 - $1\frac{1}{2}$ longiores quam latiores; styli inferne valde nodulosi glabri vel dense hirsuti, appendicibus linearibus sublaevibus vel mamillosis; achaenia prismatica vel fusiformia pauce vel dense setifera aliquantum glandulifera; carpopodia magna valde distincta breviter cylindrica, cellulis basilibus magnis angustatis, superioribus parvis rotundatis vel subquadratis 2-6-seriatis; parietibus incrassatis; pappus setiformis uniseriatus, setis 15-40 scabris ad apicem vix angustioribus; cellulis apicalibus acutis vel subacutis.

Species typica: Eupatorium latipaniculatum Rusby

Our studies of the genus indicate that it contains the following 13 species.

Ayapanopsis adenophora R.M.King & H.Robinson, sp. nov.

Herbae vel suffrutices erecti pauce ramosi. Caules, petioli, costae abaxiales laminararum, pedicelli et involucri squamae exteriores distincte glanduliferae, glandulis plerumque longistipitatis, cellulis capitularum numerosis multiseriatis. Folia longipetiolata, petiolis 2-3 cm longis superne sensim late alatis, laminis 4-8 cm longis 1.5-3.5 cm latis ovatis leniter acuminatis crenato-serratis base acutis utrinque puberulis; folia basilaria majora, petiolis usque ad 15 cm longis, laminis usque ad 20 cm longis 12 cm latis. Inflorescentiae laxe longe ramosae, ramis paniculatis, pedicellis ultimis 1-3 cm longis. Capitula ca. 1 cm alta; involucri squamae 30-35 virides 5-seriatae 2-8 mm longae 0.5-1.0 mm latae anguste acutae extus striatae plerumque parce puberulae et glanduliferae; receptacula minute pilosa. Flores ca. 40 in capitulo; corollae ca. 7 mm longae viridi-albae inferne tubulares superne sensim breviter infundibulares, lobis aequilateraliter triangularibus extus glanduliferis; filamenta antherarum in parte superiore ca. 350μ longa, parietibus distincte ornatis, appendices ca. 1½ longiores quam latiores; styli inferne glabri; achaenia ca. 2.5 mm longa inferne glabra superne setifera; carpopodia ca. 300μ lata 250μ alta, cellulis basilaribus 50-100μ altis, cellulis superioribus 6-8-seriatis plerumque subquadratis 12-25μ longis et latis; pappi setae ca. 35 ad apicem aliquantum vix dilatatae acutae. Grana pollinis 20-22μ diam.

Type: BOLIVIA: Hacienda Casana sobre el camino a Tipuani. 26 IX 1922, Altura sobre el mar 1400 m. Dr. Otto Buchtien 7540 (Holotype US!).

The new species is most distinctive in the numberous long-stalked glands on the vegetative parts.

Ayapanopsis andina (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium andinum B.L.Robinson, Contr. Gray Herb. n.s. 77: 9. 1926. Peru.

Ayapanopsis didyma (Klatt) R.M.King & H.Robinson, comb. nov. Eupatorium didymum Klatt, Ann. Naturhist. Wien 9: 356. 1894. Bolivia.

Ayapanopsis esperanzae (Hass.) R.M.King & H.Robinson, comb. nov. Eupatorium esperanzae Hass., Fedde Rep. Spec. Nov. 11: 170. 1912. Paraguay.

Ayapanopsis euphyes (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium euphyes B.L.Robinson, Contr. Gray Herb. n.s. 68: 16. 1923. Bolivia.

Ayapanopsis garcia-barrigae R.M.King & H.Robinson, sp. nov. Herbae erectae 2 m altae. Caules subglabri rubescentes. Folia subsessilia, petiolis brevibus alatis, laminis 10-15 cm longis 2.5-3.5 cm latis elliptico-lanceolatis acuminatis margine argute serrulatis base longe cuneatis utrinque glabris supra in nervis puberulis. Inflorescentiae laxe late ramosae, pedicellis ultimis 1-2 cm longis glanduliferis. Capitula ca. 6 mm alta; involucri squamae 35-40 fulvae 1.5-5.0 mm longae 0.7-1.0 mm latae ad apicem anguste obtusae extus minute striatae glabrae. Flores ca. 42 in capitulo; corollae 3.0-3.5 mm longae rubrae inferne tubulares superne sensim breviter infundibulares, lobis brevibus late triangularibus extus pauce breviter setiferis et glanduliferis; filamenta antherarum in parte superiore ca. 350μ longa, parietibus vix ornatis, appendices ca. 2/3 breviores quam latiores; styli inferne glabri; achaenia ca. 2 mm longa fere glabra in parte superiore pauce setifera; carpopodia ca. 300μ late 250μ alta, cellulis basilaribus 50-100μ altis, cellulis superioribus 4-seriatis plerumque oblongis vel rotundatis 20-40μ longis ca. 20μ latis; pappi setae 35-40 ad apicem vix angustiores argute acutae. Grana pollinis ca. 20μ diam.

Type:COLOMBIA: Narino: Barbacoas, Corregimiento

Santander (Buenavista) a Barbacoas (Vertiente del rio Telembi); alt. 840-200 m., Agosto 3-5, 1948, H. Garcia-Barriga 13123 (Holotype US!).

The new species is distinctive by the subsessile leaves, by the short throats on the corollas, by the short corolla lobes bearing stout short setae and by the rather short anther appendages. The corolla lobes are composed of small quadrate cells and many of the setae on the outer surface have cells in two rows.

*Ayapanopsis latipaniculata* (Rusby) R.M.King & H.Robinson, comb. nov. *Eupatorium latipaniculatum* Rusby, Bull. N.Y. Bot. Gard. 4: 380. 1907. Bolivia.

*Ayapanopsis mathewsii* (B.L.Robinson) R.M.King & H.Robinson, comb. nov. *Eupatorium mathewsii* B.L.Robinson, Proc. Amer. Acad. 55: 23. 1919. Peru.

*Ayapanopsis tarapotensis* (B.L.Robinson) R.M.King & H. Robinson, comb. nov. *Eupatorium tarapotense* B.L. Robinson, Proc. Amer. Acad. 55: 37. 1919. Peru.

*Ayapanopsis triosteifolia* (Rusby) R.M.King & H.Robinson, comb. nov. *Eupatorium triosteifolium* Rusby, Bull. N.Y. Bot. Gard. 4: 379. 1907. Bolivia.

*Ayapanopsis trixioides* (Baker) R.M.King & H.Robinson, comb. nov. *Eupatorium trixioides* Baker, Mart. Fl. Bras. 6(2): 311. 1876. Brazil.

*Ayapanopsis tucumanensis* (Lillo & B.L.Robinson) R.M. King & H.Robinson, comb. nov. *Eupatorium tucumanense* Lillo & B.L.Robinson, Contr. Gray Herb. n.s. 90: 32. 1930. Argentina.

*Ayapanopsis vargasii* R.M.King & H.Robinson, sp. nov.

Suffrutices erecti pauce ramosi. Caules virides minute purpureo-puberuli. Folia distincte petiolata, petiolis 1.0-2.5 cm longis lata alatis, laminis 7-13 cm longis 1.5-3.5 cm latis lanceolatis longe acuminatis subserrulatis base acutis subtus concoloris vel purpureis utrinque minute puberulis. Inflorescentiae 45$^{\circ}$ patentes, ramis paniculatis puberulis et pauce glanduliferis, pedicellis ultimis 2-15 longis dense puberulis. Capitula 6-7 mm alta; involucri squamae 30-35 virides vel rubro-tinctae 2-6 mm longae 0.5-1.0 mm latae ad apicem anguste acutae extus striatae exteriores puberulae. Flores ca. 47 in capitulo; corollae 2.5 mm longae albae vel parum roseo-albae inferne tubulares superne anguste infundibulares, lobis longe triangularibus 1 1/3 longioribus quam latioribus extus glanduliferis; filamenta antherarum in parte superiore ca. 200μ longa, parietibus leniter ornatis, appendices ca. 1 1/3 longiores quam latiores; styli inferne glabri; achaenia ca. 1.8 mm longa inferne glabra superne dense glandulifera et setifera, stipitibus glandularum aliquantum brevibus leniter scleroideis; carpopodia ca. 250μ lata 175μ alta, cellulis basilaribus 45-50μ altis, cellulis superioribus 4-5-seriatis plerumque subquadratis 15-20μ longis et latis; pappi setae ca. 30 ad apicem vix angustiores argute acutae. Grana pollinis 20-25μ diam.

Type: PERU: Cuzco: Quispicanchis: Maniri, Dec. 8, 1962, *C. Vargas C. 14061* (Holotype US!). Additional specimen PERU: Cuzco: Paucartambo: Tananayo, June 1966, *C. Vargas C. 17463* (Paratype US!).

The new species seems closest to *A. latipaniculata* and *A. tucumanensis* which also have achenes with many short stalked glands with or instead of the usual setae. Both of the related species differ from *A. vargasii* by the prominent hairs on corolla lobes and by the hairs on the stylar node.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). CIV.

## A NEW GENUS, GONGROSTYLUS.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

The elements of the Ayapana complex in the Andean region northward to Central America include two larger genera, Ayapana and Ayapanopsis, and two very distinctive species belonging in two separate genera, Polyanthina and Gongrostylus. The latter genus is described here for a plant of scandent habit having large club-shaped smooth tips on the style branches and very short truncate anther appendages. The genus shares the the distinctive carpopodial structure of other Andean members of the complex, many series of thick-walled cells with the basal series greatly enlarged.

The single species of the genus presents a slight phytogeographical problem. The original collection was credited to Costa Rica but all recent collections have been from Ecuador. Such a distribution is not impossible but needs varification.

Gongrostylus R.M.King & H.Robinson, genus novum, Asteracearum (Eupatorieae). Plantae scandentes pauce ramosae. Caules teretes subglabri. Folia opposita breviter petiolata, laminis ovatis acuminatis base rotundatis valde trinervatis. Inflorescentiae axillares et terminales corymboso-paniculatae, pedicellis tenuibus saepe elongatis. Involucri squamae subimbricatae 3-4-seriatae valde inaequilongae anguste lanceolatae vel lineares; receptacula leniter convexa glabra pustulata. Flores ca. 20 in capitulo; corollae anguste infundibulares, lobis longe triangularibus extus glanduliferis; filamenta antherarum in parte superiore incrassata elongata, cellulis minutis breviter oblongis vel elongatis, parietibus inferme annulate ornatis; appendices antherarum breves duplo latiores quam longiores; styli inferne valde nodulosi dense hirsuti, appendicibus inferne tenuibus leniter mamillosis ad apicem valde late nodulosis laevibus; achaenia prismatica 5-costata glabra; carpopodia magna valde distincta breviter cylindrica, cellulis basilaribus magnis angustatis, superioribus parvis subquadratis multiseriatis, parietibus incrassatis, pappus setiformis uniseriatus, setis ca. 30 scabris ad apicem vix angustioribus, cellulis apicalibus subacutis.

Species typica: Eupatorium costaricense Kuntze

The genus is monotypic.

**Gongrostylus costaricensis** (Kuntze) R.M.King & H.Robinson, comb. nov. Eupatorium costaricense Kuntze, Rev. Gen. 337. 1891. Costa Rica, Ecuador.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). CV.

## A NEW GENUS, HETEROCONDYLUS.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

One rather large and diverse group of species in the Ayapanoid series of the Eupatorieae is easily distinguished by the somewhat distorted carpopodium having porose thickened walls and having the basal tier of cells not more enlarged than the others. The species thus distinguished include a number of brazilian species and also the very widely distributed *Eupatorium vitalbae* DC. In spite of many superficial differences, it has seemed best to place all the species in the single new genus, *Heterocondylus*, described here.

The genus *Heterocondylus* shows a number of extreme variations in habit including the slender nearly monocephalic microphyllous *H. lysimachioides* and the small long scapose forms like *H. amphidictyus*, *H. pandurifolius*, and *H. pumilus*. In most species the normal plants have alternate branching in the inflorescence, but this branching is usually opposite in two species, *H. vautherianus* and *H. vitalbae*. The latter character, which seems of little significance phyletically, is nevertheless very obvious and has resulted in an undue tendency to confuse the last two species. There is also a marked variation in phyllaries in the genus, being rather broad and subequal in *H. grandis* and *H. vitalbae* but in many unequal series in most other species.

**Heterocondylus** R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae herbaceae vel suffrutescentes erectae vel subscandentes pauce ramosae. Folia inferne opposita suprene plerumque alterna sessilia vel breviter petiolata, laminis ovatis vel anguste oblongis integris vel serratis. Inflorescentiae pauce vel multo ramosae paniculatae vel cymosae. Capitula magna; involucri squamae 15-30 imbricatae vel subimbricatae valde inaequilongae vel subaequilongae 3-5-seriatae oblongae vel lanceolatae; receptacula plana glabra. Flores 20-80 in capitulo; corollae anguste infundibulares 5-lobatae, lobis triangularibus, plerumque distincte longioribus quam latioribus, laevibus glabris vel pauce glanduliferis; filamenta antherarum in parte superiore saepe incrassata, cellulis inferne subquadratis vel latioribus superne oblongis vel longioribus, parietibus annulate ornatis, appendicibus longioribus quam latioribus; styli inferne nodulosi glabri vel hirsuti, appendicibus late linearibus sublaevibus vel breviter papillosis; achaenia 5-costata setifera vel glandulifera, inferne attenuata; carpopodia distincta aliquantum inaequilateralia plerumque obturaculiformia, cellulis subquadratis multiseriatis, parietibus distincte incrassatis; pappus setiformis uniseriatus, setis 20-35 scabris ad apicem aequalibus vel leniter dilatatis, cellulis apicalibus acutis.

Species typica: Eupatorium vitalbae DC.

Our studies of the genus indicate that it contains the following 12 species.

Heterocondylus amphidictyus (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium amphidictyum A.P.Decandolle, Prodr. 5: 168. 1836. Brazil.

Heterocondylus decipiens (Baker) R.M.King & H.Robinson, comb. nov. Eupatorium decipiens Baker in Mart. Fl. Bras. 6(2): 347. 1876. Brazil.

Heterocondylus grandis (Schultz-Bip. ex Baker) R.M. King & H.Robinson, comb. nov. Eupatorium grande Schultz-Bip. ex Baker, Mart. Fl. Bras. 6(2): 347. 1876. Brazil.

Heterocondylus itacolumiensis(Schultz-Bip. ex Baker) R.M.King & H.Robinson, comb. nov. Eupatorium itacolumiense Schultz-Bip. ex Baker, Mart. Fl. Bras. 6(2): 310. 1876. Brazil.

Heterocondylus jaraguensis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium jaraguense B.L. Robinson, Contr. Gray Herb. n.s. 80: 23. 1928. Brazil.

Heterocondylus leptolepis (Baker) R.M.King & H.Robinsom, comb. nov. Eupatorium leptolepis Baker, in Mart. Fl. Bras. 6(2): 359. 1876. Brazil.

Heterocondylus lysimachioides (Chod.) R.M.King & H.Robinson, comb. nov. Eupatorium lysimachioides Chod. Bull. Herb. Boiss. Ser. 2. 2:310. 1902. ("lysimachioide"). Paraguay.

Heterocondylus pandurifolius (Baker) R.M.King & H.Robinson, comb. nov. Eupatorium pandurifolium Baker, Mart. Fl. Bras. 6(2): 310. 1876. Brazil.

Heterocondylus pumilus (Gardn.) R.M.King & H.Robinson, comb. nov. Bulbostylis pumila Gardn., London J. Bot. 5: 470. 1846. Brazil.

Heterocondylus reitzii R.M.King & H.Robinson, sp. nov. Plantae suffrutescentes erectae vel suberectae e basi ramosae. Caules dense glanduliferi, glandibus longe pedicellatis. Folia opposita, petiolis brevibus anguste alatis, laminis late ovatis obtusis vel breviter acutis argute serratis basi rotundatis supra et subtus sparse glanduliferis. Inflorescentiae dense corymbosae. Capitula ca. 13 mm alta, ca. 15 mm lata, floribus ca. 65-70; involucri squamae ca. 40 valde inaequilongae 4-5-seriatae, usque ad 7 mm longae, ovatae vel anguste oblongae, breviter acutae, extus pilosae; corollae ca. 7 mm longae, lobis ca. $1\frac{1}{2}$ longioribus quam latioribus glabris; appendices antherarum non longiores quam latiores; styli inferne valde nodulosi dense hirsuti; achaenia 5 mm longa, glandulifera, in costis breviter setifera; carpopodia breviter late cylindrica. Pappi setae ca. 35 superne fere ad apicem aequales.

Type: BRAZIL: Santa Catarina: Morro do Iquererim, Campo Alegre, Alt. 1500 meters. 5.9.1957, Reitz & Klein 4785 (Holotype US!).

The species is closest to H. jaraguensis & H itacolumiense but the upper leaves are not reduced and the stylar node is densely hirsute.

Heterocondylus vauthierianus (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium vauthierianum A.P.Decandolle, Prodr. 5: 159. 1836. Brazil.

Heterocondylus vitalbis (A.P.Decandolle) R.M.King &

H.Robinson, comb. nov. *Eupatorium vitalbae* A.P. Decandolle, Prodr. 5: 163. 1836.

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 and A #2 to the senior author.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CVI.

A NEW GENUS, GYMNOCONDYLUS.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

In the region of central Brazil the Eupatorieae seem to be represented by a number of distinctive members of the *Ayapana* complex. Among these is the previously described monotypic genus, *Monogerion* along with species of *Ayapana*, *Heterocondylus* and *Ayapanopsis*. To this series we add here a new genus *Gymnocondylus* based on *Eupatorium galeopsifolium* Gardn. of Goyaz.

The new genus is most distinctive among the *Ayapana* series by the 5-10 pappus setae on each achene and the rather thick densely papillose style. The carpopodium, without larger cells in the lower tier, indicates closest relationship to *Heterocondylus* but that genus, in addition to fully developed pappus and smoother style branches, has only glands on the outer surfaces of the corolla lobes. *Gymnocondylus* is reminiscent of *Monogerion* from Para in Brazil but the latter genus differs most importantly by its compound leaves, the single long pappus seta on each achene, the carpopodium with larger cells in the basal tier, the smaller more rounded anther appendages, and the hairs on the inner surface of the corolla. The style branches of *Gymnocondylus* are similar in their papillosity to those of *Monogerion* though the latter are narrower, The style branches have a very different aspect from the laxly long papillose very slender type seen in *Ayapana*.

*Eupatorium galeopsifolium* Gardn. has been treated by Baker (1876) as a synonym of *E. rupestre* Gardn. of Minas Geraes, but the number of pappus setae was cited as 15-20. Material of the latter has not been seen and it seems best to withhold judgement.

*Gymnocondylus* R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae herbaceae erectae pauce ramosae. Folia opposita distincte petiolata, laminis ovatis vix acuminatis crenulatis, basi abrupte breviter cuneatis. Inflorescentiae laxe corymbosae pauce ramosae. Involucri squamae ca. 50

eximbricatae aliquantum inaequilongae 2-3-seriatae anguste lanceolatae; receptacula leniter convexa glabra. Flores 60-80 in capitulo; corollae anguste infundibulares inferne peranguste tubulares, lobis anguste triangularibus duplo longioribus quam latioribus, extus dense hirsutis, intus glabris laevibus; filamenta antherarum in parte superiore angusta, cellulis breviter oblongis vel longioribus transverse annulate ornatis, appendicibus triangularibus 1½ longioribus quam latioribus; styli inferne valde nodulosi glabri, appendicibus linearibus vix incrassatis dense cylindrice papillosis; achaenia fusiformia 5-costata superne ubique setifera, setis valde argutis; carpopodia superne aliquantum obturaculiformia, cellulis subquadratis vel breviter oblongis, parietibus valde incrassatis minute multiporosis; pappus setiformis 1-seriatus, setis 5-10 scabris superne parum dilatatis, cellulis apicalibus acutis.

Species typica: Eupatorium galeopsifolium Gardn.

The genus is monotypic.

Gymnocondylus galeopsifolius (Gardn.) R.M.King & H. Robinson, comb. nov. Eupatorium galeopsifolium Gardn., London J. Bot. 6: 446. 1847. Brazil.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). CVII.

## A NEW GENUS, ALOMIELLA.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

Among the south american species previously placed in Alomia H.B.K. are representatives of numerous rather unrelated groups including species of Ageratum, Trichogonia and Acritopappus. Probably more misplaced than any of the preceding was a species from central Matto Grosso in Brazil that belonged to the distinctive Ayapana series. The latter species is the basis for the genus Alomiella described here.

The new genus is one of three monotypic Ayapanoid genera from the fringes of the Amazon Basin in Brazil all notable for a reduced pappus, glabrous stylar nodes and for variously papillose style branches. Of the three, Monogerion is very distinct in the tripartite leaves, the hairs inside of the corolla and the one very long pappus seta on each achene; Gymnocondylus is distinct by the five to ten pappus setae, the scarcely enlarged lower tier of carpopodial cells, and the slightly thickened style branches; Alomiella is distinct in the complete lack of pappus, the many fewer hairs on the outer surfaces of the corolla lobes, the few rather sclerotized papillae at the apices of the style branches, and the glabrous achenes. The three genera represent a complex in Brazil nearly as diverse as the distinctive Polyanthina, Isocarpha, and Ayapana (Lepidesmia) squarrosa-complex in the more northern parts of the range of the Ayapanoid series.

Alomiella R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Herbae perennes erectae vel decumbentes usque ad 30 cm altae pauce ramosae. Caules, folia, pedicellae et squamae exteriores involucri glandulis longiuscule stipitatis subdense obsitae. Folia opposita vel subopposita distincte petiolata, laminis late ovatis serratis, non glandulopunctatis. Inflorescentiae laxe cymosae. Involucri squamae 20-30 subimbricatae inaequilongae 3-seriatae oblongae breviter acutae; receptacula plana glabra. Flores ca. 40 in capitulo; corollae anguste infundiblares, lobis aequilateraliter triangularibus extus pauce setiferis, cellulis setarum saepe biseriatis, nervis corollarum in partibus basilaribus valde incrassatis; filamenta antherum in parte inferiore brevibus in parte superiore brevioribus, cellulis inferioribus plerumque subquadratis superioribus longioribus, parietibus transverse annulate ornatis, cellulis exothecialibus subquadratis vel brevioribus, appendicibus aliquantum longioribus quam latioribus; styli inferne valde nodulosi glabri, appendicibus linearibus dense longe papillosis; papillis apicalibus aliquantum induratis; achaenia prismatica 5-costata glabra; carpopodia distincta breviter obturaculiformia, cellulis basilaribus oblongis, superioribus brevioribus, parietibus dense nodulosis; pappus nullus.

Species typica: Alomia regnellii Malme

The genus is monotypic.

Alomiella regnellii (Malme) R.M.King & H.Robinson, comb. nov. Alomia regnellii Malme, Svendk. Vet. Akad. Handl. 32, No. 5: 32. 1899. Brazil.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). CVIII.

## A NEW GENUS, CONDYLOPODIUM.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

A group of species described here as a new genus, Condylopodium, is presently known only from Colombia. The plants show the large leaved shrubby or subarborescent habit of many genera of the Critonioid genera of the Eupatorieae but the style bases are prominently enlarged. In anatomical details the four species are like the Brickellioid series but the latter are all herbs or subshrubs of very different habit. The present inclination is to relate the group closely to the Critonoid genera of the Andes in spite of the presence of the distinct stylar node.

*Condylopodium* R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Frutices erecti vel scandentes laxe ramosi plerumque dense breviter tomentosi. Caules teretes. Folia opposita distincte breviter petiolata, laminis late ellipticis acutis vel acuminatis base rotundatis vel cuneatis; nervis secundariis pinnatis. Inflorescentieae late paniculatae; pedicellis primariis longis ca. $90^{\circ}$ divergentibus, pedicellis ultimis brevibus congestis. Involucri squamae 20-30 subimbricatae valde inaequilongae ca. 4-5-seriatae ovatae vel anguste oblongae; receptacula leniter convexa puberula. Flores ca. 10-12 in capitulo; corollae anguste tubulares superne parum infundibulares, lobis oblongo-ovatis aliquantum longioribus quam latioribus laevibus extus glanduliferis parce vel non setiferis; filamenta in parte superiore interdum indistincta brevia, cellulis oblongis, parietibus vix ornatis, appendices oblongae aliquantum longiores quam latiores; styli inferne nodulosi hirsuti vel glabri, appendicibus elongate clavatis laevibus; achaenia prismatica 5-costata setifera vel pauce glandulifera; carpopodia breviter cylindrica vel rotundata, cellulis minutis quadratis vel breviter oblongis multiseriatis; pappus setiformis uniseriatus,, setis 30-40 scabris ad apicem distincte dilatatis, cellulis apicalibus acutis. Grana pollinis perbreviter spinosa.

Species typica: Eupatorium fuliginosum H.B.K.

The genus Condylopodium is recognized here to include four species of which three are previously undescribed. The species can be distinguished by the following key.

1. Leaves with rounded bases; stylar node glabrous, style branches narrowly clavate at tip. ... *C. killipii*

1. Leaves with cuneate bases; stylar node hirsute, style branches with distinctly enlarged tips. ... 2

2. Corolla lobes with only glands on outer surface, phyllaries ca. 34-38 with striations of outer surface obscure or lacking. ... *C. fuliginosum*

2. Corolla lobes with hairs and glands on outer surface, phyllaries usually ca. 30 with striations of outer surface slightly to very distinct ... 3

3. Pubescence of leaf undersurface ca. 1 mm long; heads mostly sessile in clusters of 2 or more; plants of higher elevations 1800-2000 m. ... *C. cuatrecasasii*

3. Pubescence of leaf undersurface mostly ca. 0.5 mm long; heads often single on pedicels 3-8 mm long; plants of lower elevations, 1200-1700 m. ... *C. pennellii*

*Condylopodium cuatrecasasii* R.M.King & H.Robinson, sp. nov. Frutices scandentes vel arborescentes laxe ramosi dense tomentosi. Folia magna, petiolis 1.2-2.5 cm longis, laminis 10-14 cm longis 3.8-6.4 cm latis late ellipticis sensim argute acuminatis minute remote serrulatis base cuneatis supra sparse puberulis subtus glanduliferis et dense pilosis, pilis ca. 1.0 mm longis. Inflorescentieae terminales vel subterminales. Capitula ca. 8 mm alta; involucri squamae ca. 28-30 virides vel rubescentes ca. 4-seriatae 1-6 mm longae 0.8-1.5 mm latae oblongo-ovatae vel oblongo-lineares extus leniter striatae minute dense appresso-puberulae. Flores ca. 20-25 in capitulo; corollae ca. 4.5 mm longae albae vel viridulae, lobis extus glanduliferis et parce setiferis; filamenta antherarum in parte superiore 100-300μ longa solum superne distincta, cellulis obscuris, thecae ca. 1.3 mm longae base rotundatae, appendicibus oblongo-ovatis ca. 150-175μ longis 150μ latis; styli inferne dense hirsuti, appendicibus valde clavatis; achaenia ca. 2.0 mm longa sparse breviter setifera; pappi setae ca. 40. Grana pollinis ca. 20-22μ diam.

Type: COLOMBIA: Cauca: Popayan: Timbio en Hatoviejo, bosque, 1800 m. alt. July 14, 1939, E. Perez Arbelaez & J. Cuatrecasas 6083 (Holotype US!). Additional specimen: COLOMBIA: Cauca: Rio Sucio to Rio Piedras, west of Popayan, alt. 1800-2000 m, July 3, 1922, Pennell & Killip 8195 (Paratype US!).

Condylopodium fuliginosum (H.B.K.) R.M.King & H.Robinson, comb. nov. Eupatorium fuliginosum H.B.K., Nov. Gen. et Sp. 4: 86. 1818. ed folio. Colombia.

Condylopodium killipii R.M.King & H.Robinson, sp nov. Plantae scandentes lignosae. Caules dense puberuli. Folia breviter petiolata, petiolis ca. 1.5 cm longis, laminis usque ad 12 cm longis 7 cm latis oblongis breviter acuminatis integris base rotundatis supra subglabris subtus sparse puberulis et glanduliferis. Inflorescentieae axillares et terminales. Capitula ca. 7 mm alta; involucri squamae ca. 20 fuscae 3-4-seriatae 1-4 mm longae 1 mm latae oblongae extus leniter striatae minute puberulae. Flores ca. 9 in capitulo; corollae ca. 5 mm longae "viridi-flavae", lobis extus glanduliferis non setiferis, filamenta antherarum in parte superiore ca. 200μ longa, thecae ca. 1.2 mm longae base obtuse prominentes, appendicibus ovatis ca. 350μ longis 250μ latis; styli inferne glabri, appendicibus vix clavatis; achaenia 2.0-2.5 mm longa pauce breviter setifera et glandulifera; pappi setae ca. 30 Grana pollinis ca. 25μ diam.

Type: COLOMBIA: Norte de Santander: Pica-Pica Valley, above Tapata (north of Toledo); alt. 2100-2400 meters, March 1-5, 1927, E.P.Killip & A.C.Smith 20243 (Holotype US!).

Condylopodium pennellii R.M.King & H.Robinson, sp. nov. Herbae vel frutices scandentes laxe ramosi dense tomentosi. Folia magna, petiolis usque ad 2 cm longis, laminis usque ad 25 cm latis late ellipticis sensim perargute acuminatis minute remote serrulatis base cuneatis supra sparse puberulis subtus glanduliferis et dense breviter pilosis, pilis ca. 0.5 mm longis. Inflorescentieae terminales. Capitula ca. 9 mm alta; involucri squamae ca. 28-30 virides ca. 4-seriatae 1-6 mm longae 0.8-1.2 mm latae oblongae vel oblongo-lineares extus leniter striatae minute dense appresso-puberulae. Flores ca. 20 in capitulo; corollae ca. 4.0 mm longae albae vel viridi-flavae, lobis extus glanduliferis et parce setiferis; filamenta antherarum in parte superiore 200-400μ longa solum superne distincta, cellulis obscuris, thecae ca. 1.3 mm longae base rotundatae, appendicibus oblongo-ovatis ca. 200μ longis 150μ latis; styli inferne dense hirsuti, appendicibus valde clavatis; achaenia ca. 1.8-2.2 mm longa sparse breviter setifera; pappi setae ca. 40. Grana pollinis ca. 20-22μ diam.

Type: COLOMBIA: El Cauca, Aganche, alt. 1200-1500 m. , July 14, 1922, F.W.Pennell & E.P. Killip 8331 (Holotype US!). Additional specimen: COLOMBIA: El Cauca, Rio ortega, alt. 1500-1700 m., June 27, 1922, F.W.Pennell & E.P.Killip 7238 (Paratype US!).

Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 and A #2 to the senior author.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE) CIX. A NEW GENUS, ACRITOPAPPUS.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

A group of three gyptoid species from eastern Brazil having a distinctive reduced pappus is described here as a new genus. Two of the species were originally placed together in the genus Decachaeta to which they had no close relationship. The form of the pappus, though very similar in both species, was described by Gardner as "coroniformi 5-dentata" in D. longifolia and "5-10-setoso, setis glabris valde inaequalibus" in D. conferta. Subsequent transfer of the species to Ageratum (Baker, 1876) and final separation by B. L. Robinson (1913) seems to have been mostly based on the slight differences in the pappus. It was amazing that after so much damaging overuse of the pappus as a character, that one of the species was ultimately placed in a genus to which it could not belong even by definition, Alomia. The second species was left without definite generic placement by B. L. Robinson (1913). A third species is newly described here.

The three species placed here in Acritopappus actually have most characters in common including the narrowly petiolate narrowly acuminate leaves with weakly pinnate and closely reticulate venation, the plane receptacle, the identical corolla, stamen and style structure, and the few very short smooth pappus setae. The genus Ageratum with which the species of Acritopappus have been associated, differs most prominently by having a conical receptacle and glandular punctate leaves. The genera Decachaeta and Alomia as redefined are strictly Mexican and Central American and belong to other series, Critonioid and Brickellioid respectively.

Acritopappus R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Frutices erecti pauce ramosi. Caules teretes vel sexangulati glabri. Folia plerumque opposita petiolata, petiolis angustis, laminis lanceolatis base acutis apice acuminatis vel acuminatissimis margine serratis vel subserrulatis supra et subtus glabris, nervis secundaris pinnatis, nervulis prominulis dense reticulatis. Inflorescentiae axillares vel terminales, ramis dense corymbosis, pedicellis hirtellis. Involucri squamae 6-15 imbricatae 3-seriatae inaequilongae oblongae apice obtusae vel breviter acutae extus glabrae; receptacula plana vel concava, paleis linearibus. Flores 6-30 in capitulo; corollae anguste infundibulares extus glanduliferae, lobis brevibus vix longioribus quam latioribus; filamenta antherarum in parte inferiore brevia in parte superiore breviora, cellulis superioribus subquadratis sensim longioribus, parietibus distincte varie annulate ornatis, cellulis exothecialibus subquadratis vel brevioribus, appendicibus distincte longioribus quam latioribus; styli inferne glabri non nodulosi; appendicibus linearibus dense breviter papillosis; achaenia prismatica 5-costata glabra; carpopodia brevia distincte contorta, cellulis breviter oblongis, parietibus dense minute nodulosis; pappi vestigiales breviter coroniformes vel pauce setiferi, setis brevibus laevibus.

Species typica: Decachaeta longifolia Gardn.

The three species of the genus can be distinguished by the following key.

1. Bases of leaf blades rounded; heads 7-9 mm high with ca. 15 phyllaries and 25-30 flowers. A. irwinii

1. Bases of leaf blades acute; heads ca. 0.5 mm high with 6-10 phyllaries and 6-15 flowers. 2

   2. Phyllaries obtusely acute with indurate tips; pappus of isolated short setae; leaf tips narrowly acuminate. A. confertus

   2. Phyllaries with rounded or truncate rather scarious tips; pappus with coroniform rim between setae; leaf tips very long and nearly filiform. A. longifolius

Acritopappus confertus (Gardn.) R.M.King & H.Robinson, comb. nov. Decachaeta conferta Gardn. in London J. Bot. 5: 463. 1846. Brazil.

Acritopappus irwinii R.M.King & H.Robinson, sp. nov. Frutices 2.5 cm alti pauce ramosi. Caules, rami et folia glabra. Folia pendentia aliquantum viscosa, petiolis 0.5-2.0 cm longis angustis, laminis ovato-lanceolatis 5-12 cm longis 1-4 cm latis apice per-anguste acuminatis base rotundatis margine crenato-serratis vel serrulatis. Capitula 7-9 mm alta; involucri squamae ca. 15 imbricatae 2-3-seriatae subaequilongae oblongae 1.5-3.5 mm longae 1.0-1.5 mm latae apice rotundatae scariosae extus glabrae. Flores 25-30 in capitulo; corollae 4.5-5.0 mm longae; appendices stylorum valde papillosae; achaenia 2.0-2.5 mm longa angusta; pappi breviter setiformis, setis 0-5. Grana pollinis ca. 25μ diam.

Type: BRAZIL: Minas Gerais: Serra do Espinhaço: Dense cerrado on red clay, hilltop ca. 15 km west of Grão Mogol, road to Cristália. Elevation 950 m. 20 February 1969. Irwin, Reis dos Santos, Souza, & da Fonseca 23621 (Holotype US!). Additional specimen BRAZIL : Minas Gerais: Serra do Espinhaço. Sandy slopes with sandstone outcrops and adjacent rocky river margin, Rio Itacambiruçu, ca. 15 km north of Grão Mogol. Elevation 950 m. 18 February 1969, Irwin, Reis dos Santos, Souza, & da Fonseca 23520 (Paratype US!).

The new species is most obviously distinct in the rounded bases of the leaf blades and the larger heads but the style branches also have longer more pointed papillae than those of the other species and the achenes are more elongate. The new species occurs in an area about 150 miles north of the known distribution of A. longifolia on a separate but adjacent mountain range. The available specimens indicate differing preferences in elevation, A. irwinii being found at 950 m and A. longifolia at 1200-1275 m.

Acritopappus longifolius (Gardn.) R.M.King & H.Robinson, comb. nov. Decachaeta longifolia Gardn. in London J. Bot. 5: 462. 1846. Brazil.

References

Baker, J.G. 1876. Compositae. II. Eupatoriaceae in Martius, Flora Brasiliensis. 6(2): 182-398. pl. 51-102.

Robinson, B.L. 1913. A generic key to the Compositae-Eupatorieae. Contr. Gray Herb. 42: 429-437.

# STUDIES IN THE EUPATORIEAE (ASTERACEAE). CX.

## ADDITIONS TO THE GENUS, CAMPULOCLINIUM.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

The recent survey of the genus *Campuloclinium* (King & Robinson, 1972) recognized ten species all showing the characteristic enlarged ring-like carpopodium and distinctly conical receptacle. Two previously overlooked species are added here on the basis of material collected by Dr. Howard Irwin during the 1969 New York Botanical Garden expedition to the Planalto of Brazil. Both of the species to be added have certain peculiarities of interest.

**Campuloclinium barrosoana** (Barroso) R.M.King & H.Robinson, comb. nov. *Trichogonia barrosoana* Barroso, Arquivo Jard. Bot. Rio de Janeiro 11: 13. 1951. Brazil.

In the recent survey of the genus *Trichogonia* (King & Robinson, 1972), *T. barrosoana* was excluded on the basis of certain described features, the lack of hairs on the corolla lobes and the presence of a conical receptacle. Comparison was made to the genus *Platypodanthera*, a genus related to *Trichogonia*. *Platypodanthera* had seemed very distinct in its totally glabrous stems, leaves, involucre, corollas and achenes, by its long-petiolate leaves and by its broad anther collars. Specimens of *T. barrosoana* have now been seen and differences from both *Trichogonia* and *Platypodanthera* have been confirmed. The new specimens show two unexpected features, a large ring-like carpopodium and small hairs and papillae on the base of the style. All features of *T. barrosoana* agree with the genus *Campuloclinium* and the species has something of the habit of *C. purpurascens* (Schultz-Bip.) R.M.King & H.Robinson. The broadly ovate to deltoid sessile densely pubescent leaves are totally distinctive along with the short blunt tipped pappus setae and the blunt setae on the ribs of the achenes.

Campuloclinium irwinii R.M.King & H.Robinson, sp. nov.

Herbae erectae ca. 1 m altae non ramosae. Caules teretes leniter striati grosse hirsuti. Folia opposita indistincte breviter petiolata, petiolis 1-3 mm longis, laminis oblongo-ellipticis 3-6 cm longis 0.7-2.5 cm latis acutis margine serratis base acutis supra et subtus hirsutis glanduliferis subtus densioribus, glandulis sessilibus. Inflorescentiae laxe cymosae, pedicellis dense hirtellis. Capitula 7-8 mm alta alba; involucri squamae 20-25 subimbricatae subaequilongae plerumque 5.0-5.5 mm longae 1-2 mm latae anguste oblongae vel ovatae extus hirsutae et glanduliferae apice acutae virides base incrassatae carnosae albae; receptacula peralte conica. Flores ca. 45-50 in capitulo; corollae 2.5 mm longae vix infundibulares extus glanduliferae, lobis vix longioribus quam latioribus intus laevibus extus vix papillosis; filamenta antherarum in parte superiore ca. 250μ longa, appendices ca. 125μ longae 200μ latae; styli inferne glabri non nodulosi, appendicibus late linearibus leniter mamillatis; achaenia 2.0-2.5 mm longa in costis dense setifera, setis argutis; pappi setae ca. 30 breves plerumque ca. 1.5 mm longae, cellulis apicalibus subacutis. Grana pollinis ca. 18-20μ diam. breviter spinosa.

Type: BRAZIL: Minas Gerais: Serra do Espinhaço: Cerrado slopes, ca. 48 km west of Montes Claros, road to Agua Boa. Elevation 950 meters. February 25, 1969. Irwin, dos Santos, Souza, da Fonseca 23865 (Holotype US!).

The new species has a habit nearly identical with Campuloclinium burchellii (Baker) R.M.King & H.Robinson showing the same general leaf shape and lax inflorescence with comparitively small heads. Differences between the two species are sufficient to make close relationship doubtful, however. The new species is unique in the genus in the fleshy bases of the phyllaries, the very high conical receptacle and the lack of hairs or papillae on the base of the style. The short pappus setae are also rather distinctive. The very high conical almost cylindrical receptacle has caused the specimens to be compared with Eupatoriopsis hoffmanniana Hier. but the latter is a relative of the genus Chromolaena which differs in its flattened achenes, corolla lobe papillosity and anther collar structure. Though clearly a Campuloclinium, the bare style base and high receptacle of the new species suggest possible subgeneric distinction.

## References

King, R.M. & H.Robinson 1972. Studies in the Eupatorieae (Asteraceae). XC. The genus, Campuloclinium. Phytologia 24: 170-172.

King, R.M. & H.Robinson 1972. Studies in the Eupatorieae (Asteraceae). XCII. The genus, Trichogonia. Phytologia 24: 176-179.

## Acknowledgement

This study was supported in part by the National Science Foundation Grant GB 20502 A #1 and A #2 to the senior author.

STUDIES IN ICHNANTHUS (GRAMINEAE). II.
NEW TAXA AND A NEW NAME
IN SECTION FOVEOLATA

Ken E. Rogers
Department of Biology
University of Southern Mississippi
Hattiesburg, Mississippi 39401

ICHNANTHUS AREOLATUS K. E. Rogers, sp. nov.

Plantae robustae, ad basim repentes atque ad nodos se radicantes, usque ad 3 m vel plus longae; internodi villosi; nodi plerumque albo-villosi; vaginae villosae vel supremis glabrescentes; laminae plerumque crassiorae firmaeque, pagina superior plerumque manifesto areolata; paniculae terminales dense florentes, 10-19 cm longae, 6-11 cm latae; spiculae 3.5-4.5 mm longae; glumae et lemmata inferiora perfirmiter membranea, aliquantulum scabrida; inferior palea elliptica, apex insigniter ciliatus; rachilla-appendiculae 0.7-0.9 mm longae.

Plants rather stout, robust, usually extensively branching, creeping at the base and rooting at the nodes, sometimes to 3 m or more in length, with ascending flowering branches; internodes villous, as much as 11 cm long; nodes usually white-villous; sheaths villous or the uppermost glabrescent, mostly 2-6 cm long, about 1/3-3/4 the length of the internodes, firm; collar pubescent; ligule membranous-ciliate, 1.3-2.4 mm long; blades usually rather thick and firm, 5-14 cm long, 1.5-5.0 cm wide, asymmetric, ovate-acuminate to elliptic-acuminate, the upper surface usually conspicuously areolate, sparsely pubescent or glabrous, the nerves somewhat scabrid, the lower surface puberulent or glabrescent, the margins thick and scabrous; panicles terminal and axillary; terminal panicles densely flowered, 10-19 cm long, 6-11 cm wide, about 1/2 as wide as long, compound, the primary branches spreading-ascending, the lowest to 15 cm long, the secondary branches ascending to appressed, to 4 cm long, the tertiary branches as much as 2.5 cm long; rachises scabrous and more or less pubescent; pulvini pilose; peduncles pubescent, as much as 15 cm long; spikelets paired and solitary, elliptic-acute, 3.5-4.5 mm long, the glumes more or less spreading short pubescent; glumes and lower lemma rather firmly membranous, somewhat scabrid; first glume ovate-acuminate, 2.5-3.2 mm long, 1/2-2/3 the length of the lower floret, 3-5 nerves; second glume ovate-acuminate, 3.1-3.6 mm long, 5-9 nerved; lower floret staminate, the stamens 1.3-1.7 mm long; lower lemma elliptic-ovate, hooded at the apex, 2.7-3.1 mm long, 5-9 nerved; lower palea elliptic, about 0.9 the length of the lower lemma, rather conspicuously ciliate at the apex, 2.3-2.7 mm long; upper floret elliptic-acute, 1.7-2.1 mm long, 0.8-1.1 mm wide; rachilla-appendages 0.7-0.9 mm long.

Holotype: Issorora, Aruka River, lat. 8 degrees 10 min N, long. 59 degrees 50 min W, edge of forest in low grounds, British Guiana, collected by A. S. Hitchcock, no. 17562, January 17, 1920 (GH; isotypes at MO, P, NY, F, IAN).

Additional specimens examined: Tobago: Hitchcock 10263a, b (US). Trinidad: Tabaquite, Hitchcock 10129 (US); ibid, Hitchcock 585 (US, P, NY, MO, F, GH). British Guiana: vicinity of Tumatumari, on Potaró River, Hitchcock 17409 (US, NY, IAN, F, GH, MO, P, K); ibid, Hitchcock 17352 (US); Jenman 7114 (K). Brazil: Para, Belem, Pires and Black 16 (IAN). French Guiana: Maripasoula, Hoock-Cayenne 1059 (K).

This species is distinguished by its comparatively large size, rather thick leaves with usually conspicuous surface cells or areolae, large panicles, and the usually villous nodes, internodes, and sheaths.

The specific spithet refers to the pattern of surface cells on the leaf-blades.

ICHNANTHUS ATTENUATUS K. E. Rogers, sp. nov.

Culmi graciles, elongati, se ad nodos radicantes, ramosi; vaginae sparsim pilosae vel glabrae; ligula membraneo-ciliata, ferme 1.0 mm longa; laminae tenues, anguste lanceolatae, apice acuminatae; paniculae terminales ac axillariae, nonnullae e superioribus vaginis, rami graciles alternati, simplices; spiculae anguste elliptico-attenuatae, 4.0-4.5 mm longae; gluma prima ovato-attenuata, 4.0-4.3 mm longa, perparum pilosa per marginem vel glabra, multo longior quam lemma inferius, paulum brevior quam gluma altera vel etiam perum longior; gluma altera elliptico-attenuata; flosculus superior anguste elliptico-acutus; rachilla-appendiculae 0.5-0.7 mm longae.

Perennial (?); culms slender, elongate, rooting at the nodes, branching; internodes pilose in lines on one side; nodes sparsely pilose; sheaths sparsely pilose or glabrous, about 1/4-1/2 the length of the internodes, 1 cm long or the uppermost as much as 3.0 cm long; collar pubescent; ligule membranous-ciliate, about 1.0 mm long; blades asymmetric, thin, narrowly lanceolate, apex acuminate, 3-7 cm long, 0.5-1.5 cm wide, the upper surface slightly scaberulous on the nerves, the lower surface glabrous, the margins papillose-ciliate at the base; panicles several from the terminal and upper sheaths, well exserted, 4-5 cm long, the slender branches alternate, simple, the lowest to 4.0 cm long; rachis scaberulous and short pubescent; pulvini pilose; pedicels scaberulous and short pubescent, the longer 1.5-3.0 mm long, the shorter 0.2-0.4 mm long; spikelets paired and solitary, narrowly elliptic-attenuate, 4.0-4.5 mm long; glumes and lower lemma membranous; first glume ovate-attenuate, 4.0-4.3 mm long, sparsely pilose along the margin or glabrous, much exceeding the lower lemma, a little shorter than to slightly exceeding the second glume, 3-nerved; second glume elliptic-attenuate, 3.8-4.3 mm long, 5-nerved; lower floret staminate, the stamens 1.3 mm long; lower lemma elliptic-acute, 3.0-3.2 mm long, 5-nerved; lower palea elliptic-obtuse, 2.1-2.3 mm long, 0.6 mm wide, ciliate on the nerves, about 3/4 the length of the lower lemma; upper floret narrowly elliptic-acute, 1.9-2.0 mm long, 0.8 mm wide, stipe about 0.2 mm long; rachilla-appendages 0.5-0.7 mm long.

Holotype: Brazil, tropical, Burchell, no. 6924 (K, no. H977/67-7; isotypes at P, NY, US).

Additional specimens examined: Brazil: Maranhão: Rio Pindaré, Moncão, Fróes, 20322 (US, IAN).

I. attenuatus is distinctive by its slender elongate culms, narrowly lanceolate blades, slender panicle branches, and attenuate glumes, the first glume much exceeding the lower lemma.

The specific name refers to the shape of the glumes.

ICHNANTHUS BRADEI K. E. Rogers, sp. nov.

Culmi verrentes, radices ut grallas graciles monstrantes, ramosi, sparsim pilosi vel glabrescentes; ligula ferme 3.5 mm longa, cilia ferme 2.0 mm longa; laminae subtenues, late lanceolatae, 9-13 cm longae, 1.5-3.5 cm latae, magna ex parte glabrosae; paniculae terminales, 8-15 cm longae, 4-11 cm latae; pedunculi elongati usque ad 24 cm longi; spiculae 4.8-5.5 mm longae, glabrosae; flosculus superior 2.6-2.8 mm longus; rachilla-appendiculae circa 0.9 mm longae.

Perennial; culms trailing, with slender stilt roots, branching, sparsely pilose or glabrescent; sheaths loose, 1/3 to 1/2 the length of the internodes on the main culms, overlapping on the branches, to 6.5 cm long, pilose on the margins; collar pubescent; ligule membranous-ciliate, about 3.5 mm long, the cilia about 2.0 mm long; blades thinnish, broadly lanceolate, asymmetric, the apex acuminate, the base more or less cordate, reticulate-veined on the undersurface, 9-13 cm long, 1.5-3.5 cm wide, essentially glabrous; panicles terminal, two or more from the uppermost sheath, 8-15 cm long, 4-11 cm wide, the branches lax, as much as 8 cm long; rachis glabrous or nearly so; pulvini pilose; peduncles elongate, up to 24 cm long; longer pedicels 2.0-4.0 mm long, the shorter about 0.5 mm long; spikelets paired and solitary in the inflorescence, 4.8-5.5 mm long, elliptic-acute, glabrous; glumes and lower lemma membranous; first glume 3.5-4.3 mm long, ovate, acute to acuminate, 2/3 to nearly equalling the lower lemma, 3- (-5) nerved; second glume 4.5-5.1 mm long, elliptic-acuminate, 5-nerved; lower floret staminate, the stamens 1.8-2.1 mm long; lower lemma 4.0-4.3 mm long, elliptic-acute, the apex hyaline, somewhat hooded, 5-nerved; lower palea 3.0-3.4 mm long, elliptic-obtuse, about 3/4 the length of the lower lemma; upper floret 2.6-2.8 mm long, elliptic-acute; upper stamens about 1.8 mm long; rachilla-appendages about 0.9 mm long.

Holotype in the herbarium of Jardim Botanico do Rio de Janeiro, Brazil, collected at Pedra do Frade, Serra dos Orgaos, Estado do Rio de Janeiro, Brazil, by Brade 16601. Isotype at IAN.

Additional specimens examined: Brazil: Rio de Janeiro: Terezopolis, Black and Adler 51-11428 (IAN).

The species is named for the collector.

ICHNANTHUS BREVIPANICULATUS K. E. Rogers, sp. nov.

Culmi verrentes, multis nodis ramosi, se ad inferiores nodos radicantes; internodi se extendentes papilloso-pilosos; nodi papilloso-pilosi; vaginae papilloso-pilosae pilos usque ad 2.5 mm longos gerentes; ligula membraneo-ciliata, ferme 1.0 mm longa; laminae ellipticae, apice subito brevi-acuminatae; paniculae terminales et axillariae sparsim florentes; spiculae 4.6-5.1 mm longae; gluma prima inter nervos laterales papilloso-pilosa; gluma altera inter nervos laterales papilloso-pilosa; flosculus superior 2.5-2.7 mm longus; rachilla-appendiculae circa 1.0 mm longae.

Apparently annual; culms trailing, branching at many nodes, rooting at the nodes, with ascending flowering branches as much as 16 cm tall; internodes spreading papillose-pilose, 1-4 cm long; nodes papillose-pilose; sheaths spreading papillose-pilose with hairs to 2.5 mm long, 0.5-2.5 cm long, about 1/2 the length of the internodes on the main culm, shorter than the internodes or overlapping on the branches; collar papillose-pilose; ligule membranous-ciliate, about 1.0 mm long, the cilia about 0.5 mm long; blades asymmetric, elliptic, the apex abruptly short acuminate, 1.2-3.2 cm long, 0.7-1.5 cm wide, papillose-pilose on both surfaces; inflorescence of terminal and axillary panicles, sparsely flowered, 1.5-3.0 cm long, 1.0-1.8 cm wide; terminal panicles 1-3 from the uppermost sheath, on peduncles as much as 8.5 cm long, branches simple, the lowest to 1.5 cm long, alternate, spreading-ascending; axillary panicles on slender peduncles; rachises and pedicels scabridulous and more or less pilose; pulvini pilose; longer pedicels 3.0-6.0 mm long, the shorter 0.5-2.3 mm long; spikelets elliptic-acute, tinged with purple, 4.6-5.1 mm long; glumes and lower lemma membranous; first glume ovate-acute, 3.1-3.6 mm long, papillose-pilose between the lateral nerves, 0.65-0.8 the length of the lower lemma, 3-nerved; second glume elliptic-acuminate, 4.6-4.7 mm long, papillose-pilose between the lateral nerves, 5-nerved; lower lemma elliptic, the apex somewhat hyaline and scarcely hooded, 4.0-4.3 mm long; lower palea elliptic-acute, narrow, about 2.3 the length of the lower lemma, 2.3-2.4 mm long; upper floret narrowly elliptic-acute, 2.5-2.7 mm long, about 0.8 mm wide, on a stipe about 0.2-0.3 mm long; rachilla-appendages about 1.0 mm long.

Holotype: Monte Serrate, Serra do Itatiaia, Estado do Rio, Brazil, collected by Brade no. 10063, June 16, 1930 (R, no. 49496; isotype at IAN).

Additional specimens examined: Brazil: Estado do Rio: Sto. Antonio de Fimbré (?), Brade and Lima 11715 (R).

The specific name brevipaniculatus is descriptive of the short panicles.

ICHNANTHUS CONFERTUS K. E. Rogers, sp. nov.

Culmi decumbentes, se extendentes, se ad nodos radicantes, villosi; nodi villosi; vaginae plerumque villosae; laminae ovato-acutae demum elliptico-acutae, pagina inferiori glabrosae vel pubescentes, plerumque manifestas superficiales cellulas in superiores vel saepe in inferiores paginas gerentes; paniculae flores stipatas gerentes; pulvini, inferiores praesertim, longo-pilosi; spiculae elliptico-acutae, 2.5-3.5 mm longae, leviter turgidae; flosculus inferior evidenter sterilis; flosculus superior 1.5-1.8 mm longus, 0.8-1.0 mm latus, sectus ex transverso manifeste triangularis atque carinatus maturus, versus per quadricirculum (90°) in longum axem in spiculo maturus.

Perennial; culms decumbent-spreading, rooting at the nodes, branched, the erect to ascending shoots 10-50 cm tall, villous; nodes villous; sheaths 1/4-2/3 the length of the internodes, or overlapping on new shoots, 1.0-3.0 cm long, usually villous; collar pubescent; ligule membranous-ciliate, truncate, 0.7-2.0 mm long; blades ovate-acute to elliptic-acute, 3-10 cm long, 1.0-3.5 cm wide, more or less clasping at the asymmetric base, the upper surface smooth or scabrid on the nerves and sometimes with soft hairs along the margin and toward the apex, the lower surface glabrous or pubescent, usually with conspicuous surface cells on the upper and often the lower surface, the margins narrowly cartilaginous and scabrid, papillose-ciliate at the base; panicles terminal and axillary, partly included to exserted, compactly flowered; terminal panicles 1.5-6.0 cm long, 1.0-4.0 cm wide, composed of few to several short ascending branches mostly 1.0-5.0 cm long; pulvini, especially the lower, long pilose, peduncles pubescent or glabrous; spikelets elliptic-acute, 2.5-3.5 mm long, glabrous, bright green, sometimes vegetative, slightly turgid; glumes and lower lemma firmly membranous, the margins hyaline; first glume ovate-acute, 1/2-3/4 the length of the lower floret, 1.5-2.3 mm long, 3-nerved; second glume elliptic-acute, 2.3-3.3 mm long, equalling or slightly exceeding the lower lemma, mostly 5-nerved; lower floret apparently sterile; lower lemma elliptic, cucullate, 2.0-2.5 mm long, 5-nerved; lower palea elliptic-acute, 1.5-2.0 mm long, 0.8-1.1 mm wide, about 0.8 the length of the lower lemma, the nerves ciliolate, the back surface glabrous; upper floret 1.5-1.8 mm long, 0.8-1.0 mm wide, conspicuously triangular in cross-section and keeled when mature, on a stipe about 0.2-0.4 mm long, rotated 90 degrees on its long axis in the spikelet when mature; margins of the upper lemma inrolled; rachille-appendages 0.5-0.7 mm long.

Holotype: Vicinity of Tumatumari, on Potaro River 5 degrees 20 min N latitude, in open ground in forest along trail to Washerwoman's Falls, British Guiana, collected by A. S. Hitchcock, no. 17376, January 5, 1920 (US, no. 1038523; isotypes at F, GH, IAN, K, MO, NY, P, W).

Additional specimens examined: Trinidad: El Tucuche Mountain, Soderstrom 1053 (US); Arima Valley, N. Range, Cowan and Simmonds 1210 (US, K); Vicinity of Tabaquite, Britton, Freeman and Nowell 2607 (NY); Broadway 5361 (MO, F); Broadway 6004 (K, MO); Fendler 923 (E). Honduras: Olancho: between Catacamas and La Presa, Standley 18546 (F). Atlantida: Lancetilla Valley, Standley 52968 (F, US). Nicaragua: Zelaya: Standley 19785 (F). Costa Rica: Limon: vicinity of Guapiles, Standley 37276 (US). Panama: Canal Zone: Frijoles, Hitchcock 8398 (GH, US). Darien: Chepijana, Terry and Terry 1510 (F, GH, MO). Venezuela: Bolivar: Gran Sabana on Rio Kukenan N of Santa Elena, Steyermark 59232 (VEN, F, NY). Monagas: La Horwiga, Wurdack and Monachino 39518 (F, NY, P, RB, US, VEN). Delta Amacuro: Steyermark 87186-A (VEN, NY). British Guiana: Tumatumari, Hitchcock 17411 (GH, US); Gleason 115 (NY); Kamuni Creek-Groete Creek, Essequibo Riber, Maguire and Fanshawe 22843 (GH, NY); Lama, Jenman 7527, 9572 (K); Pomeroon River, De La Cruz 3116 (GH, F, MO, NY); Jacoba Creek, Land and Persaud 261 (F). Surinam: Kegel 138 (P); Nassau, Lanjouw and Lindeman 2925 (NY, IAN, K), 2934 (NY, IAN). French Guiana: Melinon s.n., in 1842 (MO, P); Soldanha 228 (IAN); Benoist 186 (P); Leschenault s.m. (P). Ecuador: Los Rios: Rio Pita, Cerro Mombo, Asplund 5529 (US). Pichincha: between Santo Domingo and Quininde, Acosta-Solis 14005 (US). Imbabura: Lita, Acosta-Solis 12156 (F, US). Guayas: Teresita, W of Bucay, Hitchcock 20426 (GH, NY). Oro: between La Chorita and Portovelo, Hitchcock 21202 (GH, NY). Napo-Pastaza: Puyo, Skutch 4413 (NY, US); Canton Napo, Tena to Napo, Mexia 7179 (F). Peru: Huanuco: Tinga Maria, Asplund 12498 (NY), 12212 (US); Ferreyra 1915 (GH). Loreto: Rio Huallaga, Williams 4422 (F). Brazil: Amapa: Rio Araguari, Pires et al 50932 (NY); Rio Oiapoque, Froes 25857, 26038 (IAN).

*I. confertus* is distinguished by the presence of surface cells or areolae on one or both surfaces of the blades, the sterile lower floret, the compact panicles, and the keeled triangular upper floret. It is closely allied to *I. brevivaginatus* Swallen which has larger, usually pubescent spikelets, acuminate to attenuate glumes, and lanceolate blades.

The specific epithet given to this species is descriptive of the panicles, which are typically compact.

*ICHNANTHUS GLAZIOUI* K. E. Rogers, nomen nov.

*I. candicans* var. *glabratus* Doell in Mart. in Martius Fl. Bras. 2(2). 1877. Lectotype: Brazil: Rio de Janeiro, Glaziou 4323 (F, No. 538472). Isolectotypes at K, P, IAN, NY, W. *I. candicans* var. *glabratus* f. *grandiflorus* Doell in Mart. in Martius Fl. Bras. 2(2). 1877.

Apparently annual; culms slender, rooting at the lower nodes, with many ascending flowering branches; internodes sparsely papillose-pilose in lines or nearly glabrous; sheaths 1.5-3.5 cm long, 1/5 the length of the internodes to exceeding them, the margins ciliate; collar glabrous or nearly so; ligule membranous-ciliate, 1.3-2.0 mm long, the cilia 0.5-0.8 mm long; blades thin, narrowly lanceolate, long acuminate, asymmetric, rounded at the base on one side, smooth or scabridulous toward the apex, 6.5-10 cm long, 0.7-1.6 mm wide; inflorescence paniculate, with few spikelets, terminal and axillary, numerous on slender peduncles; terminal panicles mostly three, 5-8 cm long, 1-6 cm wide, on peduncles of dissimilar lengths up to 20 cm long; axillary panicles on long peduncles; lowest primary branches as much as 4.5 cm long; rachis sparsely scaberulous; spikelets elliptic-acute, glabrous or sparsely pilose on the upper margins of the glumes, 5.0-6.5 mm long; glumes and lower lemma membranous; first glume 3.5-5.0 mm long, ovate-acuminate, the midnerve shortly excurrent, scabridulous, 3-5 nerved; second glume 4.7-5.2 mm long, elliptic-acuminate, scabridulous on the midnerve, 5-9 nerved; lower floret staminate, the stamens 2.0-2.2 mm long; lower lemma 4.2-4.5 mm long, elliptic, the apex hooded and hyaline, 5-7 nerved; lower palea 3.0-3.5 mm long, about 3/4 the length of the lower lemma; upper floret 2.6-2.8 mm long, about 1.0 mm wide, narrowly elliptic-acute; rachilla-appendages about 1.0 mm long.

Additional specimens examined: Brazil: Rio de Janeiro: Petropolis, Chase 12177 (US); prope Petropolis, Ball s.n. (E); Glaziou 3152 (US, P, W). Minas Geraes: Caldes, Lindberg 655 (US). Rio Grande do Sul, Morro de Glorio, Porto Alegre, Rambo 29037 (US).

ICHNANTHUS HITCHCOCKII K. E. Rogers, sp. nov.

Culmi elongati, ramificantes, se ad inferiores nodos radicantes; internodi molliter pilosi; nodi molliter pilosi; vaginae pilosae vel superioribus glabrosae; laminae subtenues, pagina superior paucos sparsos longos pilos manifestans vel glabrosa, pagina inferior puberulenta; paniculae terminales et axillariae; spiculae 4.0-5.2 mm longae, glabrosae; flosculus superior elliptico-acutus, 2.0-2.2 mm longus; rachilla-appendiculae ferme 0.7 mm longae.

Perennial; culms elongate, branching, rooting at the lower nodes, with ascending flowering branches; internodes soft pilose, as much as 6 cm long; nodes soft pilose; sheaths shorter than the internodes, mostly 1-3 cm long, pilose or the uppermost glabrate; collar pubescent; ligule membranous-ciliate, about 1.2 mm long; leaf-blades thinnish, lanceolate, short acuminate, inequilaterally cordate at the base, 4-8 cm long, 1.3-2.5 cm wide, the upper surface with a few scattered long hairs or glabrous, the lower surface puberulent; inflorescence of terminal and axillary panicles; terminal panicles exserted, 7-9 cm long, as much as 6 cm wide, the lowest primary branches to 5 cm long, the secondary branches as much as 1.5 cm long; rachises scaberulous; pulvini pilose; axillary panicles exserted, as much as 11 cm long; spikelets paired and solitary, 4.0-5.2 mm long, glabrous; glumes and lower lemma membranous; first glume ovate-acuminate, 2.5-3.5 mm long, shorter than the lower lemma, 3-nerved; second glume elliptic-acuminate, 4.0-5.0 mm long, 5-7 nerved; lower lemma elliptic-acuminate, 3.5-4.0 mm long, 5-7 nerved; lower palea about equalling the lower lemma; upper floret elliptic-acute, 2.0-2.2 mm long; rachilla-appendages about 0.7 mm long.

Holotype: Mariposoula (?), French Guiana, collected by J. Hoock-Cayenne, s.n., January 30, 1956 (NY).

Additional specimens examined: Triniday: Esin Savanna, Soderstrom 1119 (K). French Guiana: Mariposoula, Hoock-Cayenne 1067 (P); ibid, Hoock-Cayenne 74 (P); ibid, Hoock-Cayenne 75; Karoway 662 (P). British Guiana: Thurman s.n. (K). Brazil: Amazonas: Rio Negro, S. Gabriel, Black 48-2525 (IAN); ibid, Black 48-2493 (IAN). Para: Rio Maicuru, Cateia, Black 57-20136 (IAN); Rio Vermelho, regiao do Tocantins, Froes, 27043 (IAN). Amapa: Lago Bom Nome, Fazenda Queimadas, Black and Lobato 50-9390 (IAN). Bolivia: Rio Guapore, Porto da Paz, Black and Cordeiro 52-15031 (IAN).

This species is named for A. S. Hitchcock.

ICHNANTHUS ITACOLUMENSIS K. E. Rogers, sp. nov.

Culmi graciles, elongati, ramosi, 3 m longi vel plus, multas radices ut grallas monstrantes; internodi plus minusue brevipilosi; ligula membraneo-ciliata, ferme 0.4 mm longa, perparum ciliata; laminae anguste lanceolatae, longo-acuminatae; paniculae terminales satius sparsim florentes; spiculae 4.0-4.5 mm longae; glumae et lemma inferius molliter membraneae; flosculus superior 2.5-2.8 mm longus; rachilla-appendiculae circa 1.0 mm longae.

Perennial; culms slender, elongate, branching, 3 m or more long, with many stilt roots; internodes as much as 7.0 cm long, more or less short pilose; sheaths about 1/2 the length of the internodes, pubescent like the culms or glabrescent, the margins ciliate, mostly about 2.5 cm long or the uppermost to 7.0 cm long; collar short pilose; ligule membranous-ciliate, about 0.4 mm long, minutely ciliate; blades narrowly lanceolate, long acuminate, asymmetric, 7-9 cm long, 0.5-0.8 cm wide, the upper surface more or less short pilose and somewhat scabridulous, the lower surface pubescent or nearly glabrous; inflorescene a terminal panicle, rather sparsely flowered, 13 cm long, 4-5 cm wide, the lower branches alternate, as much as 3.5 cm long, the middle and upper subverticillate; rachis scaberulous; pulvini pilose; pedicels short, scaberulous and short pilose at base; spikelets paired and solitary, tinged with purple, elliptic-acuminate, 4.0-4.5 mm long; glumes and lower lemma softly membranous; first glume ovate, acuminate to attenuate, 3.5-4.5 mm long, pilose on the margins, barely shorter than to exceeding the lower lemma, 3-nerved; second glume alliptic-acuminate, 3.8-4.0 mm long, 5-nerved; lower floret staminate, the stamens about 2.0 mm long; lower lemma elliptic, the apex hyaline and hooded, 3.3-3.5 mm long, scabridulous on the upper outer surface or smooth, 5-nerved; lower palea elliptic, obtusish, 2.7-2.8 mm long, about 0.8 the length of the lower lemma; upper floret narrowly elliptic-acute, 2.5-2.8 mm long, the stamens about 2.0 mm long; rachilla-appendages about 1.0 mm long.

Holotype: Itacolumy, East of Ouro Preto, el. 1300 m, edge of brushy woods, mountain slope, Minas Geraes, Brazil, collected by Agnes Chase, no. 9412-I, April 1925 (US, no. 1257590).

Additional specimens examined: Brazil: Minas Geraes: Itacolumy, East of Ouro Preto, Chase 9412 II (US); ibid, Chase 9411 (US).

ICHNANTHUS PILOSUS K. E. Rogers, sp. nov.

Culmi graciles, late ramosi, verrentes, rami florescentes ascendentes usque ad 15 cm; internodi papilloso-pilosi; vaginae papilloso-pilosae pilos extensos gerentes; ligula membraneo-ciliata, 0.5-0.7 mm longa; laminae ovatae, 1.0-3.0 cm longae, 0.5-0.8 cm latae, ambobus paginis papilloso-pilosae; paniculae terminales, paucae florentes, vix exsertae vel in basim aliquantum inclusae; rachis plus minusue pilosa; pulvini pilosi;

spiculae anguste ellipticae, attenuatae, 4.0-4.5 mm longae; gluma prima ovata, longo-acuminata; gluma altera anguste elliptico-ovata, longo-acuminata; flosculus superior anguste ellipticus, acutus, 1.9-1.9 mm longus.

Apparently annual; culms slender, extensively branching, trailing, rooting at the nodes, with ascending flowering branches as much as 15 cm high; internodes papillose-pilose, as much as 3.5 cm long; nodes papillose-pilose; sheaths papillose-pilose with spreading hairs, about 1/2 the length of the internodes, overlapping on the branches, mostly 0.5-1.0 cm long; collar pubescent; ligule membranous-ciliate, 0.5-0.7 mm long; blades asymmetric, ovate, acute to short acuminate, 1.0-3.0 cm long, 0.5-0.8 cm wide, thinnish, papillose-pilose on both surfaces; inflorescence a terminal, few-flowered panicle, barely exserted or partly included at base, 1-2 cm long, 0.3-1.0 cm wide; panicle branches simple, as much as 0.8 cm long; rachis scaberulous and more or less pilose; pulvini pilose; peduncle 1 cm or less long, papillose-pilose; pedicels scaberulous and short pilose, the longer 1.0-2.3 mm long, the shorter 0.2-0.5 mm long; spikelets paired and solitary, narrowly elliptic, attenuate, 4.0-4.5 mm long; glumes and lower lemma membranous; first glume ovate, long acuminate, 3.2-3.7 mm long, papillose-pilose between the lateral nerves with spreading hairs, slightly shorter than the lower lemma, 3-nerved; second glume narrowly elliptic-ovate, long acuminate, 4.0-4.3 mm long, papillose-pilose between the nerves with spreading hairs, 5-nerved; lower lemma elliptic, acute, 3.3-3.6 mm long, 5-nerved; lower palea narrowly elliptic-acute, 1.6-1.8 mm long, about 1/2 the length of the lower lemma; upper floret narrowly elliptic, acute, 1.8-1.9 mm long, about 0.7 mm wide, on a stipe about 0.2 mm long; rachilla-appendages about 0.8 mm long.

Holotype: Belterra, máta; fórma tapêtes; Para, Brazil, collected by Black, no. 47-1013, July 10, 1947 (IAN, no. 29487; isotypes at US, NY).

Additional specimens examined: Brazil: Maranhão: Perizes; Black, Pires, and Lima 54-16566 (IAN).

This specific epithet is descriptive of the pubescence, the plants being essentially papillose-pilose throughout.

ICHNANTHUS RAMOSISSIMUS K. E. Rogers, sp. nov.

Culmi plus minusue lignosi, multum ramosi, ascendentes altitudine usque ad sex pedes aut plus; internodi papilloso-pilosi per unam aut duas lineas vel paene glabrosi; ligula membraneo-ciliata, 0.4-0.5 mm longa, ciliar minutum; laminae anguste lanceolatae, longo-acuminatae; paniculae terminales; spiculae 3.6-4.0 mm longae, glabrae; glumae et inferior lemma tenuiter membraneae; prima gluma ovata, brevior quam vel etiam excedens lemma inferius; superior flosculus elliptico-acutus, ferme 2.3 mm longus; rachilla-appendiculae 0.6-0.8 mm longae.

Perennial; culms more or less woody, much branched, clambering to about 6 or more feet; internodes papillose-pilose in one or two lines or nearly glabrous, up to 11 cm long; sheaths 1/2-3/4 the length of the internodes, papillose-ciliate on the margins, 3-5 cm long or the uppermost to 9 cm long; collar pubescent; ligule membranous-ciliate, 0.4-0.5 mm long, the ciliar minute; blades narrowly lanceolate, long acuminate, the base unequally cordate, 9-14 cm long, 0.8-1.2 cm wide, the upper surface with scattered short, soft hairs and more or less scabridulous, the lower surface more or less short pubescent or glabrescent; inflorescence paniculate, terminal, 15-15 cm long, 3-5 cm wide, pulvini pilose, rachis scabridulous, lower branches solitary, as much as 7.5 cm long, the middle and upper subverticillate, ascending, secondary branches appressed, to 1.5 cm long, peduncle as much as 9 cm long; spikelets paired and solitary in the inflorescence, short pedicellate, elliptic-acuminate, 3.6-4.0 mm long, glabrous; glumes and lower lemma thinly membranous; first glume ovate, the apex acuminate to attenuate, 3.8-4.0 mm long, shorter than to exceeding the lower lemma, 3-nerved; second glume ovate-elliptic, acuminate, 3.6-3.8 mm long, 5-nerved; lower floret staminate, the stamens about 1.4 mm long; lower lemma elliptic, the apex hooded and hyaline, 3.0-3.2 mm long, 5-nerved; lower palea elliptic-acute, 2.7-2.9 mm long, 0.8 the length of the lower lemma to nearly equalling it; upper elliptic-acute, about 2.3 mm long; upper stamens about 1.3 mm long; rachilla-appendages 0.6-0.8 mm long.

Holotype: Rio Cacador, Santa Catarina, Brazil, collected by Jason R. Swallen, no. 8293, January 22, 1946 (US, no. 1960931).

Additional specimens examined: Santa Catarina: W of Rio Negrinho, Smith and Klein 12044-A (US); Anita Garibaldi, Reitz and Klein 14793 (US). Parana: Ponta Grossa, Swallen 8454 (US); Curitaba, Swallen 8595 (US); ibid, Swallen 8545 (US); Guarapuava, Swallen 8937 (US); Dusen 4257 (US).

The specific epithet is descriptive of the the much branched culms.

## ICHNANTHUS TENUIFOLIUS K. E. Rogers, sp. nov.

Culmi elongati, graciles, verrentes, se ad multos nodos radicantes, rami florentes et ascendentes usque ad 12 cm vel altiores; internodi molliter pilosi in ordinibus; vaginae maxima ex parte 1 cm vel minus longae, multo breviores quam internodi in principales culmos, multo in ramos suprapositae; ligula membraneo-ciliata, exigua, 0.4-0.5 mm longa; laminae lanceolatoacuminatae, tenues, 3-6 cm longae, 0.5-0.8 cm latae; paniculae terminales, 1.5-2.2 cm longae, 0.5-1.0 cm latae, raro florentes, vagina superior tantum 1-2 flores exhibens; spiculae 3.0-3.4 mm longae, glabrosae; rachilla-appendiculae 0.5 mm longae.

Annual; culms elongate, slender, trailing, rooting at many nodes, with ascending flowering branches to 12 cm or more high; internodes softly pilose in lines, at least below the nodes, to 5.5 cm long on main culms; nodes pilose; sheaths mostly 1 cm or less long, much shorter than the internodes on main culms, mostly overlapping on branches, softly pilose; collar pubescent; ligule membranous-ciliate, minute, 0.4-0.5 mm long; blades lanceolate-acuminate, asymmetric, thin, 3-6 cm long, 0.5-0.8 cm wide, the upper surface glabrous or sparsely pubescent, the lower surface puberulent; panicles terminal, 1.5-2.2 cm long, 0.5-1.0 cm wide, few flowered, 1-2 from the uppermost sheath, consisting of 3-5 short, alternate, appressed branches as much as 0.8 cm long; peduncles to 5 cm long; spikelets paired and solitary, 3.0-3.4 mm long, glabrous, on pedicels 0.5-2.5 mm long; glumes and lower lemma membranous, with hyaline margins; first glume ovate-acuminate, 2.8-3.4 mm long, shorter than to exceeding the lower lemma, 3-5 nerved; second glume ovate-elliptic, short acuminate, 2.7-3.0 mm long, 5-nerved; lower floret staminate, the stamens 1.0-1.3 mm long; lower lemma ovate-elliptic, the apex somewhat hooded and hyaline, 2.4-2.6 mm long, 5-nerved; lower palea elliptic-acute, 2.0-2.2 mm long, about 0.9 the length of the lower lemma; upper floret 2.0 mm long, 1.0 mm wide, elliptic-acute; rachilla-appendages 0.5 mm long.

Holotype: Rancho Grande, Parque Nacional, Venezuela, collected by Luces, no. 40, May 18, 1942 (VEN, no. 22025).

Additional specimens examined: Venezuela: Rancho Grande, Aragua, Tamayo 2252 (VEN); Estado Garacuy, Silva nublada de Aroa, Aristequieta and Foldata 1479 (VEN).

This entity appears to belong to the *I. nemorosus* species complex. It is distinguished by the slender culms with ascending branches, the short sheaths, the minute ligule, the small, few-flowered terminal panicles, and the narrow leaf-blades.

The specific epithet given to this species is descriptive of the narrow leaf-blades.

## NOTES ON BROMELIACEAE, XXXIV

Lyman B. Smith

---

### KEY TO AECHMEA AND SIMULATORS

This revision follows the same general plan as that of Tillandsia in my Notes on Bromeliaceae, XXXI, and Guzmania in number XXXII. It is the last large key preliminary to my monograph and the only one of any great size in the Bromelioideae.

The demarcation of Aechmea as a genus is very difficult and I have erred on the side of lumping by reducing Chevalieria, Disteganthus, Wittmackia (Phytologia 14: 464. 1967) and Gravisia (Phytologia 19: 281. 1970) to Aechmea because their supposed distinctions proved inadequate or illusory.

I have had to change Mez's key to subgenera because the cyathiform inflorescence that he used to define Subgenus Ortgiesia is not significant and the species that he included there must be distributed elsewhere. At the same time Hoplophytum is replaced by Ortgiesia because Aechmea fasciata, the type species of Hoplophytum, accords better with Mez's definition of Subgenus Aechmea, while the type species of Ortgiesia, Aechmea recurvata, fits his definition of Hoplophytum except for the cyathiform inflorescence. The revised key to subgenera is as follows:

1. Petal-appendages well developed; inflorescence simple or compound, never perennial.
  2. Flowers pedicellate; inflorescence lepidote, amply compound, lax..................................Subgenus 1. PODAECHMEA
  2. Flowers sessile or subsessile or if pedicellate then the inflorescence glabrous and simple or subsimple.
    3. Inflorescence compound, or if simple then lax with entire sepals or the flowers distichous.
      4. Sepals unarmed; flowers in more than 2 ranks, glabrous. Subgenus 2. LAMPROCOCCUS
      4. Sepals mucronate or mucronulate, or if unarmed then the flowers distichous and lepidote.
        5. Floral bracts neither decurrent nor forming pouches around the flowers.
          6. Sepals nearly or quite free...........Subgenus 3. AECHMEA
          6. Sepals connate for one-third to one-half their length, their mucros about as long as their free lobes. Subgenus 4. ORTGIESIA
        5. Floral bracts decurrent and forming pouches around the flowers.........................Subgenus 5. PLATYAECHMEA
    3. Inflorescence simple; flowers more than 2-ranked.
      7. Sepals mucronate or mucronulate; petal-appendages appearing basal or higher......................Subgenus 6. POTHUAVA
      7. Sepals unarmed; petal-appendages mostly appearing to be inserted well above the base....Subgenus 7. MACROCHORDION
1. Petal-appendages rudimentary or reduced; inflorescence simple

or rarely digitate, perennial; flowers strobilate, in many ranks; floral bracts mostly thick and ligneous.
Subgenus 8. PURPUROSPADIX

Subgenus 1. PODAECHMEA

1. Sepals unarmed, 4 mm long. Peru................Ae. ferruginea
1. Sepals mucronate.
 2. Sepals 22 mm long; inflorescence pendulous, its axes, ovaries and sepals coarsely and densely white-lepidote. Mexico. Ae. mcvaughii
 2. Sepals not over 6 mm long.
  3. Petals yellow; sepals 4 mm long; pedicels 4 mm long. Mexico Ae. galeottei
  3. Petals red to blue.
   4. Sepals 6 mm long; lower branches of the inflorescence much divided. Mexico, Costa Rica, Ecuador........Ae. mexicana
   4. Sepals 3.5 mm long; lower branches of the inflorescence simple or slightly divided. Mexico, British Honduras. Pl. I, fig. 1-3.......................Ae. lueddemanniana

Subgenus 2. LAMPROCOCCUS

1. Calyx campanulate; sepals broadly obovate. Guyana. Ae. campanulata
1. Calyx tubular.
 2. Leaves 2-ranked; sheaths elongate.
  3. Scape long, decurved; leaf-blades marked with spots or bands. Brazil.........................Quesnelia marmorata
  3. Scape short, erect, largely hidden by the leaf-sheaths; leaf-blades concolorous. Colombia, Venezuela, Amazonian Brazil...................................Ae. brevicollis
 2. Leaves more than 2-ranked; sheaths short.
  4. Ovary alate; inflorescence few-flowered; floral bracts large. Brazil............................Ae. brachycaulis
  4. Ovary wingless, terete.
   5. Inflorescence involucrate with large upper scape-bracts and lower primary bracts, corymbose. Colombia, Peru, Amazonian Brazil...........................Ae. corymbosa
   5. Inflorescence not involucrate.
    6. Floral bracts evident, well developed.
     7. Inflorescence simple.
      8. Leaf-blades petiolate or subpetiolate. Costa Rica, Colombia............................Ronnbergia spp.
      8. Leaf-blades ligulate, not narrowed at base. Brazil. Quesnelia spp.
     7. Inflorescence laxly bipinnate. Brazil. Pl. I, fig. 4. Ae. weilbachii
    6. Floral bracts minute or lacking. Brazil.
     9. Flowers distinctly pedicellate; ovary verrucose.
      10. Sepals 4 mm long; scape erect; inflorescence basally compound..............................Ae. podantha

10. Sepals 9 mm long; scape usually decurved; inflorescence simple. P. I, fig. 5, 6.................Ae. racinae
9. Flowers sessile.
11. Inflorescence bipinnate throughout.
12. Petals white; sepals 6.5 mm long.........Ae. corallina
12. Petals colored; sepals 4 mm long.
13. Inflorescence longer than broad; petal-blades wholly blue..................................Ae. miniata
13. Inflorescence about as broad as long; petal-blades blue only at apex......................Ae. farinosa
11. Inflorescence simple or bipinnate at base only.
14. Scape decurved; sepals 8-10 mm long; ovary verrucose. Ae. warasii
14. Scape erect; sepals 4.5-6 mm long.
15. Floral bracts minute...................Ae. victoriana
15. Floral bracts wholly lacking.............Ae. fulgens

Subgenus 3. AECHMEA

1. Floral bracts about equaling to exceeding the sepals.
2. Inflorescence dense.
3. Sepals serrulate-alate on the keel; inflorescence densely subglobose, densely brown-lanate. Brazil.......Ae. mollis
3. Sepals not serrulate-alate.
4. Leaf-blades with broad dark purple spots beneath; inflorescence ovoid, 7 cm long; sepals free, 11 mm long, mucronulate. Brazil.............................Ae. orlandiana
4. Leaf-blades concolorous.
5. Inflorescence broad.
6. Flowers fasciculate; primary bracts forming an involucre beneath the subglobose inflorescence. Trinidad, Venezuela. Pl. I, fig. 7-9..................Ae. aripensis
6. Flowers spicate.
7. Inflorescence tripinnate, corymbose. Venezuela. Pl. I, fig. 10, 11...............................Ae. gigantea
7. Inflorescence bipinnate, digitate. Amazonian Brazil. Ae. rodriguesiana
5. Inflorescence cylindric or slenderly fusiform.
8. Floral bracts and sepals marginally serrate. Colombia, Ecuador....................................Ae. hoppii
8. Floral bracts and sepals entire. Brazil.
9. Sepals free, 9 mm long, unarmed..............Ae. mutica
9. Sepals connate, 23 mm long including the 5 mm mucro. Ae. macrochlamys
2. Inflorescence lax at least toward base.
10. Sepals 11-22 mm long.
11. Spikes few-flowered, 3-5 cm long.
12. Mucros of the floral bracts mkch longer than the body of the bract. Guyana.....................Ae. brassicoides
12. Mucros of the floral bracts short. Brazil.
13. Inflorescence ample, tripinnate; sepals 22 mm long. Ae. rubens

13. Inflorescence bipinnate from a few spikes; sepals 13 mm long.......................................<u>Ae</u>. <u>prava</u>

11. Spikes many-flowered, 15-35 cm long; flowers distichous. Brazil.

14. Floral bracts divergent, not touching one another; sepals 21-25 mm long. Pl. II, fig. 1, 2......<u>Ae</u>. <u>blanchetiana</u>

14. Floral bracts imbricate; sepals 17 mm long. <u>Ae</u>. <u>fraudulosa</u>

10. Sepals 4-6 mm long; flowers distichous.

15. Spikes lax; floral bracts one to one and a half times as long as the internodes. Costa Rica. Pl. II, fig. 3, 4. <u>Ae</u>. <u>pittieri</u>

15. Spikes dense or subdense; floral bracts at least twice as long as the internodes.

16. Floral bracts even or nearly so, glabrous, 15-20 mm long. Costa Rica to Colombia....................<u>Ae</u>. <u>dactylina</u>

16. Floral bracts prominently nerved, densely white-arachnoid at first, 6-13 mm long. Honduras to Colombia..................................<u>Ae</u>. <u>pubescens</u>

1. Floral bracts distinctly surpassed by the sepals.

17. Floral bracts in the form of a cylinder or cup, completely enclosing the base of the ovary with their margins overlapping.

18. Mucro of the floral bracts 2-8 mm long; sepals 3-11 mm long

19. Spikes very dense; flowers few, subfasciculate; sepals mucronate, 4 mm long. Northern South America. <u>Ae</u>. <u>mertensii</u>

19. Spikes lax; sepals 6-11 mm long.

20. Rhachis terete, slender; spikes distinctly stipitate. Peru......................................<u>Ae</u>. <u>paniculata</u>

20. Rhachis angled. Brazil.

21. Leaf-spines 5 mm long; inflorescence slenderly cylindric <u>Ae</u>. <u>huebneri</u>

21. Leaf-spines 2 mm long; inflorescence amply pyramidal. Pl. II, fig. 5-7..............................<u>Ae</u>. <u>ampla</u>

18. Mucro of the floral bracts to 16 mm long; sepals 16-20 mm long.

22. Inflorescence densely ferruginous-flocculose; branches all bearing a few flowers at their bases, but the upper branches with sterile apices. Bolivia, Brazil. <u>Ae</u>. <u>kuntzeana</u>

22. Inflorescence pale-flocculose.

23. Branches at the base of the inflorescence reduced to fascicles of sterile setiform bracts. Panama to French Guiana, Brazil..............................<u>Ae</u>. <u>setigera</u>

23. Branches all bearing a few flowers at their bases, but with sterile apices.

24. Floral bracts but slightly exceeding the ovary. Colombia..............................<u>Ae</u>. <u>longicuspis</u>

24. Floral bracts nearly equaling the sepals. Amazonian Brazil. Pl. II, fig. 8, 9.................<u>Ae</u>. <u>prancei</u>

.....................................................................

.17. Floral bracts not completely enclosing the base of the ovary
25. Floral bracts equaling or exceeding the ovary at anthesis.
26. Sepals 12-23 mm long.
27. Inflorescence laxly and amply 3-4-pinnate, broad. Brazil
28. Floral bracts ovate, attenuate; rhachis angled. Pl. II, fig. 10-12........................Ae. eurycorymbus
28. Floral bracts reniform with a terminal spine; rhachis terete......................Streptocalyx floribundus
27. Inflorescence or its branches dense.
29. Lower primary bracts ample, nearly as broad as long, covering most of each branch.
30. Primary bracts with conspicuous densely white-lepidote apices; sepals inconspicuously mucronulate; branches aborted, few-flowered. Colombia, Ecuador. Ae. nidularioides
30. Primary bracts nearly or quite concolorous; sepals often strongly mucronate.
31. Flowers distichous; scape usually not more than equaling the globose to cylindric inflorescence. Northern South America.............Streptocalyx spp.
31. Flowers polystichous; scape much longer than the globose inflorescence. Brazil..........Ae. capitata
29. Lower primary bracts much longer than broad, thin, entire, crumpled with age.
32. Floral bracts narrow, exposing the rhachis. Trinidad. Ae. downsiana
32. Floral bracts ample, imbricate and concealing the rhachis (Gravisia in part).
33. Flowers spicate on elongate axes. Brazil. Ae. lanjouwii
33. Flowers fasciculate at the ends of the branches.
34. Lower branches equaling to much exceeding the primary bracts. Brazil......................Ae. mulfordii
34. Lower branches only about half as long as the primary bracts. Costa Rica, Venezuela, Trinidad, Tobago, Guiana, Brazil........................Ae. aquilega
26. Sepals 4-11 mm long.
35. Flowers polystichous or so few or so lax as not to show their rank.
36. Sepals not more than apiculate. Brazil.
37. Leaf-blades with brown-purple spots or wavy bands; lower branches stipitate..............Ae. fosteriana
37. Leaf-blades concolorous; all branches sessile, densely fasciculate in the axils of the primary bracts. Ae. bambusoides
36. Sepals distinctly mucronate.
38. Inflorescence dense.
39. Spikes to 10-flowered; floral bracts lance-ovate, attenuate. Venezuela..................Ae. gigantea
39. Spikes 2-3-flowered; floral bracts very broadly subovate. Brazil. Pl. II, fig. 13, 14. Ae. phanerophlebia

38. Inflorescence lax.
40. Rhachis geniculate. Brazil.
41. Ovary trigonous; some leaf-blades narrowly triangular branches to 6 cm long............*Ae. purpurea-rosea*
41. Ovary terete; all leaf-blades ligulate; branches 40_50 cm long..............*Streptocalyx floribundus*
40. Rhachis straight; leaf-blades ligulate. Lesser Antilles, Trinidad, Guiana, Brazil.....*Ae. lingulata*
35. Flowers manifestly distichous; spikes mostly rather dense
42. Inflorescence 3-4-pinnate.
43. Sepals acuminate to a soft point; inflorescence densely white-lanate. Brazil...................*Ae. araneosa*
43. Sepals not acuminate; inflorescence not densely vistite
44. Upper scape-bracts serrate. Colombia..*Ae. servitensis*
44. Upper scape-bracts entire.
45. Floral bracts only about as long as the internodes, red. Mexico, Central America, Colombia. *Ae. bracteata*
45. Floral bracts more than twice as long as the internodes. Colombia, Ecuador. Pl. II, fig. 15, 16. *Ae. pyramidalis*
42. Inflorescence not more than bipinnate.
46. Spike-rhachis excavated or winged.
47. Upper scape-bracts serrate. Costa Rica to Peru and Bolivia............................*Ae. angustifolia*
47. Upper scape-bracts entire. Colombia, Ecuador. *Ae. leucocarpa*
46. Spike-rhachis merely angled.
48. Sepals 9-10 mm long.
49. Spikes densely few-flowered; rhachis straight. Colombia...........................*Ae. stenosepala*
49. Spikes lax, 10 cm long; rhachis geniculate. Peru. *Ae. nallyi*
48. Sepals 4-5 mm long.
50. Scape-bracts dentate. Ecuador...........*Ae. eggersii*
50. Scape-bracts entire. Bolivia.........*Ae. brachyclada*
25. Floral bracts distinctly shorter than the ovary at anthesis
51. Sepals 12-23 mm long.
52. Floral bracts setiform from a minute base or evenlacking.
53. Axes stout; sepals 23 mm long; primary bracts broad. Brazil..................................*Ae. tomentosa*
53. Axes slender; sepals 12-16 mm long.
54. Inflorescence densely cylindric except at base; sepals 16 mm long. Brazil.......................*Ae. bahiana*
54. Inflorescence laxly subpyramidal; sepals 12-14 mm long.
55. Ovary slenderly cylindric. Brazil.
56. Inflorescence white-tomentose.........*Ae. costantinii*
56. Inflorescence ferruginous-tomentose....*Ae. stelligera*
55. Ovary obovoid or clavate; inflorescence sparsely flocculose, soon glabrous.
57. Inflorescence broadly pyramidal, lax, 30-60 cm wide at base. Colombia, Venezuela.......*Ae. spectabilis*

57. Inflorescence cylindric, narrow. Venezuela, Trinidad Pl. III, fig. 1-3......................*Ae. fendleri*

52. Floral bracts broad and flat for most of their length.

58. Scape decurved, very slender; floral bracts minute, suborbicular. Venezuela.

59. Inflorescence branched throughout; wing of the sepal not extending above the midnerve. Pl. III, fig. 4, 5 *Ae. filicaulis*

59. Inflorescence terminating in a long spike; wing of the sepal much exceeding the midnerve.........*Ae. lasseri*

58. Scape erect.

60. Primary bracts like the floral bracts; inflorescence cylindric. Mexico.........................*Ae. matudae*

60. Primary bracts large.

61. Inflorescence densely cylindric except the interrupted base.

62. Primary bracts firm, serrate. Colombia, Peru, Bolivia, Suriname, Amazonian Brazil. *Streptocalyx poeppigii*

62. Primary bracts thin, entire. Trinidad..*Ae. downsiana*

61. Inflorescence amply paniculate.

63. Petals 15 mm long; primary bracts 15-18 mm long. Guatemala...............................*Ae. iguana*

63. Petals 25-35 mm long. Brazil.

64. Floral bracts 5-8 mm long; petals 25 mm long. *Ae. werdermannii*

64. Floral bracts 1-3 mm long; petals 35 mm long. Pl. III, fig. 6, 7......................*Ae. megalantha*

51. Sepals 4-11 mm long.

65. Branches of the inflorescence (either the primary or the ultimate) fascicled at each node, very slender, terete.

66. Spikes mostly 1-flowered, the flowers appearing slenderly pedicellate but the floral bracts situated immediately below the ovary. Venezuela. *Ae cymoso-paniculata*

66. Spikes nearly all 2-8-flowered.

67. Inflorescence broadly pyramidal, lax, 30-60 cm wide at base. Colombia, Venezuela............*Ae. spectabilis*

67. Inflorescence cylindric, not more than 9 cm wide at base.

68. Sepals 11-12 mm long. Trinidad, Venezuela. Pl. III, fig. 1-3...............................*Ae. fendleri*

68. Sepals 5-6 mm long. Jamaica, Colombia. *Ae. paniculigera*

65. Branches of the inflorescence solitary at each node.

69. Sepals obscurely mucronulate to unarmed; flowers distichous.

70. Inflorescence subdigitate; spikes dense. Ecuador. *Ae. abbreviata*

70. Inflorescence elongate.

71. Scape-bracts serrate or serrulate.

.....................................................

72. Inflorescence tripinnate at base, its trichomes flat, peltate. Colombia..................*Ae. servitensis*

72. Inflorescence bipinnate throughout, its trichomes cylindric, crisped.........................*Ae. nallyi*

71. Scape-bracts entire.

73. Leaf-blades subentire or minutely serrulate toward base. Costa Rica to Peru and Venezuela, Amazonian Brazil..............................*Ae. penduliflora*

73. Leaf-blades laxly serrate with broad flat spines 7 mm long. Venezuela.......................*Ae. politii*

69. Sepals distinctly mucronate.

74. Ovary trigonous; trichomes of the inflorescence filamentous, crisped; outer leaf-blades narrowly triangular; scape-bracts inconspicuous. Brazil. Pl. III, fig. 8, 9...........................*Ae. purpurea-rosea*

74. Ovary terete; leaf-blades all ligulate.

75. Rhachis straight or slightly flexuous.

76. Flowers polystichous. Central America.
*Androlepis skinneri*

76. Flowers distichous.

77. Upper scape-bracts serrulate. Colombia....*Ae. nivea*

77. Upper scape-bracts entire. Venezuela, Suriname, Amazonian Brazil, Bolivia. Pl. III, fig. 10, 11.
*Ae. tocantina*

75. Rhachis geniculate.

78. Inflorescence trichomes slenderly cylindric; upper scape-bracts massed beneath the inflorescence, flat, serrate, persistent. Colombia, Bolivia, Brazil. Pl. III, fig. 12-14. *Ae. castelnavii*

78. Inflorescence trichomes squamiform.

79. Leaf-sheaths concolorous with the blades; scape-bracts persistent. Brazil..............*Ae. azurea*

79. Leaf-sheaths dark castaneous; scape-bracts soon deciduous.

80. Blades broadly acute or obtuse, 5 cm wide, the teeth stout, 4 mm long; inflorescence minutely verrucose. The Guianas, Amazonian Brazil.
*Ae. melinonii*

80. Blades acute, 3 cm wide, the teeth slender; inflorescence smooth. Amazonian Brazil..*Ae. egleriana*

Subgenus 4. ORTGIESIA

1. Scape wholly covered by the leaf-sheaths; floral bracts usually serrulate.

2. Sepals 6 mm long without the terminal mucro. Brazil.
*Ae. guaratubensis*

2. Sepals 9-15 mm long without the terminal mucro.

3. Leaf-blades narrowly triangular, regularly attenuate from base to apex. Brazil, Uruguay, Paraguay, Argentina.
*Ae. recurvata*

3. Leaf-blades linear, acute. Brazil.......*Ae. pimenti-velosoi*

1. Scape evident, raising the inflorescence well above the leaf-sheaths. Brazil.
 4. Inflorescence compound.
  5. Floral bracts exceeding the sepals. (cf. Subgenus Aechmea). (Ae. macrochlamys)
  5. Floral bracts distinctly surpassed by the sepals.
   6. Petals white; leaves frequently banded; flowers 15 mm long; sepals 3.5 mm long without the 3 mm mucro.....Ae. candida
   6. Petals colored.
    7. Petals yellow; inflorescence densely white-flocculose; branches slender, geniculate; scape-bracts mostly imbricate; flowers 20-25 mm long............Ae. caudata
    7. Petals blue.
     8. Inflorescence persistently white-flocculose; branches nearly or quite straight; flowers 20 mm long. Ae. coelestis
     8. Inflorescence soon glabrous; branches geniculate.
      9. Flowers 17 mm long; scape-bracts mostly imbricate. Ae. organensis
      9. Flowers 25 mm long; scape-bracts mostly remote. Ae. gracilis
 4. Inflorescence simple.
  10. Petals white.
   11. Leaves broadly rounded and apiculate, sometimes banded; sepals 3.5 mm long without the 3 mm mucro..(Ae. candida)
   11. Leaves abruptly acuminate, densely and evenly cinereous-lepidote beneath; sepals 4 mm long without the 1 mm mucro....................................Ae. bicolor
  10. Petals colored,
   12. Petals yellow.
    13. Flowers subverticillate; leaves often white-banded beneath; sepals 7 mm long including the 3 mm mucro. Ae. blumenavii
    13. Flowers evenly distributed along the axis or more lax toward the base, but not at all verticillate; leaves not banded; sepals 7-11 mm long including the long mucro.
     14. Sepals connate for one-third to half their length. Ae. caudata
     14. Sepals short-connate; anthesis beginning in the middle of the inflorescence...................Ae. kertesziae
   12. Petals blue.
    15. Inflorescence very lax, few-flowered, soon glabrous; flowers 25 mm long; scape-bracts mostly remote.
     16. Scape erect.................................Ae. gracilis
     16. Scape decurved.........................Ae. apocalyptica
    15. Inflorescence with its axis slightly exposed, many-flowered.
     17. Flowers 20 mm long; inflorescence stout; floral bracts soft..................................Ae. cylindrata
     17. Flowers 15 mm long; inflorescence slender; floral bracts pungent................................Ae. gamosepala

Subgenus 5. PLATYAECHMEA

1. Flowers polystichous; floral bracts serrulate. Brazil.
  2. Primary bracts about equaling or shorter than the branches; sepals unarmed, free; flowers 13 mm long. Pl. IV, fig. 1-2 ..... Ae. caesia
  2. Primary bracts exceeding the branches or the inflorescence simple and cyathiform.
    3. Inflorescence broadly pyramidal, compound; only the highest scape-bracts imbricate; bracts of the inflorescence pale rose, becoming glabrous; p etals pale blue at anthesis. ..... Ae. fasciata
    3. Inflorescence narrowly pyramidal or ellipsoid and simple; scape-bracts nearly all imbricate; bracts of the inflorescence brown, persistently white-lepidote; petals coral red at anthesis.................................Ae. dealbata
1. Flowers distichous; floral bracts entire.
  4. Floral bracts truncate, pouch-shaped. Bolivia, Brazil, Uruguay, Paraguay, Argentina..............Ae. distichantha
  4. Floral bracts not truncate, extending much higher dorsally than ventrally.
    5. Leaf-blades distinctly petiolate; inflorescence simple or rarely digitate from a few spikes. Colombia, Peru, Guiana, Brazil..............................Ae. contracta
    5. Leaf-blades not petiolate.
      6. Sepals exserted beyond the bracts at anthesis.
        7. Lower primary bracts serrulate.
          8. Sepals very unequally connate, 15 mm long; primary bracts diminishing gradually in size toward the apex of the inflorescence. Colombia...................Ae. anomala
          8. Sepals free or equally short-connate, 10-13 mm long; primary bracts abruptly much shorter toward the apex of the inflorescence.
            9. Floral bracts elliptic, retuse, much exceeding the ovary; leaf-blades concolorous. Peru.......Ae. retusa
            9. Floral bracts broadly ovate, subtruncate, slightly exceeding the ovary; leaf-blades usually conspicuously white-banded. Colombia, Peru, Amazonian Brazil. Pl. IV, fig. 3, 4..........................Ae. chantinii
        7. Lower primary bracts entire.
          10. Floral bracts uniform, their mucro short, subapical; spikes oblong. Lesser Antilles, Trinidad. ..... Ae. dichlamydea
          10. Floral bracts tapering into a terminal mucro 4-5 mm long, the lower ones much larger than the others. Lesser Antilles........................Ae. smithiorum
      6. Sepals included in the floral bracts at anthesis.
        11. Leaf-blades broadly white-banded beneath; floral bracts 28 mm long. Colombia.......................Ae. zebrina
        11. Leaf-blades concolorous; floral bracts 6-25 mm long.
          12. Primary bracts entire; rhachis flattened, little or not at all excavated (cf. Subgenus Aechmea).

13. Floral bracts even or nearly so, glabrous, 15-20 mm long. Costa Rica to Colombia.........(Ae. dactylina)
13. Floral bracts prominently nerved, densely white-arachnoid at first, 6-13 mm long. Honduras to Colombia.............................(Ae. pubescens)
12. Primary bracts serrate; rhachis strongly excavated.
14. Spikes short-stipitate or sessile.
15. Sepals connate for 2 mm. Lesser Antilles..Ae. serrata
15. Sepals subfree. Mexico to Colombia and Guyana, Brazil Ae. tillandsioides
14. Spikes long-stipitate; primary bracts diminishing evenly in size toward the apex of the inflorescence.
16. Floral bracts coriaceous, nearly even, narrow and exposing the rhachis at anthesis. Colombia, Peru. Pl. IV, fig. 5, 6....................Ae. tessmannii
16. Floral bracts chartaceous, prominently nerved, ample and completely covering the rhachis at anthesis. Colombia...............................Ae. romeroi

Subgenus 6. POTHUAVA

1. Floral bracts serrate. Brazil.
2. Inflorescence scapose..........................Ae. pectinata
2. Inflorescence sessile.....................Ae. pitcairnioides
1. Floral bracts entire.
3. Scape-bracts serrate.
4. Floral bracts with soft apices, unarmed
5. Lower floral bracts like the scape-bracts but entire, covering the flowers. Panama................Ae. allenii
5. Lower floral bracts shorter than the fruiting ovaries.
6. Scape-bracts minutely dentate toward apex; inflorescence subdense. Costa Rica......................Ae. tonduzii
6. Scape-bracts coarsely and densely serrate; inflorescence very dense. Costa Rica, Colombia.....Ae. mariae-reginae
4. Floral bracts with pungent narrowly triangular or spinose apices; inflorescence subdense.
7. Mucros of the sepals 8-10 mm or longer.
8. Sepal mucro much more than 10 mm long. Ecuador. Ae. aciculosa
8. Sepal mucro 8-10 mm long.
9. Inflorescence cylindric. Peru. Pl. IV, fig. 7, 8. Ae. weberbaueri
9. Inflorescence subcapitate. Costa Rica, Colombia. Ronnbergia spp.
7. Mucros of the sepals not more than 3 mm long.
10. Flowers 50 mm long; sepals 17 mm long without the mucro. Ecuador.............................Ae. involucrata
10. Flowers 30 mm long; sepals 10 mm long without the mucro. Ecuador, Peru.............................Ae. fraseri
3, Scape-bracts entire or obscurely serrulate.
11. Ovary verrucose; inflorescence laxly few-flowered. Ecuador. Ae. drakeana

11. Ovary even.
12. Floral bracts with soft flat apices.
13. Floral bracts shorter than the enlarged ovary.
14. Scape-bracts elliptic, rose; leaf-blades unchanneled. Mexico, Central America, West Indies, Venezuela, Brazil..................................*Ae. nudicaulis*
14. Scape-bracts narrowly lanceolate or linear, green; leaf-blades with a strong narrow median channel.
15. Sepals nearly or quite free. Costa Rica...*Ae. tonduzii*
15. Sepals half-connate or more. Costa Rica, Colombia, Peru..................................*Ronnbergia spp.*
13. Floral bracts much exceeding the ovaries of the lower flowers.
16. Scape-bracts green, rather firm. Colombia. *Ronnbergia spp.*
16. Scape-bracts thin and scarious, often deciduous.
17. Petals blue; floral bracts quickly deciduous; flowers 20 mm long (cf. Subgenus *Ortgiesia*). Brazil. (*Ae. cylindrata*)
17. Petals yellow; floral bracts persistent.
18. Floral bracts subnavicular and enfolding the base of the ovary; mucro about half as long as the calyx-lobe; flowers 20 mm long. Brazil.........*Ae. comata*
18. Floral bracts very narrow; mucro almost as long as the calyx-lobe; flowers 17 mm long. Brazil, Argentina. *Ae. calyculata*
12. Floral bracts with spinose or pungent apices.
19. Floral bracts thin, strongly nerved.
20. Flowers finally becoming reflexed; floral bracts suborbicular; leaves spinose-acuminate; sepals 14 mm long, their mucros 3 mm long. Brazil..........*Ae. squarrosa*
20. Flowers never more than spreading.
21. Floral bracts emarginate; inflorescence with a conspicuous coma of sterile bracts; sepals 9 mm long, their mucros minute. Brazil.................*Ae. alopecurus*
21. Floral bracts acute to acuminate.
22. Leaf-blades narrowly elliptic, subpetiolate; mucro of the sepals 4 mm long. Colombia.....*Ae. subpetiolata*
22. Leaf-blades ligulate, not narrowed toward the base. Brazil.
23. Scape-bracts subcoriaceous, persistent, ample, very densely imbricate and wholly concealing the scape; leaves acute or acuminate; petals blue toward apex; flowers 20-25 mm long; sepals 8-10 mm long, lanate at base...........................*Ae. vanhoutteana*
23. Scape-bracts membranaceous, soon disintegrating, the lower ones remote; leaves rounded and apiculate. *Ae. kleinii*
19. Floral bracts thick, coriaceous or woody. Brazil.
24. Sepals connate; scapebracts divergent, acuminate into a stout subulus................................*Ae. ornata*
24. Sepals free.

25. Sepals to 5 mm long, the mucro to 1 mm long.
26. Leaf-blades ligulate; petals yellow, 8.5 mm long. Ae. pineliana
26. Leaf-blades lanceolate; petals white, 6.5 mm long. Ae. roberto-seidelii
25. Sepals 8-9 mm long.
27. Axis of the inflorescence lanate; floral bracts slightly thickened toward apex; mucro of the sepals minute..............................Ae. alopecurus
27. Axis of the inflorescence appressed-lepidote; floral bracts much thickened toward apex; mucro of the sepal large...........................Ae. triticina

Subgenus 7. MACROCHORDION

1. Scape-bracts erect, equally distributed. Brazil.
2. Floral bracts subcoriaceous, scarcely nerved. Quesnelia edmundoi
2. Floral bracts thin, nerved, about equaling the sepals or longer.
3. Floral bracts subligulate, broadly acute to truncate. Quesnelia spp.
3. Floral bracts ovate or lanceolate, acute or acuminate.
4. Sepals acute.
5. Sepals ca. 18 mm long.................Quesnelia imbricata
5. Sepals 8 mm long.
6. Lateral wing narrower than body of sepal......Ae. nervata
6. Lateral wing broader than body of sepal..Ae. turbinocalyx
4. Sepals obtuse............................Quesnelia spp.
1. Scape-bracts massed beneath the inflorescence; floral bracts at least subcoriaceous, not nerved.
7. Leaves, or at least the outer ones, petiolate, channeled, minutely serrulate; sepals free, 8 mm long; petals white. Brazil.........................................Ae. alba
7. Leaves not at all petiolate; sepals connate.
8. Leaf-blades minutely and subdensely serrulate, linear, 4-9 dm long, 2-4 cm wide; inflorescence sparsely lanate to appressed-lepidote; floral bracts acute; sepals 11 mm long, half connate; petals yellow at anthesis. Brazil. Ae. lamarchei
8. Leaf-blades laxly serrate with spines 1-7 mm long, ligulate to narrowly triangular.
9. Petals lavender to purple at anthesis; leaf-blades all narrowly triangular; sepals 6 mm long, connate for 2 mm. Brazil..................................Ae. triangularis
9. Petals yellow at anthesis; leaf-blades ligulate or rarely the out ermost narrowly triangular.
10. Floral bracts truncate; sepals 8 mm long, half connate; inflorescence white-lanate. Guatemala and British Honduras to Paraguay and Argentina....Ae. bromeliifolia
10..Floral bracts acute or apiculate. Brazil.

...............................................................

11. Leaves and scape-bracts spotted with red; sepals 8 mm long, about half connate; petals appendaged near the middle; inflorescence flocculose..........*Ae. maculata*
11. Leaves and scape-bracts concolorous; sepals 12 mm long, connate for 2 mm; petals appendaged at base; inflorescence appressed-lepidote.............*Ae. chlorophylla*

Subgenus 8. PURPUROSPADIX

1. Floral bracts serrulate.
 2. Sepals 13 mm long; scapes central; spikes cylindric, single.
  3. Floral bracts merely spreading, broadly acute. Panama, Colombia..................................*Ae. germinyana*
  3. Floral bracts spreading-recurving toward apex, acuminate. Costa Rica to Peru............................*Ae. veitchii*
 2. Sepals 15-38 mm long.
  4. Sepals about half connate, 15 mm long; leaves petiolate; scapes lateral from below the rosette; inflorescence simple.
   5. Sepals entire. French Guiana............*Ae. basi-lateralis*
   5. Sepals serrulate. Brazil.................*Ae. calatheoides*
  4. Sepals short-connate or free, 17-38 mm long.
   6. Scape-bracts scarcely or not imbricate, smaller than the floral bracts; scapes lateral. Suriname....*Ae. lateralis*
   6. Scape-bracts densely imbricate and large or the scape lacking.
    7. Sepals 25-38 mm long. Mexico to Amazon Basin.
     8. Leaves and bracts sparsely pale-lepidote to glabrous.
      9. Scape elongate; spikes globose, usually several in a digitate inflorescence. Mexico to Venezuela and Ecuador................................*Ae. magdalenae*
      9. Scape short or none; spike flattened-globose, solitary. Guyana Brazil...........................*Ae. fernandae*
     8. Leaves and bracts densely ferruginous-lepidote.
      10. Floral bracts spreading, 5 cm long; sepals 25 mm long. Colombia, Brazil.....................*Ae. rubiginosa*
      10. Floral bracts reflexed toward apex, 7 cm long; sepals 36 mm long. Ecuador.................*Ae. strobilacea*
    7. Sepals 17-20 mm long, Eastern Brazil.
     11. Inflorescence globose to cylindric; scape elongate. *Ae. multiflora*
     11. Inflorescence depressed-globose.
      12. Scape-bracts and floral bracts red, drying to dark castaneous; floral bracts coarsely serrate, flat toward base.............................*Ae. depressa*
      12. Scape-bracts and floral bracts always green; floral bracts serrulate, their bases enfolding the flowers.
       13. Ovules caudate.............................*Ae. saxicola*
       13. Ovules obtuse..............................*Ae. hostilis*
1. Floral bracts entire.
 14. Floral bracts flat, dark castaneous when dry. Brazil. *Ae. conifera*

.14..Floral bracts navicular, enfolding at least the base of the flower.
15. Sepals and floral bracts wholly covered with a white wooly indument; inflorescence cylindric, 6 cm in diameter; sepals 10 mm long. Brazil..................Ae. perforata
15. Sepals and floral bracts clearly visible.
16. Apices of the floral bracts broadly acute to acuminate, not truly mucronate.
17. Scape-bracts serrate; floral bracts and sepals punctulate lepidote. Brazil...................Ae. sphaerocephala
17. Scape-bracts entire.
18. Floral bracts and sepals completely covered with appressed white scales; leaf-blades ligulate. Brazil. Ae. leucolepis
18. Floral bracts and sepals glabrous; leaf-blades narrowly triangular. Venezuela....................Ae. pallida
16. Apices of the floral bracts mucronate with terete spines. Brazil.
19. Sepals 26 mm long; floral bracts acuminate into an 8-12 mm mucro; inflorescence green.............Ae. muricata
19. Sepals not over 17 mm long.
20. Floral bracts and sepals covered with white appressed scales; sepal-mucro large, stout..........Ae. cariocae
20. Floral bracts brown-lepidote; sepals glabrous, the delicate mucro 0.5 mm long...............Ae. castanea

Supplement to Key
Subgenus 5. PLATYAECHMEA

3a. Scape erect; inflorescence many-branched; spikes many-flowered....................................Ae. fasciata
3a, Scape decurved; inflorescence few-branched; spikes 1-3-flowered.................................Ae. wittmackiana

AECHMEA
Relative to Mez in Engler, Pflanzenreich IV. Fam. 32. 1934.
(Synonymy in separate list following)

ABBREVIATA L. B. Smith, Phytologia 6: 434. 1959.
ACICULOSA Mez & Sodiro; Pflr. 156.
ALBA Mez; Pflr. 168.
ALLENII L. B. Smith, Ann. Missouri Bot. Gard. 28: 411. 1941.
ALOPECURUS Mez; Pflr. 163.
AMPLA L. B. Smith, sp. nov. Ae. paniculata R. & P. atque Ae. huebneri Harms affinis, a priore axibus lanatis, petalis minoribus, a posteriore inflorescentia ampla, a ambobus foliorum spinis parvis distinguenda.

PLANT flowering 1.3 m high. LEAVES ca. 50 cm long, covered with pale appressed scales; sheaths elliptic, ample, merging with the blades and somewhat longer, dark castaneous basally; blades ligulate, broadly subacute, ca. 7 cm wide, the spines sublax, triangular, spreading, 2 mm long. - SCAPE erect, 1 cm in diameter, pale-lanate; scape-bracts erect, imbricate and enfolding the scape, elliptic, entire, subchartaceous, pale-lanate. INFLORESCENCE erect, laxly pyramidal, ca. 70 cm long, amply tripinnate, pale-lanate; primary bracts like the upper scape-bracts, longer or shorter than the naked sterile bases of the branches; primary branches spreading, to 30 cm long; secondary bracts linear, shorter than the spikes; spikes spreading, 2-3 cm long, laxly and distichously few-flowered; rhachis nearly straight, angled, sulcate. FLORAL BRACTS suborbicular with the margins free from the rhachis, completely surrounding the base of the flower, 5 mm long without the 2 mm slender mucro, about equaling the ovary; flowers divergent, sessile. SEPALS strongly asymmetric with the right wing extending above the apex, 11 mm long, short-connate, unarmed; petals imperfectly known, over 18 mm long, bearing 2 lacerate scales at base. Pl. II, fig. 5: Spike; fig. 6: Floral bract; fig. 7: Sepal.

BRAZIL: BAHIA: Canavieiras, restinga, 29 January 1965, Lanna 742 & Castellanos 25491 (Centro Pesq. Fl. & Conserv. Nat. - Rio de Janeiro, type; photo US).

ANGUSTIFOLIA Poepp. & Endl.; Pflr. 132.

ANOMALA L. B. Smith, Caldasia 3: [237]. 1945.

APOCALYPTICA Reitz, Sellowia 14: 99. 1962.

AQUILEGA (Salisb.) Griseb.; Pflr. 108 sub Gravisia. Cf. Phytologia 19: 281. 1970.

Var. AQUILEGA. Floral and secondary bracts green. Costa Rica Venezuela, Trinidad, Tobago, the Guianas, Brazil.

Var. CHRYSOCOMA (Baker) L. B. Smith, Phytologia 19: 281. 1970. Floral and secondary bracts bright yellow. Brazil.

ARANEOSA L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 53. 1941.

ARIPENSIS (N. E. Brown) Pittendrigh, Journ. Washington Acad. Sci. 48: 316. 1958. Pflr. 109 sub Gravisia.

AZUREA L. B. Smith, Arquiv. Jard. Bot. Rio de Janeiro 10: [141]. 1950.

BAHIANA L. B. Smith, Phytologia 13: 458. 1966.

BAMBUSOIDES Smith & Reitz, Bromel. Soc. Bull. 14: 32. 1964.

BASI-LATERALIS (Lem.) L. B. Smith, Phytologia 7: 109. 1960. Pflr. 38 sub Disteganthus.

BICOLOR L. B. Smith, Smithsonian Misc. Coll. 126: 12, 213. 1955.

BLANCHETIANA (Baker) L. B. Smith, Smithsonian Misc. Coll. 126: 13, 205. 1955. Pflr. 133. sub Aechmea remotiflora Mez.

BLUMENAVII Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 21. 1952.

BRACHYCAULIS Baker; Pflr. 124.

BRACHYCLADA Baker; Pflr. 142.

BRACTEATA (Sw.) Griseb.; Pflr. 139 but with "Mez" as combining author.

Var. BRACTEATA. Primary bracts completely lacking in the apical part of the inflorescence; young fruit lepidote. Mexico to Colombia.

Var. PACIFICA Beutelspacher, Cact. Sucul. Mex. 16: 44. 1971.

Primary bracts developed throughout the inflorescence; young fruit glabrous. Mexico

BRASSICOIDES Baker; Pflr. 108 sub Gravisia.

BREVICOLLIS L. B. Smith, Contr. Gray Herb. 154: 32. 1945.

BROMELIIFOLIA (Rudge) Baker: Pflr. 165.

Var. BROMELIIFOLIA. Leaf-blades green. Guatemala to Argentina.

Var. RUBRA M. B. Foster, Bromel. Soc. Bull. 12: 34. 1962. Leaf-blades reddish. Brazil.

CAESIA E. Morr. ex Baker; Pflr. 151.

CALATHEOIDES L. B. Smith, Phytologia 13: 147. 1966.

CALYCULATA (E. Morr.) Baker; Pflr. 159.

CAMPANULATA L. B. Smith, Mem. New York Bot. Gard. 9: 316. 1957

CANDIDA E. Morr. ex Baker; Pflr. 127.

CARIOCAE L. B. Smith, Smithsonian Misc. Coll. 126: 13, 228. 1955. Pflr. 97 sub Chevalieria comata Mez.

CASTANEA L. B. Smith, Smithsonian Misc. Coll. 126: 13, 228. 1955.

CASTELNAVII Baker; Pflr. 137.

CAUDATA Lindm.; Pflr. 126. Brazil.

Var. CAUDATA. Leaf-blades wholly green; live petal-blades yellow turning purplish with age.

Var. VARIEGATA M. B. Foster, Bromel. Soc. Bull. 3: 47. 1953. Leaf-blades with broad white longitudinal stripes.

Var. EIPPERI Reitz, Sellowia 17: 41. 1965. Petal-blades blue at anthesis. This character would seem to contradict one of the chief specific characters.

CHANTINII (Carr.) Baker; Pflr. 137.

CHLOROPHYLLA L. B. Smith, Smithsonian Misc. Coll. 126: 14, 227 1955.

COELESTIS (K. Koch) E. Morr.; Pflr. 126.

COMATA (Gaud.) Baker; Pflr. 160. Brazil.

Var. COMATA. Leaf-blades concolorous.

Var. MAKOYANA (Mez) L. B. Smith, Smithsonian Misc. Coll. 126: 14, 221. 1955. Pflr. 159 sub Aechmea lindenii Baker. Leaf-blades yellow-striped.

CONIFERA L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 53. 1941.

CONTRACTA (Mart. ex Schult. f.) Baker; Pflr. 160.

CORALLINA (Beer) Brongn. ex Baker; Pflr. 123.

CORYMBOSA (Mart. ex Schult. f.) Mez; Pflr. 125.

COSTANTINII (Mez) L. B. Smith, Phytologia 19: 281. 1970. Pflr 111 sub Gravisia.

CYLINDRATA Lindm.; Pflr. 158.

CYMOSO-PANICULATA Baker; Pflr. 134.

DACTYLINA Baker; Pflr. 147.

DEALBATA E. Morr. ex Baker; Pflr. 152.

DEPRESSA L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 54. 1941.

DICHLAMYDEA Baker; Pflr. 146.

Var. DICHLAMYDEA. Stipes equaling or exceeding the primary bracts; primary bracts narrow, thin. Lesser Antilles.

Var. PARIAENSIS Pittendrigh in L. B. Smith, Phytologia 18: 137. 1969. Primary bracts ample, firm. Venezuela.

Var. TRINITENSIS L. B. Smith, Contr. Gray Herb. 102: 145, 185. 1933. Stipes shorter than the primary bracts, stout. St. Vincent, Trinidad.

DISTICHANTHA Lem.; Pflr. 149.

Var. DISTICHANTHA. Inflorescence lax or sublax with spikes more or less spreading; leaf-blades mostly acute or attenuate, evenly convex.

Forma DISTICHANTHA. Petals purple or blue. Brazil, Bolivia, Paraguay, Argentina, Uruguay.

Forma ALBIFLORA L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 102. 1943. Petals white. Brazil.

Var. CANALICULATA M. B. Foster, Bromel. Soc. Bull. 12: 4. 1962 Leaf-blades with a narrow median channel. Brazil.

Var. SCHLUMBERGERI E. Morr. ex Mez; Pflr. 149. Inflorescence dense, elongate; leaves usually attenuate. Brazil, Bolivia, Paraguay, Argentina.

Var. GLAZIOVII (Baker) L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 102. 1943. Pflr. 148 sub Aechmea glaziovii Baker. Inflorescence dense, short, ovoid; leaves usually rounded and apiculate. Brazil.

DOWNSIANA Pittendrigh, Journ. Washington Acad. Sci. 48: 315. 1958.

DRAKEANA André; Pflr. 157.

EGGERSII Mez; Pflr. 142.

EGLERIANA L. B. Smith, Bol. Mus. Paraense Emilio Goeldi II. 1: 2. 1958.

Var. EGLERIANA. Plant 40 cm high; leaves 50 cm long; inflorescence 9-21 cm long. Brazil.

Var. MAJOR L. B. Smith, Mem. New York Bot. Gard. 10, no. 5: 40. 1964. Plant over 60 cm high; leaves to 110 cm long; inflorescence ample, 37 cm long. Brazil, Venezuela.

EURYCORYMBUS Harms, Notizblatt 12: 528. 1935.

FARINOSA (Regel) L. B. Smith, Phytologia 13: 148. 1966. Pflr. 125 sub Aechmea glomerata (Beer) Mez var. farinosa (Regel) Mez. Brazil.

Var. FARINOSA. Leaf-blades green with a farinose coat on both sides.

Var. CONGLOMERATA (Baker) L. B. Smith, Phytologia 13: 148. 1966. Leaf-blades farinose beneath, glabrous above, wholly green

Var. DISCOLOR (Beer ex Baker) L. B. Smith, Phytologia 13: 148. 1966. Leaf-blades claret-brown beneath.

FASCIATA (Lindl.) Baker; Pflr. 152. Brazil.

Var. FASCIATA. Leaves green.

Var. PURPUREA (Guillon) Mez; Pflr. 152. Leaves red-purple.

FENDLERI André; Pflr. 134.

FERNANDAE (E. Morr.) Baker; Pflr. 170.

FERRUGINEA L. B. Smith, Contr. Gray Herb. 98: 5. 1932.

FILICAULIS (Griseb.) Mez; Pflr. 134.

FOSTERIANA L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 54. 1941.

FRASERI Baker; Pflr. 157.
FRAUDULOSA Mez; Pflr. 636.
FULGENS Brongn.; Pflr. 123. Brazil.
Var. FULGENS. Leaves green.
Var. DISCOLOR (C. Morr.) Brongn.; Pflr. 123. Leaves red-purple beneath.
GALEOTTEI Baker; Pflr. 121.
GAMOSEPALA Wittm.; Pflr. 128. Brazil.
Var. GAMOSEPALA. Sepals red; petals purple or blue.
Var. NIVEA Reitz, Sellowia 14: 101. 1962. Sepals rose; petals white.
GERMINYANA (Carr.) Baker; Pflr. 168.
GIGANTEA Baker; Pflr. 138.
GRACILIS Lindm.; Pflr. 127.
GUARATUBENSIS E. Pereira, ined. Oct. 1972. Keyed from manuscript by permission of author.
HOPPII (Harms) L. B. Smith, Phytologia 4: 213. 1953.
HOSTILIS E. Pereira, ined. Oct. 1972. Keyed from manuscript by permission of author.
HUEBNERI Harms, Pflr. 131.
IGUANA Wittm.; Pflr. 135.
INVOLUCRATA André; Pflr. 157.
KERTESZIAE Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 24. 1952.
KLEINII Reitz, Anais Bot. Herb. Barbosa Rodrigues 5: 254. 1954
KUNTZEANA Mez; Pflr. 128.
LAMARCHEI Mez; Pflr. 165.
LANJOUWII (L. B. Smith) L. B. Smith, Phytologia 19: 281. 1970.
LASSERI L. B. Smith, Bromel. Soc. Bull. 3: 43. 1953.
LATERALIS L. B. Smith, Contr. U. S. Nat. Herb. 29: 525. 1954.
LEUCOCARPA André; Pflr. 143.
LEUCOLEPIS L. B. Smith, Smithsonian Misc. Coll. 126: 14, 228. 1955.
LINGULATA (L.) Baker; Pflr. 87 sub Wittmackia.
Var. LINGULATA. Branches spreading and curved-ascending; subulate apex of the floral bracts much longer than the inconspicuous base. Lesser Antilles, Trinidad, the Guianas, Venezuela, Brazil.
Var. PATENTISSIMA (Mart. ex Schult. f.) L. B. Smith, Smithsonian Misc. Coll. 126: 15, 208. 1955. Branches straight, spreading to reflexed; floral bracts with broadly ovate base about as long as the subulate apex; sepals about 2 mm long without the mucro. Brazil.
Var. FROESII L. B. Smith, Smithsonian Misc. Coll. 126: 15, 208 1955. Floral bracts with a relatively short mucro; sepals 7 mm long without the mucro. Brazil.
LONGICUSPIS Baker; Pflr. 128.
LUEDDEMANNIANA (K. Koch) Brongn.; Pflr. 120.
MACROCHLAMYS L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 54. 1941.
MACULATA L. B. Smith, Smithsonian Misc. Coll. 126: 15, 227. 1955.

MAGDALENAE (André) André ex Baker; Pflr. 169.

Var. MAGDALENAE. Leaf-blades wholly green. Mexico to Venezuela and Ecuador.

Var. QUADRICOLOR M. B. Foster, Bromel. Soc. Bull. 16: 27. 1966 Leaf-blades variegated with longitudinal stripes of green, white and yellow blending down into red. Mexico.

MARIAE-REGINAE H. Wendl.; Pflr. 156.

MATUDAE L. B. Smith, Contr. U. S. Nat. Herb. 29: 430. 1951.

MCVAUGHII L. B. Smith, Phytologia 10: 481. 1964.

MEGALANTHA Harms, Gartenflora 86: 159. 1937.

MELINONII Hook.; Pflr. 138.

MERTENSII (Meyer) Schult. f.; Pflr. 130.

MEXICANA Baker; Pflr. 119.

MINIATA (Beer) hort. ex Baker; Pflr. 124. Brazil.

Var. MINIATA. Leaves green.

Var. DISCOLOR (Beer) Beer ex Baker; Pflr. 124. Leaves purple-brown beneath.

MOLLIS L. B. Smith, Phytologia 20: 178. 1970.

MULFORDII L. B. Smith, Phytologia 19: 281. 1970.

MULTIFLORA L. B. Smith, Contr. Gray Herb. 117: 4. 1937.

MURICATA (Arr. Cam.) L. B. Smith, Phytologia 8: 12. 1961. Pflr. 97 sub _Chevalieria_ _stephanophora_. Considered by Erdtman to be distinct from _Aechmea_ in pollen type (letter), which would require erection of new genus as type species of _Chevalieria_ is an _Aechmea_.

MUTICA L. B. Smith, Smithsonian Misc. Coll. 126: 16, 205. 1955

NALLYI L. B. Smith, Bromel. Soc. Bull. 13: 124. 1964.

NERVATA L. B. Smith, Smithsonian Misc. Coll. 126: 17, 224. 1955.

NIDULARIOIDES L. B. Smith, Phytologia 4: 356. 1953.

NIVEA L. B. Smith, Caldasia [1], no. 4: 13. 1942.

NUDICAULIS (L.) Griseb.; Pflr. 160.

Var. NUDICAULIS. Leaf-blades wholly green; inflorescence lax; floral bracts reniform and inconspicuous or lacking. Mexico, Central America, West Indies, Venezuela.

Var. CUSPIDATA Baker; Pflr. 161 sub var. _sulcata_ (Lindm.) Mez. Floral bracts subtriangular or ovate, conspicuous; inflorescence lax; flowers wholly yellow. Brazil.

Var. AUREO-ROSEA (Ant.) L. B. Smith, Smithsonian Misc. Coll. 126: 17, 220. 1955. Flowers apically red. Brazil.

Var. CAPITATA Reitz, Sellowia 17: 42. 1965. Inflorescence dense, subcapitate; leaf-blades white-banded. Brazil.

Var. PLURIFOLIA E. Pereira, Bradea 1: 161. 1972. Leaves many in an obconical rosette, red-spotted at apex. Brazil.

ORGANENSIS Wawra; Pflr. 127.

ORLANDIANA L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 55. 1941.

ORNATA (Gaud.) Baker; Pflr. 164 sub _Ae_. _hystrix_ E. Morr. Brazil.

Var. ORNATA. Leaves concolorous; inflorescence to 4 cm thick without the petals; flowers stout; petals usually pale red or rose.

Var. HOEHNEANA L. B. Smith, Smithsonian Misc. Coll. 126: 17, 224. 1955. Inflorescence about 3 cm thick without the petals; flowers slender; petals blue.

Var. NATIONALIS Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 30. 1952. Leaves longitudinally green- and yellow-striped.

PALLIDA L. B. Smith, Mem. New York Bot. Gard. 10, no. 5: 40. 1964.

PANICULATA R. & P.; Pflr. 129.

PANICULIGERA (Sw.) Griseb.; Pflr. 135.

PECTINATA Baker; Pflr. 155.

PENDULIFLORA André; Pflr. 143.

PERFORATA L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 55. 1941.

PHANEROPHLEBIA Baker; Pflr. 129.

PIMENTI-VELOSOI Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 26. 1952. Brazil.

Var. PIMENTI-VELOSOI. Ovary white-tomentulose.

Var. GLABRA Reitz, Anais Bot. Herb. Barbosa Rodrigues 5: 256. 1953. Ovary glabrous, red.

PINELIANA (Brongn. ex Planch.) Baker; Pflr. 164.

Var. PINELIANA. Leaf-blades to 6 cm wide; inflorescence to 7 cm long and 3 cm thick.

Var. MINUTA M. B. Foster, Bromel. Soc. Bull. 11: 96. 1961. About half as large as the typical variety.

PITCAIRNIOIDES Mez; Pflr. 155.

PITTIERI Mez; Pflr. 139.

PODANTHA L. B. Smith, Smithsonian Misc. Coll. 126: 18, 203. 1955.

POLITII L. B. Smith, Mem. New York Bot. Gard. 9: 318. 1957.

PRANCEI L. B. Smith, sp. nov. A Ae. longicuspe Baker, cui valde affinis, bracteis florigeris magnis sepala fere omnino occultantibus differt.

PLANT flowering over 1 m high. LEAVES ca. 1 m long; sheaths suboblong, 30 cm long, dark castaneous, densely brown-lepidote; blades ligulate, acuminate into a stout dark terminal cusp, laxly serrate with stout dark antrorse 5 mm long spines, glabrous. SCAPE erect, 1 cm in diameter, densely white-lanate; scape-bracts lanceolate, attenuate to a dark stout cusp, 30 cm long, entire, subcoriaceous, rose, densely white-tomentulose. INFLORESCENCE bipinnate, densely cylindric, 30 mm long, 7 cm in diameter, densely white-tomentulose on axes and bracts; primary bracts narrowly lanceolate, attenuate, to 25 mm long including the slender terminal spine; branches very short with the basal flower developed and the 1 or 2 others much reduced. FLORAL BRACTS forming a tube that encloses all but the tips of the sepals, thin-coriaceous, bearing a dark slender terminal 15 mm long spine. SEPALS strongly asymmetric, subelliptic, obtuse, unarmed, 18 mm long, glabrous; petals and fruit green (! Prance). Pl. II, fig. 8: Floral bract and flower; fig. 9: Sepal.

BRAZIL: ACRE: epiphytic in forest on terra firme, vicinity of km 7, road Sena Madureira to Rio Branco, 30 September 1968, Prance, Coelho, Ramos & Farias 7681 (US, type; NY).

PRAVA E. Pereira, ined. Oct. 1972. Keyed from manuscript by permission of author.

PUBESCENS Baker; Pflr. 141.

PURPUREO-ROSEA (Hook.) Wawra; Pflr. 125.

PYRAMIDALIS Benth.; Pflr. 140.

RACINAE L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 56. 1941. Brazil.

Var. RACINAE. Scape long, decurved; leaves obconic-rosulate, blades recurved, ligulate.

Var. TUBIFORME E. Pereira, Bradea 1: 161. 1972. Leaves cylindric-rosulate, blades erect, sublinear.

Var. ERECTA L. B. Smith, Arquiv. Jard. Bot. Rio de Janeiro 10: 142. 1950. Scape short, erect.

RAMOSA Mart. ex Schult. f.; Pflr. 129. Brazil.

Var. RAMOSA. Sepals and ovary green and yellow.

Var. FESTIVA L. B. Smith, Smithsonian Misc. Coll. 126: 18, 210. 1955. Sepals red; ovary white.

RECURVATA (Kl.) L. B. Smith; Pflr. 153. Brazil.

Var. RECURVATA. Inflorescence completely exserted above the leaf-sheaths; floral bracts serrate.

Var. ORTGIESII (Baker) Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 29. 1952. Pflr. 154 sub Aechmea ortgiesii Baker. Inflorescence almost or wholly included by the leaf-sheaths; floral bracts serrate.

Var. BENRATHII (Mez) Reitz, Anais Bot. Herb. Barbosa Rodrigues 4: 30. 1952. Pflr. 153 sub Aechmea benrathii Mez. Leaves and bracts entire or nearly so.

RETUSA L. B. Smith, Phytologia 10: 484. 1964.

ROBERTO-SEIDELII E. Pereira, Bradea 1: 159. 1972.

RODRIGUESIANA (L. B. Smith) L. B. Smith, Phytologia 19: 281. 1970.

ROMEROI L. B. Smith, Phytologia 5: 282. 1955.

RUBENS (L. B. Smith) L. B. Smith, Phytologia 19: 282. 1970.

RUBIGINOSA Mez; Pflr. 170.

SAXICOLA L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 2: 118. 1950.

SERRATA (L.) Mez; Pflr. 145.

SERVITENSIS André; Pflr. 141.

Var. SERVITENSIS. Scape-bracts and lower primary bracts broad, coarsely dentate.

Var. EXIGUA L. B. Smith, Phytologia 4: 358. 1953. Scape-bracts and lower primary bracts narrow, obscurely dentate.

SETIGERA Mart. ex Schult. f.; Pflr. 129.

SMITHIORUM Mez; Pflr. 147.

SPECTABILIS Brongn. ex Houllet; Pflr. 134.

SPHAEROCEPHALA (Gaud.) Baker; Pflr. 96 sub Chevalieria sphaerocephala Gaud.

SQUARROSA Baker; Pflr. 164.

STELLIGERA L. B. Smith, Smithsonian Misc. Coll. 126: 18, 207. 1955.

STENOSEPALA L. B. Smith, Bot. Mus. Leafl. Harvard 17: 76. 1955.

STROBILACEA L. B. Smith, Phytologia 6: 435. 1959.
SUBPETIOLATA L. B. Smith, Contr. Gray Herb. 124: 8. 1939.
TESSMANNII Harms; Pflr. 145.
TILLANDSIOIDES (Mart. ex Schult. f.) Baker; Pflr. 144.
Var. TILLANDSIOIDES. Inflorescence pinnate, usually much interrupted toward base. Colombia, Venezuela, Guiana, Brazil.
Var. KIENASTII (E. Morr. ex Mez) L. B. Smith, Caldasia [1], no. 5: [5]. 1942. Pflr. 144 sub Aechmea kienastii E. Morr. ex Mez. Inflorescence digitate or rarely simple. Mexico, Central America, Colombia, Venezuela.
TOCANTINA Baker; Pflr. 140.
TOMENTOSA Mez; Pflr. 138.
TONDUZII Mez & Pittier; Pflr. 162.
TRIANGULARIS L. B. Smith, Smithsonian Misc. Coll. 126: 19, 224. 1955.
TRITICINA Mez; Pflr. 162. Brazil.
Var. TRITICINA. Upper scape-bracts entire; floral bracts exceeded by the sepals.
Var. CAPENSIS L. B. Smith, Smithsonian Misc. Coll. 126: 19, 223. 1955. Upper scape-bracts serrulate; floral bracts overtopping the sepals.
TURBINOCALYX Mez; Pflr. 162.
VANHOUTTEANA (Van Houtte) Mez; Pflr. 162.
VEITCHII Baker; Pflr. 169.
VICTORIANA L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 57. 1941. Brazil.
Var. VICTORIANA. Leaves wholly green.
Var. DISCOLOR, M. B. Foster, Bromel. Soc. Bull. 5: 29. 1955. Leaves bronze-red beneath.
WARASII E. Pereira, Bradea 1: 160. 1972.
WEBERBAUERI Harms, Notizblatt 14: 330. 1939.
WEILBACHII Didr.; Pflr. 122. Brazil.
Var. WEILBACHII. Leaves green.
Var. LEODIENSIS André. Pflr. 122. Leaves tinged with purple.
WERDERMANNII Harms, Notizblatt 12: 529. 1935.
WITTMACKIANA (Regel) Mez; Pflr. 147.
WORONOWII Harms, Notizblatt 11: 60. 1930; Pflr. 137; emend L. B. Smith. Streptocalyx subnuda L. B. Smith, Bot. Mus. Leafl. Harvard 17: 73, fig. 1955. S. holmesii Slingerland, Brom. Soc. Bull. 14: 53 (color plate), 54. 1964. Nomen.
Inflorescentia bipinnata, ad 26 cm longa.
COLOMBIA: CAQUETA: woods, Hetucha, on Río Orteguaza, July 1926, Woronow & Juzepczuk 6158 (B, type, B photo 1192/28); epiphytic, Río Caucaya, between Puerto Jaramillo and Río Putumayo, alt. 225 m, 16 May 1942, Schultes 3719 (GH, type of Streptocalyx subnuda L. B. Smith). AMAZONAS: Loretoyacu River, Trapecio Amazónico, alt. 100 m, September 1946, Schultes & Black 8294 (US).
PERU: LORETO: woods by Mouth of Río Napo, J. Holmes & Lee Moore, cultivated January 1967, J. Marnier-Lapostolle 34 (US, clonotypic of Streptocalyx holmesii Slingerland).
Harms correctly placed Aechmea woronowii in Aechmea but

mistook the whole inflorescence for a single branch. I recognized the character of the inflorescence in describing the species as Streptocalyx subnuda, but placed it in the wrong genus because I failed to find appendages on the petals at that time.

ZEBRINA L. B. Smith, Phytologia 4: 358. 1953.

SYNONYMS AND EXCLUDED NAMES

amazonica Ule; Pflr. 145 - CHANTINII.
ampullacea Mez; Pflr. 153 - RECURVATA var. RECURVATA.
ampullacea var. longifolia Hassler; Pflr. 153 - RECURVATA var. RECURVATA.
andradei Gilmartin, Phytologia 16: 167. 1968 - LEUCOCARPA.
aureo-rosea (Ant.) Baker; Pflr. 161 - NUDICAULIS var. AUREO-ROSEA.
benrathii Mez; Pflr. 153 - RECURVATA var. BENRATHII.
bernoulliana Wittm.; Pflr. 120 - MEXICANA
boliviana Rusby; Pflr. 142 - ANGUSTIFOLIA
capixabae L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 56. 1941 - VICTORIANA var. VICTORIANA.
chromatica C. H. Wright; Pflr. 156 - PANICULIGERA.
cumingii Baker; Pflr. 143 - ANGUSTIFOLIA
cylindrica Mez; Pflr. 142 - ANGUSTIFOLIA
dryanderae Harms, Notizblatt 12: 529. 1935 - (inflorescence) ANGUSTIFOLIA, (leaf) PITCAIRNIA SP.
ellipsoidea Rusby; Pflr. 166 - BROMELIIFOLIA
eriostachya Ule; Pflr. 165 - BROMELIIFOLIA
friedrichsthalii Mez & Donn.-Smith; Pflr. 140 - PENDULIFLORA
glaziovii Baker; Pflr. 148 - DISTICHANTHA var. GLAZIOVII.
glomerata (Beer) Mez; Pflr. 124 - FARINOSA var. CONGLOMERATA.
glomerata var. discolor (Beer) Mez; Pflr. 125 - FARINOSA var. DISCOLOR.
glomerata var. farinosa (Regel) Mez; Pflr. 125 - FARINOSA var. FARINOSA.
hamata Mez; Pflr. 151 - FASCIATA.
humilis Mez; Pflr. 132 - MERTENSII.
hystrix E. Morr.; Pflr. 164 - ORNATA var. ORNATA.
inconspicua Harms; Pflr. 133 - ANGUSTIFOLIA
inermis Mez; Pflr. 143 - PENDULIFLORA
involucrifera Mez, Pflr. 157 - DISTICHANTHA var. SCHLUMBERGERI
jucunda E. Morr. ex Baker; Pflr. 148 - DISTICHANTHA var. GLAZIOVII.
kienastii E. Morr. ex Mez; Pflr. 144 - TILLANDSIOIDES var. KIENASTII.
lagenaria Mez; Pflr. 166 - LAMARCHEI.
lalindei Linden & Rodigas; Pflr. 156 - MARIAE-REGINAE.
latifolia (Willd.) Kl.; Pflr. 136 - PANICULIGERA.
lavandulacea C. H. Wright; Pflr. 146 - SMITHIORUM.
laxiflora Benth.; Pflr. 141 - BRACTEATA.

lindenii (E. Morr.) Baker; Pflr. 158 - COMATA var. COMATA.
macracantha Brongn.; Pflr. 139 - BRACTEATA.
marmorata (Lem.) Mez; Pflr. 122 - QUESNELIA MARMORATA (Lem.) R. W. Read.
mitis (Mart. ex Schult. f.) L. B. Smith, Smithsonian Misc. Coll. 126: 16, 205. 1955 - CORYMBOSA.
mucroniflora Hook.; Pflr. 131 - MERTENSII.
myriophylla E. Morr. ex Baker; Pflr. 150 - DISTICHANTHA var. DISTICHANTHA.
nudicaulis var. sulcata (Lindm.) Mez; Pflr. 161 - Var. CUSPIDATA.
ortgiesii Baker; Pflr. 154 - RECURVATA var. ORTGIESII.
platyphylla Hassler; Pflr. 150 - DISTICHANTHA var. DISTICHANTHA.
platzmannii Wittm.; Pflr. 125 - CAUDATA var. CAUDATA.
poeppigii Baker; Pflr. 89 - LINGULATA ?
polystachya (Vell.) Mez; Pflr. 149 - DISTICHANTHA var. DISTICHANTHA.
polystachya var. excavata (Baker) Mez; Pflr. 150 - DISTICHANTHA var. DISTICHANTHA.
polystachya var. longifolia Castellanos; Pflr. 150 - DISTICHANTHA var. SCHLUMBERGERI.
porteoides Britton; Pflr. 135 - FENDLERI.
pulchella E. Morr. ex Baker; Pflr. 148 - DISTICHANTHA var. GLAZIOVII.
pulchra (Beer) Mez; Pflr. 168 - BROMELIIFOLIA.
purpurea B. S. Williams, New & General Plant Catalogue Victoria & Paradise Nursuries, London 22. 1889 [According to Kew Index Suppl. 1: 12. 1902]; Kew Bull. 1890, Appendix 2: 37. 1890. Colombia - leaves only, identification probably impossible
purpurea-coerulea Mez; Pflr. 642 - error for PURPUREA-ROSEA.
remotiflora Mez; Pflr. 133 - BLANCHETIANA.
rubra Alv. Silv. Fl. Mont. 2, add.: 1. 1931. Pflr. 637 - DISTICHANTHA var. SCHLUMBERGERI ?
schultesiana Mez; Pflr. 133 - PENDULIFLORA.
selloana Baker; Pflr. 160 - CALYCULATA.
spicata Mart.; Pflr. 131 - MERTENSII.
sprucei Mez; Pflr. 137 - CASTELNAVII.
standleyi Cuf. Arch. Bot. Sist. Fitogeog. & Genet. 9: 182. 1933 - PUBESCENS ?
thyrsiflora (Willd.) Schlecht.; Pflr. 132 - MERTENSII.
tinctoria (Mart.) Mez; Pflr. 166 - BROMELIIFOLIA.
tricolor Alv. Silv. Fl. Mont. 2, add.: 2. 1931; Pflr. 637 - NUDICAULIS var. CUSPIDATA.

Chevalieria - AECHMEA

comata Mez; Pflr. 97 in part, not as to basionym - AECHMEA CARIOCAE.
ornata Gaud.; Pflr. 96 - AECHMEA ORNATA.
sphaerocephala Gaud.; Pflr. 96 - AECHMEA SPHAEROCEPHALA.
stephanophora (E. Morr. ex Baker) Mez; Pflr. 97 - AECHMEA

MURICATA.

thyrsigera (Speg.) Mez; Pflr. 95 - AECHMEA CALYCULATA [Castellanos !].

Disteganthus - AECHMEA

basi-lateralis Lem.; Pflr. 38 - AECHMEA BASI-LATERALIS.

Gravisia - AECHMEA

aquilega (Salisb.) Mez; Pflr. 108 - AECHMEA AQUILEGA.

aquilega var. chrysocoma (Baker) L. B. Smith, Phytologia 8: 219. 1962 - AECHMEA AQUILEGA var. CHRYSOCOMA.

aripensis N. E. Br.; Pflr. 109 - AECHMEA ARIPENSIS.

brassicoides (Baker) Mez; Pflr. 108 - AECHMEA BRASSICOIDES.

capitata (Schult. f.) L. B. Smith, Arquiv. Bot. Est. S. Paulo II. 1: 57. 1941 - AECHMEA CAPITATA (Schult. f.) Baker, Journ. Bot. 17: 167. 1879 (in key above, but overlooked in list of accepted species).

chrysocoma (Baker) Mez; Pflr. 109 - AECHMEA AQUILEGA var. CHRYSOCOMA.

costantinii Mez; Pflr. 111 - AECHMEA COSTANTINII.

exsudans (Lodd.) Mez; Pflr. 109 - AECHMEA AQUILEGA var. AQUILEGA.

fosteriana L. B. Smith, Phytologia 8: 218. 1962, non Aechmea fosteriana L. B. Smith 1941. - AECHMEA MULFORDII.

lanjouwii L. B. Smith, Act. Bot. Neerl. 5: 93. 1956 - AECHMEA LANJOUWII.

rodriguesiana L. B. Smith, Phytologia 13: 153. 1966 - AECHMEA RODRIGUESIANA.

rubens L. B. Smith, Phytologia 8: 218. 1962 - AECHMEA RUBENS.

Wittmackia - AECHMEA

glaziovii Mez; Pflr. 89 - AECHMEA LINGULATA var. LINGULATA.

lingulata (L.) Mez; Pflr. 87 - AECHMEA LINGULATA var. LINGULATA.

odora (Miq.) Mez; Pflr. 88 - AECHMEA LINGULATA var. LINGULATA.

patentissima (Mart.) Mez; Pflr. 89 - AECHMEA LINGULATA var. PATENTISSIMA.

poeppigii (Baker) Mez; Pflr. 89 - AECHMEA LINGULATA var. LINGULATA ?

MISCELLANEOUS NOTES

ENCHOLIRIUM PATENS L. B. Smith, sp. nov. A E. lutzii L. B. Smith, cui affinis, bracteis florigeris longe caudatis, pedicellis gracillimis , floribus viridibus differt.

PLANT flowering ca. 2 m high. LEAVES over 60 cm long; sheaths suborbicular, 6 cm wide; blades very narrowly triangular, 35 mm wide, covered with pale appressed scales, becoming more or less glabrous above, repand-serrate with broad flat antrorse teeth 5 mm long. SCAPE glabrous; scape-bracts erect, the lower subfoliaceous and much exceeding the scape, the upper entire, much reduced and several times shorter than the internodes. INFLORESCENCE glabrous, straight, appearing simple but the basal bracts resembling upper scape-bracts and subtending undeveloped branch buds, the terminal and developed portion laxly racemose, to 35 cm long; axis to 7 mm thick. FLORAL BRACTS long-caudate from a broadly ovate base, much shorter than the very slender spreading 10 mm long pedicels; only very immature flowers known. SEPALS broadly ovate, subtruncate, 5 mm long. Pl. V, fig. 1: Floral bract and young flower.

BRAZIL: BAHIA: cerrado on slopes of Espigão Mestre, ca. 8 km northwest of Barreiras, incomplete road to Santa Rita da Cassia, valley of the Rio das Ondas, alt. 600 m, 3 March 1971, Irwin, Harley & Smith 31443 (NY, type).

GREIGIA STENOLEPIS L. B. Smith, sp. nov. G. juarezianae L. B. Smith in systemate meo (Phytologia 20: 70. 1968) affinis sed foliorum laminis ubique serratis, bracteis sepalisque majoribus differt.

LEAVES rosulate (! Cuatrecasas), to 9 dm long; sheaths elliptic, 10 cm long, castaneous except the pale base, densely brown-lepidote, spinose-serrate at apex; blades linear, attenuate, slightly contracted toward base, to 33 mm wide in the middle, pale-lepidote on both sides, laxly serrate, the spines slender, spreading or antrorse, dark castaneous, the basal ones to 5 mm long. SCAPE to 5 cm long; upper scape-bracts triangular-ovate without distinction between base and blade, to 5 cm long, entire, thin, strongly nerved, centrally castaneous with pale margins. INFLORESCENCES compressed and probably lateral, ca. 10-flowered; primary bracts like the upper scape-bracts, about equaling the sepals at anthesis. FLORAL BRACTS linear, ca. 35 mm long, thin except for the thick-subulate apex, sparsely lepidote. SEPALS triangular-ovate, to 23 mm long, acute with a small slightly subterminal mucro, pale, strongly nerved; petals and stamens not seen; ovary ellipsoid, dark castaneous. Pl. V, fig. 2: Base of leaf; fig. 3: Scape and inflorescence; fig. 4: Sepal.

COLOMBIA: CUNDINAMARCA: Massif of Bogotá, eastern slope, drainage of Río Negro, knife crests between Fómeque and Laguna de Chingaza, between El Paval and Cuchillero, alt. 3050-3200 m, 7 February 1969, J. Cuatrecasas & T. R. Soderstrom 27308 (US, type)

GUZMANIA CUATRECASASII L. B. Smith, Phytologia 21: 85. 1971, emend.

SEPALIS lanceolatis, apice fractis ignotis, quam bracteis florigeris bene brevioribus, tenuibus, nervatis.

Due to faulty observation in the original description, terminal floral bracts were mistaken for sepals.

GUZMANIA CUZCOENSIS L. B. Smith, sp. nov. G. cuatrecasasii L. B. Smith in systemate meo (Phytologia 21: 73. 1971) affinis sed inflorescentia laxa longiore, spicis angustioribus differt.

PLANT 2 m high (! Dudley), described from only the upper scape and fruiting inflorescence. LEAVES rosulate, ca. 1 m long

(! Dudley), presumably with ligulate blades judging from the form of the scape-bracts. SCAPE 1 cm in diameter at apex; scape-bracts erect, imbricate, broadly ovate, the lower ones castaneous at base, the upper largely castaneous. INFLORESCENCE laxly bipinnate except at apex, 32 cm long, glabrous at least with age; axis stout, geniculate; primary bracts semiorbicular, apiculate, to 3 cm long, even, thin-coriaceous, castaneous; spikes spreading short-stipitate, ellipsoid but appearing nearly spherical with age due to the spreading fruit, strobilate, 60 mm long, 25 mm in diameter. FLORAL BRACTS broadly elliptic, obtusely cuspidate, 25 mm long, wholly covering the sepals, broadly convex and ecarinate even except the faintly nerved and possibly verrucose or lepidote apex; flowers subsessile. SEPALS lanceolate, obtuse, 17 mm long, short-connate, thin, nerved. Pl. V, fig. 7: Apex of inflorescence; fig. 8: Sepal.

PERU: CUZCO: LA CONVENCION: in very dense, always damp and dripping dark cloud forest at Camp 3, alt. 2150-2200 m, 23 July 1968, T. R. Dudley 11317 (NA, type).

HECHTIA CAERULEA (Matuda) L. B. Smith, comb. nov. Niveophyllum caeruleum Matuda, Cact. & Sucul. Mex. 10: 3, fig. 2-4. 1965. Hechtia integerrima M. B. Foster, Bromel. Soc. Bull. 18: 4, fig. 1968. Pl. V, fig. 5: Branch of inflorescence; fig. 6: Dissection of pistillate flower.

MEXICO: MEXICO: humid calcareous ravine of Santo Tomás de los Plátanos, south of Valle de Bravo, alt. 1200 m, 15 March 1960, Matuda 37440 (UNAM, type); idem, cultivated, University of California s. n. (US).

ORIGIN UNSPECIFIED: cultivated, Orlando, Florida, 1966, M. B. Foster 3072 (US, type of Hechtia integerrima M. B. Foster).

HOHENBERGIA VESTITA L. B. Smith, sp. nov. Ab omnibus speciebus inflorescentia angusta tripinnata lanuginosa, bracteis florigeris late acutis, sepalis inermibus differt.

PLANT flowering to 1.5 m high (! Irwin). LEAVES ca. 70 cm long, covered with pale appressed brown-centered scales; sheaths elliptic, 25 cm long, dark castaneous; blades ligulate, flat, 4-7 cm wide, attenuate at apex into a stout cusp, laxly serrate with flat dark spines 3-5 mm long. SCAPE straight, stout, pale-lanate; scape-bracts much exceeding the internodes but so narrow as to expose much of the scape, lance-ovate, attenuate to a slender cusp, covered with pale appressed scales, the upper entire. INFLORESCENCE subcylindric, 11-27 cm long, laxly tripinnate at base with spikes about 3 in each subsessile fascicle, densely bipinnate toward apex; p rimary bracts like the upper scape-bracts but much smaller, exceeding the lowest branches; spikes subcylindric, dense, to 5 cm long, densely pale-lanate. FLORAL BRACTS broadly ovate, broadly acute and mucronulate, to 12 mm long, about equaling the sepals, subcoriaceous, nerved, sublustrous, red when dry. SEPALS very short-connate, strongly asymmetric with a rounded wing extending well above the midnerve, 6.5 mm long, unarmed. Pl. V, fig. 9: Branch of inflorescence; fig. 10: Sepal.

BRAZIL: MINAS GERAIS: secondary forest on steep slopes, shallow lateritic clay at base of Serra da Piedade, ca. 35 km east of Belo Horizonte, road to Caete, alt. 1600 m, 13 January 1971, Irwin, Harley & Onishi 30287 (NY, type). BAHIA: extensive area of sandstone above the 100 m falls of the Rio Ferro Doido, ca. 18 km east of Morro do Chapéu (11° 32' S, 41° 10' W), Serra do Tombador, alt. 1100 m, 20 February 1971, Irwin, Harley & Smith 30693 (NY, US); on sandstone rocks, summit of Morro do Chapéu, 7 km south of Morro do Chapeu (town), alt. 1150 m, 16 February 1971, Irwin, Harley & Smith 32287 (NY, US).

NEOREGELIA HATSCHBACHII L. B. Smith, sp. nov. N. bahianae (Ule) L. B. Smith in systemate meo (Phytologia 15: 180. 1967) affinis sed foliis acutis, extus densissime lepidotis, sepalis minoribus differt.

PLANT propagating by stout scaly stolons. LEAVES about 10 in an ellipsoid rosette, reddish, concolorous, densely cinereous-lepidote on all exposed surfaces, the outer ones reduced to short ovate acute sheaths, the inner to 25 cm long; sheaths elliptic, 14 cm long, distinctly exceeding the blades; blades varying from (outer) triangular with a thick involute terminal cusp to ligulate, broadly acute and apiculate, 27 mm wide, laxly serrulate with spreading spines 0.5 mm long. SCAPE 7 cm long; scape-bracts imbricate, the upper ones short-involucrate about the inflorescence, elliptic, entire, membranaceous, subdensely brown-lepidote INFLORESCENCE simple, few-flowered. FLORAL BRACTS ovate, acute, about equaling the pedicels; pedicels slender, distinct, to 23 mm long. SEPALS slightly asymmetric, oblong, acute, 26 mm long, very short-connate, membranaceous, sparsely lepidote; petals acute, ca. 4 cm long, white with blue apices (! Hatschbach). Pl. V, fig. 11: Floral bract and flower; fig. 12: Sepal.

BRAZIL: MINAS GERAIS: Mun. Diamantina: rock outcrops, Guinda, alt. 1300 m, 14 November 1971, Hatschbach & Pelanda 27945 (US, type; Herb. Mus. Bot. Municipal, Curitiba, isotype).

Neoregelia hatschbachii would probably present further contrasts with N. bahiana if the outer leaves of the latter were known.

NEOREGELIA PASCOALIANA L. B. Smith, sp. nov. N. seideliana Smith & Reitz in systemate meo (Phytologia 15: 180. 1967) affinis sed foliorum laminis latioribus purpureo-maculatis, sepalis latioribus, petalis omnino albis differt.

LEAVES many in a broadly obconic rosette, to 46 cm long; sheaths broadly elliptic, 20 cm long, covered with appressed brown scales; blades broadly ligulate, broadly rounded and apiculate, 9 cm wide, finely purple-spotted with a large spot at apex, covered with appressed cinereous scales, laxly antrorse-serrate with flat dark spines 4 mm long. SCAPE 7 cm long; scape-bracts imbricate, the upper ones involucrate about the inflorescence, broadly ovate, broadly acute and apiculate, exceeding the ovaries entire, subchartaceous, subdensely brown-lepidote. INFLORESCENCE simple, many-flowered, 8 cm in diameter. FLORAL BRACTS oblong, acute, exceeding the ovaries, thin, tomentose-lepidote at apex; pedicels slender, distinct, to 25 mm long. SEPALS asymmetric, broadly sublanceolate, acute and minutely apiculate, 28 mm long, connate for 4 mm, green, brown-lepidote, the apical scales filamentous-lacerate; petals white (! Vinha). Pl. V, fig. 13: Floral bract and flower; fig. 14: Sepal.

BRAZIL: BAHIA: restinga, Parque Nacional de Monte Pascoal, (ca. 16° 55' S, 39° 40' W), 26 March 1968, S. G. da Vinha & Santos 168 (US, type; Herb. Centro Pesquizas do Cacau, Itabuna, isotype).

STREPTOCALYX BIFLORUS L. B. Smith, sp. nov. A *S. longifolio* (Rudge) Baker, cui affinis, foliorum laminis latioribus, floribus 2 fasciculatis, bracteis florigeris apice tomentoso-lepidotis differt.

PLANT known only from fragments. LEAVES over 50 cm long, laxly and obscurely appressed-lepidote; sheaths elliptic; blades linear, attenuate to a slender cusp, 30 mm wide, flat, sublaxly serrulate with broad spreading spines 2 mm long, deep red (! Dodson & Thien). SCAPE little known, probably short. INFLORESCENCE subcapitate, densely bipinnate, 9 cm long; primary bracts ovate, acute, 7 cm long, glabrous, yellow (! Dodson & Thien), densely dark-serrulate; spikes 2-flowered fascicles. FLORAL BRACTS obovate, conduplicate, much exceeding the ovary, serrulate near apex but this concealed by dense linear ferruginous scales. SEPALS slightly asymmetric, spatulate, mucronate, 15 mm long, the apex very finely serrulate; petals 35 mm long, naked pink (! Dodson & Thien); stamens included; ovary obconic; placentae subapical; ovules obtuse. Pl. V, fig. 15: Primary bract and branch; fig. 16: Sepal.

ECUADOR: PASTAZA: tropical rainforest, Topo, along Río Topo, alt. 1300 m, 11 January 1962, Dodson & Thien 2070 (WIS, type; photo US).

Pl. I

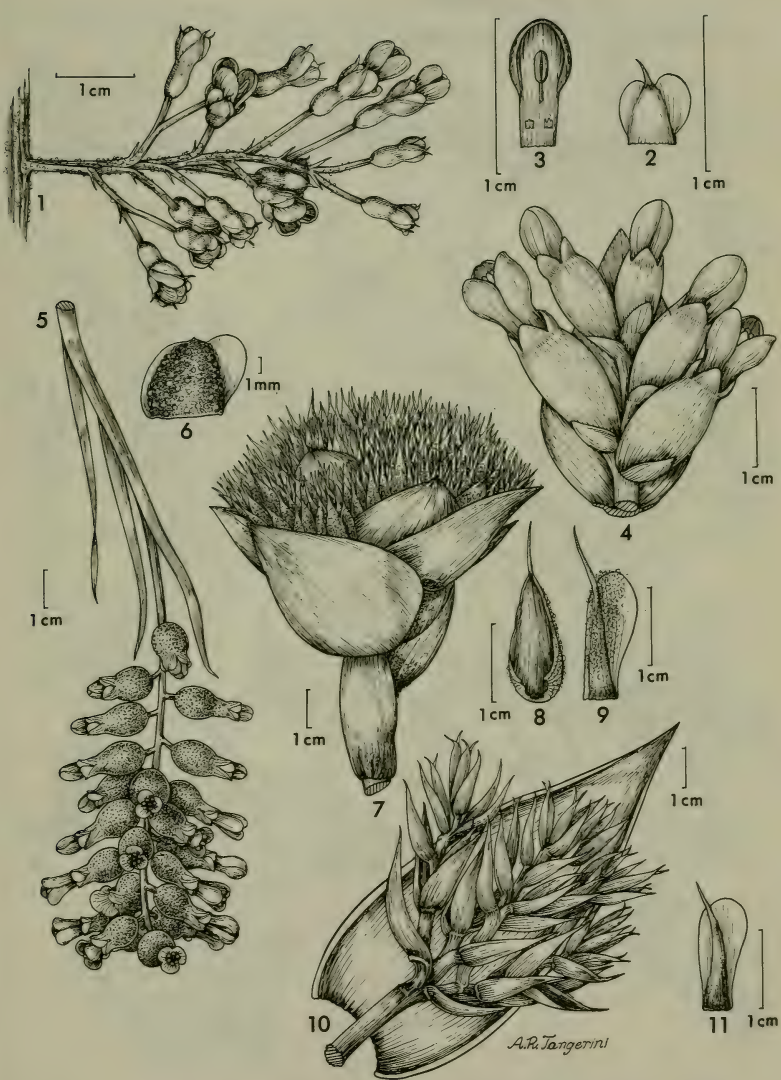



Fig. 1-3: Aechmea lueddemanniana. 4: Ae. weilbachii.
5, 6: Ae. racinae. 7-9: Ae. aripensis.
10, 11: Ae. gigantea.

Pl. II

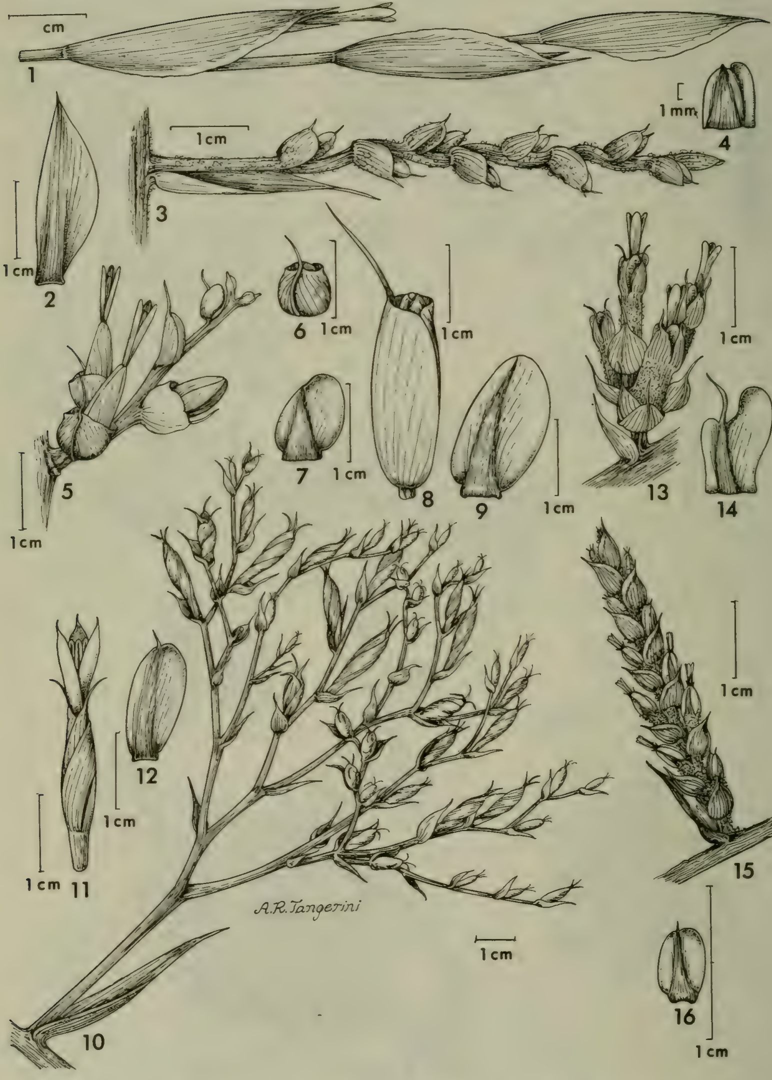



Fig. 1, 2: Aechmea blanchetiana. 3, 4: Ae. pittieri. 5-7: Ae. ampla. 8, 9: Ae. prancei. 10-12: Ae. eurycorymbus. 13, 14: Ae. phanerophlebia. 15, 16: Ae. pyramidalis.

Pl. III

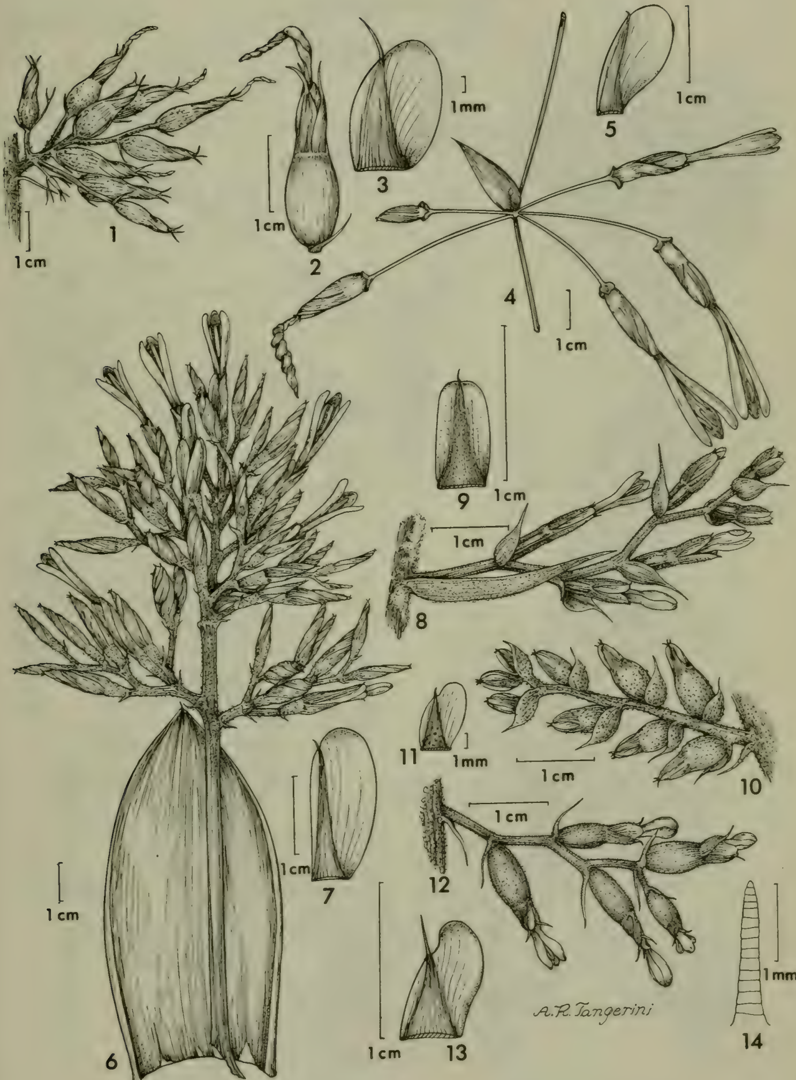



Fig. 1-3: Aechmea fendleri. 4, 5: Ae. filicaulis. 6, 7: Ae. megalantha. 8, 9: Ae. purpurea-rosea. 10, 11: Ae. tocantina. 12-14: Ae. castelnavii.

Pl. IV

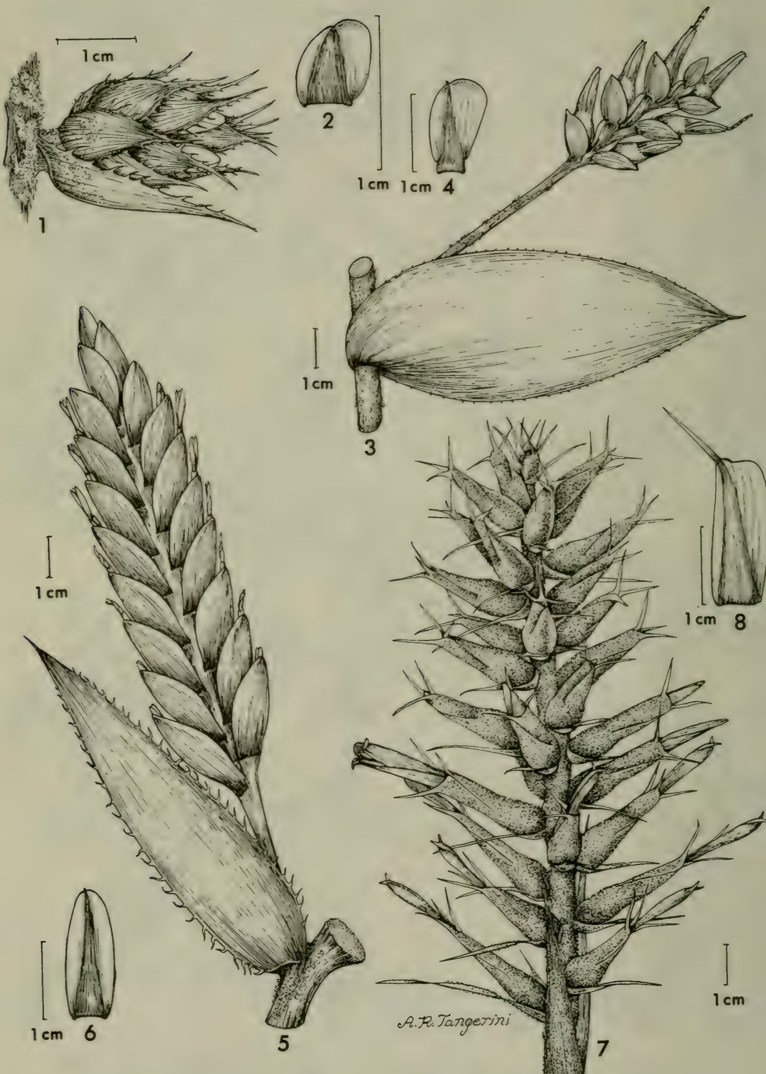



Fig. 1, 2: Aechmea caesia. 3, 4: Ae. chantinii.
5, 6: Ae. tessmannii. 7, 8: Ae. weberbaueri.

Pl. V

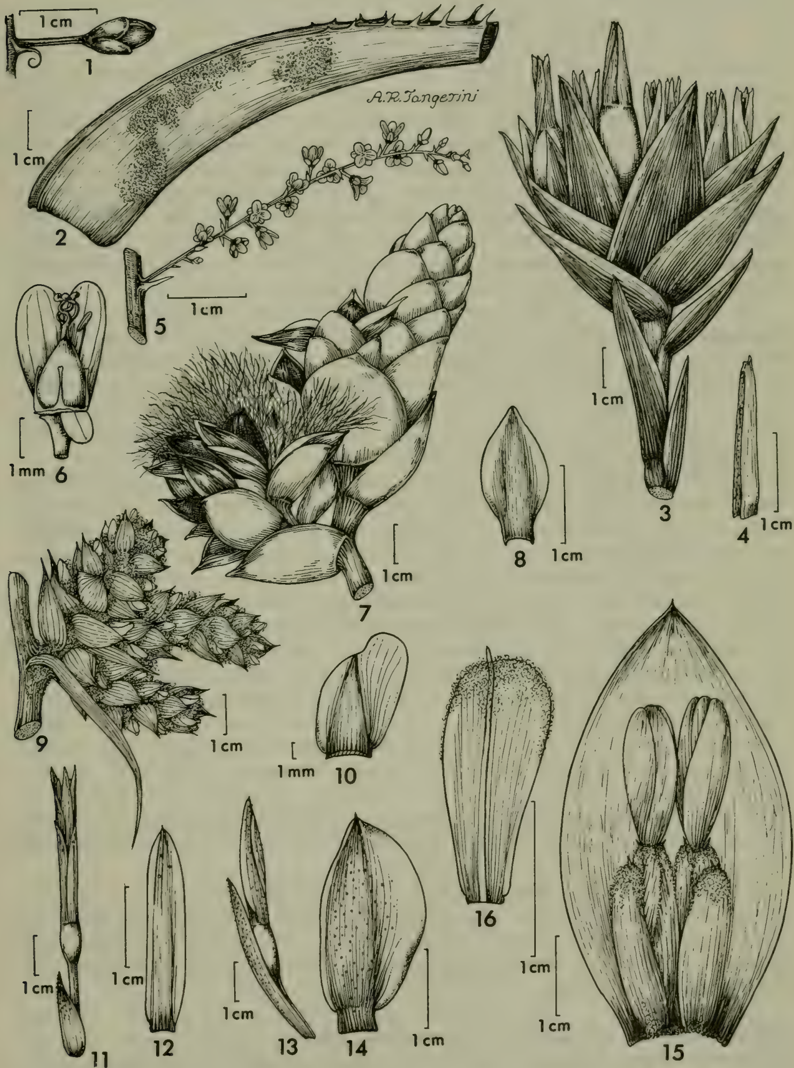



Fig. 1: Encholirium patens. 2-4: Greigia stenolepis. 5, 6: Hechtia caerulea. 7, 8: Guzmania cuzcoensis. 9, 10: Hohenbergia vestita. 11, 12: Neoregelia hatschbachii. 13, 14: N. pascoaliana. 15, 16: Streptocalyx biflorus.

# TWO VERBENACEOUS NOVELTIES

Harold N. Moldenke

LIPPIA LINEARIFOLIA Moldenke, sp. nov.

Herba suffruticosa vel frutex ca. 1 m. alta; caule ramisque ramulisque gracillimis, hornotinis glabris, annotinis minute pilosulis; foliis anguste linearibus 5—11.5 mm. longis 1 mm. latis densiuscule vel sparse pilosulis, pilis plerumque capitato-glanduliferis; inflorescentiis axillaribus paucis parvis capitatis; pedunculis filiformibus 1.5—2 cm. longis sparse capitato-pilosulis; floribus sessilibus; bracteolis late-ovato-ellipticis dense glanduloso-puberulis obtusis; corollis flavis.

Suffrutescent herb or subshrub, about 1 m. tall; stems and branches very slender, glabrous; branchlets very slender, short, numerous, minutely pilosulous, some of the hairs sometimes gland-tipped; leaves abundant on the branchlets only, narrowly linear, 5—11.5 mm. long, 1 mm. wide, blunt at the apex, sessile, sparsely or rather densely pilosulous, the hairs with capitate glands at their apex; inflorescence axillary, near the tips of the branchlets, few, small, capitate; peduncles filiform, 1.5—2 cm. long, sparsely capitate-pilosulous; flowers sessile, few; bractlets comparatively large and foliaceous, broadly elliptic-ovate or -subovate, about 5 mm. long, 4.5—4.8 mm. wide, obtuse at the apex, clasping at the base, densely puberulent on the outside with gland-tipped hairs; calyx completely hidden by the bractlets, bifid, 1—1.5 mm. long, the lobes ovate-lanceolate, subacute at the apex, connate at the base, densely white-pilosulous, a few of the hairs sometimes glandular-capitate; corolla hypocrateriform, yellow, the tube curvate, 5—6 mm. long, minutely pilosulous on the outside above the calyx, the limb spreading, 3—3.5 mm. wide, 4-lobed, the lobes rounded-lingulate; stamens 4, inserted at two levels in the corolla-tube, included; filaments filiform, about 0.5 mm. long, glabrous; anthers 2-celled, elliptic or oblong, about 0.5 mm. long; pistil 1, included, about 1.5 mm. long, glabrous; style terminal; stigma flattened-capitate; ovary very small, rotund.

The type of this most distinct and unusual species was collected by Gert Hatschbach (no. 27812) on rocky outcrops in the municipality of Gouveia, Serra do Espinhaço, Minas Gerais, Brazil, on November 12, 1971, and is deposited in my personal herbarium at Plainfield, New Jersey.

STACHYTARPHETA LINEARIS Moldenke, sp. nov.

Herba xylopodiifera, caulibus numerosis 20—25 cm. altis erectis gracillimis glabris nitidulis; internodiis uniforme abbreviatis; foliis oppositis suboppositisve alternisve linearibus numerosis erectis 1—2 cm. longis 1—2 mm. latis apiculato-acutis integris glabris punctulatis, marginibus revolutis; inflorescentiis terminalibus spicatis; pedunculis brevibus obscuris ca. 1 cm. longis glabris nitidulis; spicis 6--8 cm. longis dense multifloris.

Herb with a short woody xylopodium; stems numerous from the apex of the xylopodium, erect, very slender, 20--25 cm. tall, glabrous, stramineous in drying, rather shiny, unbranched; internodes uniformly very short, 1--1.5 cm. long or less; leaves numerous, the lower opposite or subopposite, the upper alternate, all linear, erect or ascending, 1--2 cm. long, 1--2 mm. wide, apiculate-acute at the apex, sessile, entire, glabrous, apparently somewhat fleshy when fresh, punctulate, the margins somewhat revolute; inflorescence terminal, spicate, simple; peduncles short and indistinct, about 1 cm. long, resembling the stems in all respects, glabrous, shiny; spikes 6--8 cm. long, many-flowered, the rachis slender, glabrous, not sculptured, the flowers imbricate, rather loosely ascending, the lowermost opening first; calyx tubular, herbaceous, 7 mm. long, 1 mm. wide, very minutely pilosulous on at least the 4 longitudinal ribs outside, the rim minutely 4-apiculate, the teeth minute, but one decidedly longer than the others; corolla hypocrateriform, lilac, the tube 1 cm. long, curvate, about 1 mm. wide at the middle and base, ampliate at the apex, the limb about 8 mm. (or more) wide; stamens 2, inserted half way up the corolla-tube, included; filaments very short, about 0.5 mm. long, glabrous; anthers 2-celled, the thecae widely divergent, each about 1 mm. long; staminodes tabescent; pistil 1, about 1 cm. long, reaching the mouth of the corolla-tube, glabrous; ovary elongate, about 1 mm. long, glabrous.

The type of this most distinct species was collected by Gert Hatschbach, Lyman B. Smith, and E. Ayensu (no. 29098) in a rocky field at 1350 meters altitude at Rod. Br. 259, in the municipality of Gouveia, Minas Gerais, Brazil, on January 21, 1972, and is deposited in my personal herbarium at Plainfield, New Jersey.

- - - - - - - - - - - - - - - -

## ADDITIONAL NOTES ON THE ERIOCAULACEAE. XXXIX

Harold N. Moldenke

ERIOCAULACEAE Lindl.

Additional bibliography: Paxt., Pock. Bot. Dict., ed. 1, 124 (1840) and ed. 2, 124. 1849; Benner, Fl. Bucks Co. 115--116. 1932; Burkill, Dict. Econ. Prod. Malay Penins., ed. 1, 1: 938. 1935; Sastri, Wealth India 3: 188. 1952; N. D. Simpson, Bibl. Ind. Brit. Fl. 15. 1960; Ramaswamy, Bull. Bot. Soc. Beng. 21: 89 & 90. 1967; Bate-Sm., Journ. Linn. Soc. Lond. Bot. 60: 334. 1968; D. McClintock, Proc. Bot. Soc. Brit. Isls. 7: 509. 1968; E. C. Wallace, Proc. Bot. Soc. Brit. Isls. 7: 566. 1969; Takhtajan, Flow. Pl. Orig. & Disp. 238. 1969; S. P. & R. N. Banerjee, Bull. Bot. Soc. Beng. 23: 168 & 170. 1969; Cherian & Pataskar, Bull. Bot. Surv.

India 11: 33. 1969; Deb, Sengupta, & Malick, Bull. Bot. Surv. India 11: 210. 1969; Singh, Bull. Bot. Surv. India 11: 19. 1969; Balgooy, Blumea Suppl. 6: [Pl. Geogr. Pacif.] 75, 170, & 219. 1971; Hellquist, Rhodora 73: 256. 1971; Gantz, Naturalist South. Fla. 148, 149, & 254. 1971; Moldenke, Phytologia 24: 333--358. 1972; A. L. Moldenke, Phytologia 24: 359. 1972; Thieret, La. Soc. Hort. Res. 13: 2, 13, 18, & 41. 1972.

Takhtajan (1969) asserts that the Order 87, Eriocaulales, probably had a common origin with the Commelinales. It includes only the family Eriocaulaceae. He classifies it in the Superorder 4, Commelinanae, Subclass 3, Commelinidae, Class Liliatae [or Monocotyledones], and Division Magnoliophyta [or Angiospermae].

ERIOCAULON Gron.

Additional bibliography: Paxt., Pock. Bot. Dict., ed. 1, 124 (1840) and ed. 2, 124. 1849; Benner, Fl. Bucks Co. 115--116. 1932; Burkill, Dict. Econ. Prod. Malay Penins., ed. 1, 1: 938. 1935; Sastri, Wealth India 3: 188. 1952; N. D. Simpson, Bibl. Ind. Brit. Fl. 15. 1960; Ramaswamy, Bull. Bot. Soc. Beng. 21: 89 & 90. 1967; Bate-Sm., Journ. Linn. Soc. Lond. Bot. 60: 334. 1968; D. McClintock, Proc. Bot. Soc. Brit. Isls. 7: 509. 1968; E. C. Wallace, Proc. Bot. Soc. Brit. Isls. 7: 566. 1969; Cherian & Pataskar, Bull. Bot. Surv. India 11: 33. 1969; Deb, Sengupta, & Malick, Bull. Bot. Surv. India 11: 210. 1969; Singh, Bull. Bot. Surv. India 11: 19. 1969; Balgooy, Blumea Suppl. 6: [Pl. Geogr. Pacif.] 75, 170, & 219. 1971; Hellquist, Rhodora 73: 256. 1971; Gantz, Naturalist South. Fla. 148, 149, & 254. 1971; Moldenke, Phytologia 24: 337--358. 1972; A. L. Moldenke, Phytologia 24: 359. 1972; Thieret, La. Soc. Hort. Res. 13: 2, 13, & 41. 1972.

ERIOCAULON AQUATICUM (J. Hill) Druce

Additional bibliography: Paxt., Pock. Bot. Dict., ed. 1, 124 (1840) and ed. 2, 124. 1849; Hare, Brit. Assoc. Adv. Sci. Dundee Rep. 1: 108. 1939; Hare, Proc. Linn. Soc. Lond. 157: 134. 1946; N. D. Simpson, Bibl. Ind. Brit. Fl. 15. 1960; Bate-Sm., Journ. Linn. Soc. Lond. Bot. 60: 334. 1968; D. McClintock, Proc. Bot. Soc. Brit. Isls. 7: 509. 1968; E. C. Wallace, Proc. Bot. Soc. Brit. Isls. 7: 566. 1969; Moldenke, Phytologia 24: 342. 1972; A. L. Moldenke, Phytologia 24: 359. 1972.

ERIOCAULON ATRATUM var. MAJOR Thwaites

Additional synonymy: Eriocaulon caulescens Hook. f. ex Ruhl. in Engl., Pflanzenreich 13 (4-30): 69 & 285, in syn. 1903 [not E. caulescens Kunth, 1971, nor Poir., 1813, nor Salzm., 1959, nor Willd., 1841].

Additional bibliography: Moldenke, Phytologia 24: 343--344. 1972.

ERIOCAULON AUSTRALE R. Br.

Additional bibliography: Paxt., Pock. Bot. Dict., ed. 1, 124

(1840) and ed. 2, 124. 1849; Moldenke, Phytologia 24: 344—345. 1972.

ERIOCAULON BUCHANANII Ruhl.

Additional bibliography: Moldenke, Phytologia 24: 348. 1972.

Lewalle describes this as a tufted plant, with basal leaves and gray inflorescences. He found it growing in a swamp at 850 m. altitude, in flower in June.

Additional citations: BURUNDI: Lewalle 6053 (Z).

ERIOCAULON CINEREUM R. Br.

Additional bibliography: Deb, Sengupta, & Malick, Bull. Bot. Surv. India 11: 210. 1969; Singh, Bull. Bot. Surv. India 11: 19. 1969; Thieret, La. Soc. Hort. Res. 13: 2 & 13. 1972; Moldenke, Phytologia 24: 339 & 350. 1972.

The Cook & Rix 45, distributed as E. cinereum, appears to be E. luzulaefolium Mart. instead. It is also possible that the California material cited as E. cinereum may prove to be E. luzulaefolium. Thieret (1972) records E. cinereum as naturalized in Louisiana and refers to it as the "ricefield pipewort". I have not as yet seen the material on which he bases this record and suspect that it may also prove to be E. luzulaefolium.

Podlech (1971) includes E. cinereum, as "E. Sieboldianum", in Rechinger's Flora Iranica, but cites only specimens from Afghanistan, so I am not at all certain that the species is actually to be included as a member of the flora of Iran. He cites Breckle A.3303, Podlech 16790, and Rasoul 392 from eastern Afghanistan. He gives the overall distribution of the species as "Afghanistan, Pamir-Alaj, Africa, India, Japonia, Sina, Australia".

Datta & Majumdar (1966) describe the species as a "Marshy herb. Head purplish. Receptacle glabrous. Sepals in male flowers 3, in female flowers 1 to 2 or 0". Deb, Sengupta, & Malick (1969) call it a "Small tufted herb, scattered in rice-fields" at 1350 meters altitude and cite Sengupta 1114. Singh (1969) found it growing in marshy places and cites his no. 25384.

ERIOCAULON COMPRESSUM Lam.

Additional & emended bibliography: C. Müll. in Walp., Ann. 6: 1170 & 1171. 1861; Moldenke, Phytologia 24: 351. 1972; Thieret, La. Soc. Hort. Res. 13: 13. 1972.

Thieret (1972) calls this species "early pipewort".

ERIOCAULON DECANGULARE L.

Additional & emended bibliography: Bong., Ess. Monog. Erioc. 2, 4, 8, & 30. 1831; Paxt., Pock. Bot. Dict., ed. 1, 124 (1840) and ed. 2, 124. 1849; Moldenke, Phytologia 24: 353—354. 1972; Thieret, La. Soc. Hort. Res. 13: 13. 1972.

ERIOCAULON ELEGANTULUM Engl., Abh. Preuss. Akad. Wiss. 1894: 14. 1894.

Additional bibliography: Moldenke, Phytologia 19: 335. 1970; Moldenke, Fifth Summ. 1: 226, 237, 239, 241, & 251 (1971) and 2: 935. 1971.

ERIOCAULON ELENORAE Fyson, Journ. Indian Bot. 1: 50 & 51, fig. 5 [as "eleanorae"], hyponym (1919) and 2: 316—317, pl. 35. 1921.

Additional & emended bibliography: Fyson, Journ. Indian Bot. 1: 50, 51, & 53, fig. 5. 1919; Cherian & Pataskar, Bull. Bot. Surv. India 11: 33. 1969; Hocking, Excerpt. Bot. A.16: 39. 1970; Moldenke, Phytologia 21: 273. 1971; Inamdar & Patel, Indian Forest. 97: 330. 1971; Moldenke, Fifth Summ. 1: 274 & 280 (1971) and 2: 499 & 935. 1971.

Illustrations: Fyson, Journ. Indian Bot. 1: 51, fig. 5. 1919.

Cherian & Pataskar (1969) describe this plant as an "Annual herb, heads white", found it to be "common" in Maharashtra, India, and cite Pataskar 101248.

ERIOCAULON ELICHRYSOIDES Bong., Mém. Acad. Imp. Sci. St. Pétersb., sér. 6, 1: 631. 1831.

Additional bibliography: Moldenke, Phytologia 20: 407. 1970; Moldenke, Fifth Summ. 1: 149, 185, & 362 (1971) and 2: 502, 508, & 935. 1971.

ERIOCAULON ENSIFORME C. E. C. Fischer, Kew Bull. Misc. Inf. 1930: 159—160. 1930.

Additional bibliography: Moldenke, Phytologia 19: 38. 1969; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 935. 1971.

ERIOCAULON EPAPILLOSUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 57. 1903.

Additional bibliography: Moldenke, Phytologia 19: 38. 1969; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 935. 1971.

ERIOCAULON EQUISETOIDES Van Royen, Blumea 10: 132—133, fig. 1 E. 1960.

Additional bibliography: Moldenke, Phytologia 20: 407. 1970; Moldenke, Fifth Summ. 1: 323 & 330 (1971) and 2: 512 & 935. 1971.

ERIOCAULON ESCAPE Hansen, Dansk Bot. Arkiv 27: [el]—33, fig. 1 & 2. 1969.

Bibliography: Hansen, Dansk Bot. Arkiv 27: [31]—33, fig. 1 & 2 a—c. 1969; Anon., Biol. Abstr. 53 (9): B.A.S.I.C. S.87. 1972; Shehatz, Biol. Abstr. 53: 4689. 1972.

Illustrations: Hansen, Dansk Bot. Arkiv 27: 32 & 33, fig. 1 & 2 a—c. 1969.

This species is based on the following collection: "Holotypus die 24 Nov. anni 1958 1300 m supra mare in loco humido arenoso pineti aperti graminosi montis tabularii thailandici Poo Kradeng sub numero SLH 6178 lectus, in Museo Botanico Hauniensi depositus." Hansen (1969) notes that the species is "Near E. echinulatum but differs considerably in lacking the scape and in the much larger measures in the floral elements."

ERIOCAULON EURYPEPLON Körn., Linnaea 27: 685—686. 1856.
Additional bibliography: Moldenke, Phytologia 20: 407. 1970; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 935. 1971.

ERIOCAULON EXSERTUM Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 156, fig. 9. 1971.
Bibliography: Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 156, fig. 9. 1971; Moldenke, Phytologia 23: 422. 1972.
Illustrations: Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 156, fig. 9. 1971.
This species is known thus far only from Nepal. The type locality and collection are described by Satake (1971) as "Nepal. Ghorwa-Sanichare, 300—200 m (H. Hara, H. Kanai, S. Kurosawa, G. Murata & M. Togashi, Dec. 10, 1963 — holotype in TI)" and comments that "This species is distinguished from Eriocaulon truncatum in having two male sepals connate at the base, acute female sepals, and female petals provided with an exserted gland at the apex."

ERIOCAULON FABERI Ruhl. in Engl., Pflanzenreich 13 (4-30): 95. 1903.
Additional bibliography: Moldenke, Phytologia 19: 39. 1969; Moldenke, Fifth Summ. 1: 289 (1971) and 2: 935. 1971.

ERIOCAULON FENESTRATUM Bojer ex Körn., Linnaea 27: 671. 1856.
Additional bibliography: Moldenke, Phytologia 21: 428. 1971; Moldenke, Fifth Summ. 1: 261 & 264 (1971) and 2: 500 & 935. 1971.

ERIOCAULON FILIFOLIUM Hand.-Mazz., Sinensia 7: 619. 1936.
Additional bibliography: Moldenke, Phytologia 18: 89—90. 1969; Moldenke, Fifth Summ. 1: 289 (1971) and 2: 935. 1971.

ERIOCAULON FISTULOSUM R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 255. 1810.
Additional bibliography: Moldenke, Phytologia 20: 11. 1970; Moldenke, Fifth Summ. 1: 346 (1971) and 2: 616 & 935. 1971.

ERIOCAULON FLUMINEUM Moldenke, Phytologia 3: 411—412. 1951.
Additional bibliography: Moldenke, Phytologia 18: 90. 1969; Moldenke, Fifth Summ. 1: 261 (1971) and 2: 935. 1971.

ERIOCAULON FLUVIATILE Trimen, Journ. Bot. 23: 270. 1885.
Additional bibliography: Fyson, Journ. Indian Bot. 1: 52 & 53. 1919; Moldenke, Phytologia 20: 407. 1970; Moldenke, Fifth Summ. 1: 280 (1971) and 2: 935. 1971.

ERIOCAULON FRIESIORUM Bullock, Kew Bull. Misc. Inf. 1932: 507. 1932.
Additional bibliography: Moldenke, Phytologia 20: 407. 1970;

Moldenke, Fifth Summ. 1: 241 (1971) and 2: 501 & 935. 1971.

ERIOCAULON FULIGINOSUM C. Wright ex Griseb., Cat. Pl. Cub. 226. 1866.

Additional bibliography: Moldenke, Phytologia 20: 407. 1970; Moldenke, Fifth Summ. 1: 81, 96, & 98 (1971) and 2: 511, 513, 515, 518, & 935. 1971.

ERIOCAULON FULVUM N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 248. 1901.

Additional bibliography: Moldenke, Phytologia 18: 92. 1969; Moldenke, Fifth Summ. 1: 214, 216, & 222 (1971) and 2: 935. 1971.

ERIOCAULON FUSIFORME Britton & Small in N. L. Britton, Bull. Torrey Bot. Club 44: 32. 1917.

Additional bibliography: Moldenke, Phytologia 20: 407. 1970; Moldenke, Fifth Summ. 1: 98 (1971) and 2: 935. 1971.

ERIOCAULON GAMBLEI C. E. C. Fischer, Kew Bull. Misc. Inf. 1930: 160--161. 1930.

Additional bibliography: Moldenke, Phytologia 19: 40. 1969; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 935. 1971.

ERIOCAULON GIBBOSUM Körn., Linnaea 27: 600. 1856.

Additional bibliography: Moldenke, Phytologia 21: 428. 1971; Hocking, Excerpt. Bot. A.18: 444. 1971; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 501 & 935. 1971.

Additional citations: BRAZIL: Mato Grosso: Irwin, Souza, Grear, & Reis dos Santos 16981 (N).

ERIOCAULON GIBBOSUM var. LONGIFOLIUM Körn. in Mart., Fl. Bras. 3 (1): 489--490. 1863.

Additional bibliography: Moldenke, Phytologia 21: 273. 1971; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 501, 935, & 968. 1971.

ERIOCAULON GIBBOSUM var. MATTOGROSSENSE Ruhl. in Pilg., Engl. Bot. Jahrb. 30: 146--147. 1901.

Additional bibliography: Moldenke, Phytologia 19: 41. 1969; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 935. 1971.

ERIOCAULON GIBBOSUM f. VIVIPARUM Moldenke, Phytologia 18: 342. 1969.

Additional bibliography: Moldenke, Phytologia 20: 408. 1970; Hocking, Excerpt. Bot. A.18: 444. 1971; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 935. 1971.

ERIOCAULON GILGIANUM Ruhl. in Engl., Bot. Jahrb. 27: 84. [April 17] 1899.

Additional bibliography: Moldenke, Phytologia 20: 408. 1970; Moldenke, Fifth Summ. 1: 237, 243, 248, 261, & 475 (1971) and 2: 496 & 935. 1971.

ERIOCAULON GLABERRIMUM Miyabe & Satake, Act. Phytotax. & Geobot. Kyoto 13: 280—281. 1943.
Additional & emended bibliography: Ohwi, Fl. Jap., [ed. Jap.], 263, 267, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [ed. Engl.], 270. 1965; Moldenke, Phytologia 20: 408. 1970; Moldenke, Fifth Summ. 1: 309 (1971) and 2: 494, 501, & 935. 1971.

ERIOCAULON GLAUCESCENS W. Griff., Notul. 3: 116. 1851.
Additional bibliography: Moldenke, Phytologia 18: 98—99. 1969; Moldenke, Fifth Summ. 1: 375 (1971) and 2: 935. 1971.

ERIOCAULON GLAUCUM W. Griff., Notul. 3: 113—114. 1851.
Additional bibliography: Moldenke, Phytologia 20: 408. 1970; Moldenke, Fifth Summ. 1: 283 (1971) and 2: 935. 1971.

ERIOCAULON GLAZIOVII Ruhl. in Engl., Pflanzenreich 13 (4-30): 51. 1903.
Additional bibliography: Moldenke, Phytologia 20: 408. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 936. 1971; Moldenke, Phytologia 24: 356. 1972.

ERIOCAULON GOMPHRENOIDES Kunth, Enum. Pl. 3: 548. 1841.
Additional bibliography: Moldenke, Phytologia 20: 11. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 936. 1971.

ERIOCAULON GRAPHITINUM F. Muell. & Tate, Trans. Roy. Soc. S. Austral. 19: 82. 1895.
Additional bibliography: Moldenke, Phytologia 20: 408. 1970; Moldenke, Fifth Summ. 1: 346 (1971) and 2: 501 & 936. 1971.

ERIOCAULON GREGATUM Körn., Linnaea 27: 606—607. 1856.
Additional bibliography: Fyson, Journ. Indian Bot. 1: 50 & 53. 1919; Moldenke, Phytologia 20: 408. 1970; Moldenke, Fifth Summ. 1: 274 & 289 (1971) and 2: 936. 1971.

ERIOCAULON GRISEUM Körn., Linnaea 27: 599 (1856) and in Mart., Fl. Bras. 3 (1): 479, pl. 60, fig. 3. 1863.
Additional bibliography: Moldenke, Phytologia 20: 408. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 936. 1971.

ERIOCAULON GUADALAJARENSE Ruhl. in Engl., Pflanzenreich 13 (4-30): 60. 1903.
Additional bibliography: Moldenke, Phytologia 20: 409. 1970; Moldenke, Fifth Summ. 1: 69 (1971) and 2: 936. 1971.

ERIOCAULON GUYANENSE Körn. in Mart., Fl. Bras. 3 (1): 478. 1863.
Additional & emended bibliography: Körn. in Mart., Fl. Bras. 3 (1): 288, 291, 475, 478, & 507. 1863; J. A. Steyerm., Act. Bot. Venez. 1: 195. 1966; Moldenke, Phytologia 20: 409. 1970; Moldenke, Fifth Summ. 1: 116, 123, 129, 133, & 149 (1971) and 2: 502, 778, & 936. 1971.

ERIOCAULON HAMILTONIANUM Mart. in Wall., Pl. Asiat. Rar. 3: 29. 1832.

Additional synonymy: Eriocaulon hamiltonianum Heyne, in herb.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 20: 409. 1970; Moldenke, Fifth Summ. 1: 274 & 295 (1971) and 2: 497, 502, 508, & 936. 1971.

Recent collectors have encountered this plant growing at 50 m. altitude, flowering and fruiting in November.

Additional citations: THAILAND: Charoenphol, Larsen, & Warncke 5009 (Ac).

ERIOCAULON HAMILTONIANUM var. MINIMUM Fyson, Journ. Indian Bot. 2: 313 [as "minima"]. 1921.

Additional bibliography: Moldenke, Phytologia 18: 106. 1969; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 502 & 936. 1971.

ERIOCAULON HAMILTONIANUM var. MINOR Fyson, Journ. Indian Bot. 2: 313. 1921.

Additional bibliography: Moldenke, Phytologia 18: 178. 1969; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 936. 1971.

ERIOCAULON HANANOEGOENSE Masamune, Mem. Fac. Sci. Agr. Taihoku Univ. 11, Bot. 4: 537—538. 1934.

Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 263, 266—267, & 1296. 1953; Koyama in Ohwi, Fl. Ja., [Engl. ed.], 270. 1965; Moldenke, Phytologia 20: 409. 1970; Moldenke, Fifth Summ. 1: 312 (1971) and 2: 494, 502, & 936. 1971.

ERIOCAULON HAYATANUM Koyama, Philip. Journ. Sci. 84: 369—370, pl. 2, fig. 3, & pl. 5, fig. B 1—6, 11, & 12. 1956.

Additional bibliography: Moldenke, Phytologia 18: 178. 1969; Moldenke, Fifth Summ. 1: 300 (1971) and 2: 936. 1971.

ERIOCAULON HELEOCHARIOIDES Satake, Journ. Jap. Bot. 15: 627—628. 1939.

Emended synonymy: Eriocaulon heleocharoides Satake ex Koyama in Ohwi, Fl. Jap., [Engl. ed.], 267. 1965.

Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 262, 264, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266 & 267. 1965; Moldenke, Phytologia 20: 409—410. 1970; Moldenke, Fifth Summ. 1: 309 (1971) and 2: 502 & 936. 1971.

ERIOCAULON HENRYANUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 86. 1903.

Additional bibliography: Moldenke, Phytologia 20: 410. 1970; Moldenke, Fifth Summ. 1: 274, 289, 295, & 301 (1971) and 2: 936. 1971.

ERIOCAULON HERZOGII Moldenke, Phytologia 19: 44. 1969.

Additional bibliography: Moldenke, Phytologia 21: 273. 1971; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 509 & 936. 1971.

xERIOCAULON HESSII Moldenke, Phytologia 5: 338. 1956.
Additional bibliography: Moldenke, Phytologia 19: 45. 1969; Moldenke, Fifth Summ. 1: 243 (1971) and 2: 493 & 936. 1971.

ERIOCAULON HETEROCHITON Körn. in Miq., Ann. Mus. Bot. Lugd. Bat. 3: 240. 1867.
Additional bibliography: Moldenke, Phytologia 19: 337. 1970; Moldenke, Fifth Summ. 1: 261 (1971) and 2: 936. 1971.

ERIOCAULON HETEROCHITON var. ACUMINATUM Moldenke, Phytologia 3: 412--413. 1951.
Additional bibliography: Moldenke, Phytologia 18: 111--112. 1969; Moldenke, Fifth Summ. 1: 261 (1971) and 2: 936. 1971.

ERIOCAULON HETERODOXUM Moldenke in Maguire & al., Bull. Torrey Bot. Club 75: 194--195. 1948.
Additional bibliography: Moldenke, Phytologia 20: 410. 1970; Moldenke, Fifth Summ. 1: 129 (1971) and 2: 936. 1971.

ERIOCAULON HETEROGYNUM F. Muell., Fragm. 1: 93--94. 1859.
Additional bibliography: Moldenke, Phytologia 19: 338. 1970; Moldenke, Fifth Summ. 1: 336 & 346 (1971) and 2: 936. 1971.

ERIOCAULON HETEROLEPIS Steud., Syn. Pl. Glum. 2: [Cyp.] 271. 1855.
Additional bibliography: Hocking, Excerpt. Bot. A. 16: 39. 1970; Moldenke, Phytologia 21: 428. 1971; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 502 & 936. 1971.
Ramamoorthy describes this plant as "common tufted herb with basal leaves, the flowers blackish-white, in marshes near paddy-fields" and found it flowering and fruiting in January.
Ruhland (1903) erroneously cites the original publication of this species' name by Steudel to page "231" instead of 271.
Additional citations: INDIA: Mysore: Ramamoorthy HFP.1311 (W).

ERIOCAULON HETEROLEPIS var. NIGRICANS Körn. in Miq., Ann. Mus. Bot. Lugd. Bat. 3: 239. 1867.
Additional bibliography: Moldenke, Phytologia 20: 410. 1970; Moldenke, Fifth Summ. 1: 324 (1971) and 2: 936. 1971.

ERIOCAULON HETEROMALLUM Bong., Mém. Acad. Imp. Sci. St. Pétersb., sér. 6, 1: 626. 1831.
Additional bibliography: Moldenke, Phytologia 20: 12. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 936. 1971.

ERIOCAULON HETEROPEPLON Alv. Silv., Fl. Serr. Min. 34, pl. 11. 1908.
Additional bibliography: Moldenke, Phytologia 20: 410. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 936. 1971.

ERIOCAULON HETEROPETALUM Ruhl. in Fedde, Repert. Spec. Nov. 22: 33. 1925.

Additional bibliography: Moldenke, Phytologia 20: 410. 1970; Moldenke, Fifth Summ. 1: 96 (1971) and 2: 936. 1971.

ERIOCAULON HEUDELOTII N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 258. 1901.

Additional synonymy: Eriocaulon heudeloti N. E. Br. ex Hocking, Excerpt. Bot. A.19: 43. 1971.

Additional bibliography: Raynal, Adansonia, ser. 2, 8: 100. 1968; Hocking, Excerpt. Bot. A.19: 43. 1971; Moldenke, Fifth Summ. 1: 210, 214, 243, 246, & 253 (1971) and 2: 502 & 936. 1971; Moldenke, Phytologia 21: 273 (1971) and 23: 430. 1972.

ERIOCAULON HILDEBRANDTII Körn. ex Ruhl. in Engl., Bot. Jahrb. 27: 73. 1899.

Additional bibliography: Moldenke, Phytologia 19: 338. 1970; Moldenke, Fifth Summ. 1: 261 (1971) and 2: 936. 1971.

ERIOCAULON HIRSUTULUM Moldenke, Résumé Suppl. 4: 6, nom. nud. June 5, 1962; Phytologia 8: 387. December 10, 1962.

Additional bibliography: Moldenke, Phytologia 20: 410. 1970; Moldenke, Fifth Summ. 1: 214 (1971) and 2: 936. 1971.

ERIOCAULON HOMOTEPALUM Koyama, Philip. Journ. Sci. 84: 370—371, pl. 2, fig. 2, & pl. 5, fig. 6. 1956.

Additional bibliography: Moldenke, Phytologia 18: 181. 1969; Moldenke, Fifth Summ. 1: 301 (1971) and 2: 936. 1971.

ERIOCAULON HONDOENSE Satake, Bot. Mag. Tokyo 51: 288—291, fig. 3. 1937.

Emended synonymy: Eriocaulon miquelianum Auct. Jap. ex Nakai & Honda, Nov. Fl. Jap. 6: 49 & 87, in syn. 1940 [not E. miquelianum Körn., 1867, nor Koeck., 1933, nor Mori, 1940]. Eriocaulon miquelianum sensu auct. Japon. ex Koyama in Ohwi, Fl. Jap., [Engl. ed.], 268, in syn. 1965.

Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 262, 265, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266, 268, & 269. 1965; Moldenke, Phytologia 20: 411. 1970; Moldenke, Fifth Summ. 1: 308, 309, 312, & 319 (1971) and 2: 494, 502, 503, 506, 513, & 936. 1971.

ERIOCAULON HONDOENSE var. GRACILE Satake ex Moldenke, Résumé 173 & 481. 1959.

Additional bibliography: Moldenke, Phytologia 18: 184. 1969; Moldenke, Fifth Summ. 1: 309 (1971) and 2: 936. 1971.

ERIOCAULON HONDOENSE var. PILOSUM Satake, Bot. Mag. Tokyo 51: 290. 1937.

Additional bibliography: Moldenke, Phytologia 20: 411. 1970; Moldenke, Fifth Summ. 1: 309 (1971) and 2: 502, 508, & 936. 1971.

ERIOCAULON HONDOENSE var. STELLATUM Satake, Bot. Mag. Tokyo 51:

290—291. 1937.
Additional bibliography: Moldenke, Phytologia 20: 411. 1970; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 503 & 936. 1971.

ERIOCAULON HONDOENSE var. STENOPETALON Koyama, Journ. Jap. Bot. 31: 9. 1956.
Additional bibliography: Moldenke, Phytologia 18: 185. 1969; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 936. 1971.

ERIOCAULON HOOKERIANUM Stapf, Trans. Linn. Soc. Lond. Bot., ser. 2, 4: 243. 1894.
Additional bibliography: Moldenke, Phytologia 21: 273. 1971; Moldenke, Fifth Summ. 1: 274, 296, 301, 305, 324, & 336 (1971) and 2: 494, 503, 505, & 936. 1971.
Saldanha notes that in Mysore this plant is "locally common marshy herb with white heads" and found it flowering and fruiting in August. Charoenphol and his associates encountered it in evergreen forests in Thailand, flowering and fruiting in October.
Additional citations: INDIA: Mysore: Saldanha 14710 (W). THAILAND: Charoenphol, Larsen, & Warncke 3861 (Ac).

ERIOCAULON HOOKERIANUM var. MICROPHYLLUM Van Royen, Nov. Guin., ser. 2, 10: 31, fig. 2j. 1959.
Additional bibliography: Moldenke, Phytologia 20: 411. 1970; Moldenke, Fifth Summ. 1: 336 (1971) and 2: 936. 1971.

ERIOCAULON HUIANUM Ruhl., Notizbl. Bot. Gart. Berlin 10: [1040]. 1930.
Additional bibliography: Moldenke, Phytologia 20: 411. 1970; Moldenke, Fifth Summ. 1: 289 (1971) and 2: 936. 1971.

ERIOCAULON HUMBOLDTII Kunth, Enum. Pl. 3: 544—545. 1841.
Additional bibliography: Moldenke, Phytologia 21: 428. 1971; Moldenke, Fifth Summ. 1: 116, 123, 129, & 149 (1971) and 2: 498, 502, 503, & 936. 1971.
Steyermark and the Dunstervilles describe this plant as having ascending pale rich-green leaves and white flower-heads. Harley, Souza, & Fereira describe it as an herb, 75 cm. tall, with a rosette of more or less erect mid-green leaves, and white flowers, the "peduncles gradually increasing in diameter toward the flower-head", and found it growing in a swampy gallery forest. Steyermark found it in flat open wet savannas near an escarpment edge, at 1230—1240 meters altitude, flowering in September.
Additional citations: VENEZUELA: Amazonas: J. A. Steyermark 105146 (Ac). Bolívar: Steyermark, Dunsterville, & Dunsterville 104115 (Ft). BRAZIL: Bahia: Irwin, Grear, Souza, & Reis dos Santos 14742 (N). Mato Grosso: Harley, Souza, & Fereira 10400 (N).

ERIOCAULON HUMILE Moldenke, Phytologia 3: 162—163. 1949.
Additional bibliography: Moldenke, Phytologia 21: 428 & 429. 1971; Moldenke, Fifth Summ. 1: 274 (1971) and 2: 936. 1971.

ERIOCAULON HYDROPHILUM Markötter, Ann. Univ. Stellenb. 8 A (1): 10. 1930.

Additional bibliography: Moldenke, Phytologia 18: 189. 1969; Moldenke, Fifth Summ. 1: 256 (1971) and 2: 936. 1971.

ERIOCAULON INFAUSTUM N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 253. 1901.

Additional bibliography: Moldenke, Phytologia 18: 189. 1969; Moldenke, Fifth Summ. 1: 251 (1971) and 2: 936. 1971.

ERIOCAULON INFIRMUM Steud., Nom. Bot., ed. 2, 1: 585 (1840); Syn. Pl. Glun. 2: [Cyp.] 271. 1855.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50 & 53. 1919; Moldenke, Biol. Abstr. 51: 9023. 1970; Moldenke, Fifth Summ. 1: 274, 283, 296, & 301 (1971) and 2: 501, 511, 512, & 936. 1971; Moldenke, Phytologia 21: 273 (1971) and 24: 339 & 350. 1972.

Recent collectors have found this plant growing at 1100 meters altitude, flowering and fruiting in November. The *Saldanha 15327*, distributed as *E. infirmum*, is actually *E. truncatum* Hamilt.

Additional citations: THAILAND: *Charoenphol, Larsen, & Warncke 4689* (Ac).

ERIOCAULON INFIRMUM var. KURZII (Fyson) Moldenke, Phytologia 19: 339. 1970.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 53. 1919; Moldenke, Biol. Abstr. 51: 9023. 1970; Moldenke, Phytologia 21: 274. 1971; Moldenke, Fifth Summ. 1: 283 (1971) and 2: 501 & 936. 1971.

ERIOCAULON INFIRMUM var. PUBERULENTUM (Moldenke) Van Royen, Nov. Guin., ser. 2, 10: 78. 1959.

Additional bibliography: Moldenke, Phytologia 20: 412. 1970; Moldenke, Fifth Summ. 1: 336 (1971) and 2: 501 & 936. 1971.

ERIOCAULON INSULARE Ruhl. in Fedde, Repert. Spec. Nov. 22: 32. 1925.

Additional bibliography: Moldenke, Phytologia 20: 412. 1970; Hocking, Excerpt. Bot. A.16: 39 & 40. 1970; Moldenke, Fifth Summ. 1: 96 & 98 (1971) and 2: 936. 1971.

ERIOCAULON INTERMEDIUM Körn., Linnaea 27: 601--603. 1856.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 20: 412. 1970; Satake, Journ. Jap. Bot. 46: 372. 1971; Moldenke, Fifth Summ. 1: 275, 281, 296, 301, & 324 (1971) and 2: 501, 512, & 937. 1971.

Charoenphol and his associates found this plant growing in 20 cm. of water in Thailand.

Additional citations: THAILAND: *Charoenphol, Larsen, & Warncke 4796* (Ac), *4810* (Ac).

ERIOCAULON INTRUSUM Meikle, Kew Bull. 22: 141. 1968.

Additional bibliography: Moldenke, Phytologia 19: 70—71. 1969; C. C. Townsend, Excerpt. Bot. A.15: 418. 1970; Moldenke, Fifth Summ. 1: 222 (1971) and 2: 504 & 937. 1971.

ERIOCAULON INUNDATUM Moldenke, Phytologia 3: 413--414. 1951.
Additional bibliography: Moldenke, Phytologia 20: 412. 1970; Moldenke, Fifth Summ. 1: 214 (1971) and 2: 937. 1971.
Lewalle describes the flower-heads of this plant as "white" or "grayish-white" and found the plant growing in marshes, flowering in February.
Additional citations: BURUNDI: Lewalle 517 (Z), 6147 (Ac).

ERIOCAULON INYANGENSE Arwidsson, Bot. Notiser 1934: 83. 1934.
Additional bibliography: Moldenke, Phytologia 20: 412. 1970; Moldenke, Fifth Summ. 1: 248 (1971) and 2: 937. 1971.

ERIOCAULON IRREGULARE Meikle, Kew Bull. 22: 143—144. 1968.
Additional bibliography: Moldenke, Phytologia 19: 71. 1969; C. C. Townsend, Excerpt. Bot. A.15: 418. 1970; Moldenke, Fifth Summ. 1: 216 & 218 (1971) and 2: 502 & 937. 1971.

ERIOCAULON JAPONICUM Körn. in Miq., Ann. Mus. Bot. Lugd. Bat. 3: 162—163 [as "iaponicum"]. 1867.
Additional bibliography: Ohwi, Fl. Jap., [Jap. ed.], 262, 265, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 267—268. 1965; Moldenke, Phytologia 20: 412. 1970; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 503 & 937. 1971.

ERIOCAULON JAUENSE Moldenke, Résumé Suppl. 17: 2, nom. nud. (1968); Phytologia 18: 246, hyponym (1969); Mem. N. Y. Bot. Gard. 22: in press.
Additional bibliography: Moldenke, Phytologia 18: 246. 1969; Moldenke, Fifth Summ. 1: 123 (1971) and 2: 937. 1971.

ERIOCAULON JOHNSTONII Ruhl. in Engl., Bot. Jahrb. 27: 82. 1899.
Additional bibliography: Moldenke, Phytologia 19: 341. 1970; Moldenke, Fifth Summ. 1: 264 (1971) and 2: 937. 1971.

ERIOCAULON JORDANI (Moldenke) Meikle, Kew Bull. 22: 143. 1968.
Additional bibliography: Moldenke, Phytologia 19: 71. 1969; C. C. Townsend, Excerpt. Bot. A.15: 418. 1970; Moldenke, Fifth Summ. 1: 218 (1971) and 2: 637 & 937. 1971.

ERIOCAULON KAINANTENSE Masamune, Trans. Nat. Hist. Soc. Taiwan 33: 13 [as "kainantensis"]. 1943.
Additional bibliography: Moldenke, Phytologia 18: 247—248. 1969; Moldenke, Fifth Summ. 1: 292 (1971) and 2: 503 & 937. 1971.

ERIOCAULON KATHMANDUENSE Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 157—158, fig. 10. 1971.
Bibliography: Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 157--158, fig. 10. 1971; Moldenke, Phytologia 23: 422. 1972.

Illustrations: Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 157, fig. 10. 1971.

Satake (1971) describes the type locality and type collection of this species as follows: "Nepal. Sundarijal Waterfall, near Kathmandu, 1600 m (H. Hara, H. Kanai & S. Kurosawa, Sep. 20, 1963 — holotype in TI). Near to Eriocaulon luzulaefolium, but the involucral bractlets are elliptical and obtuse at the apex, the anterior lobes of the male petals is much longer than the lateral ones, and female petals are more or less pilose." It is known thus far only from the original collection.

ERIOCAULON KATOI Onuma ex Moldenke, Résumé 173 & 481, nom. nud. (1959); Phytologia 18: 248, hyponym. 1959.

Additional bibliography: Moldenke, Phytologia 18: 248. 1969; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 937. 1971.

ERIOCAULON KENGII Ruhl., Notizbl. Bot. Gart. Berlin 10: 1042—1043. 1930.

Additional bibliography: Moldenke, Phytologia 18: 248. 1969; Moldenke, Fifth Summ. 1: 289 (1971) and 2: 937. 1971.

ERIOCAULON KINABALUENSE Van Royen, Blumea 10: 133—134, fig. 1 F. 1960.

Additional bibliography: Moldenke, Phytologia 20: 412. 1970; Moldenke, Fifth Summ. 1: 324 (1972) and 2: 492 & 937. 1971.

ERIOCAULON KINLOCHII Moldenke, N. Am. Fl. 19: 23—24. 1937.

Additional bibliography: Moldenke, Phytologia 20: 13. 1970; Moldenke, Fifth Summ. 1: 81 (1971) and 2: 937. 1971.

McKee describes this plant as "submerged except for the inflorescence in small permanent pools, the leaves light-green, the inflorescence white", growing at 20 meters altitude in a pine savanna, flowering in January.

Additional citations: NICARAGUA: Zelaya: McKee 11269 (W—2634649).

ERIOCAULON KIUSIANUM Maxim., Diagn. Pl. Nov. Asiat. 8: 22—24. 1893.

Additional bibliography: Moldenke, Phytologia 20: 412. 1970; Moldenke, Fifth Summ. 1: 292, 310, & 313 (1971) and 2: 937. 1971.

ERIOCAULON KLOTZSCHII Moldenke, Phytologia 17: 484. 1969.

Additional bibliography: Moldenke, Phytologia 20: 412—413. 1970; Moldenke, Fifth Summ. 1: 129 (1971) and 2: 495 & 937. 1971.

ERIOCAULON KLOTZSCHII var. PROLIFERUM (Moldenke) Moldenke, Phytologia 17: 484. 1969.

Additional bibliography: Moldenke, Phytologia 19: 341. 1970; Moldenke, Fifth Summ. 1: 123 (1971) and 2: 495 & 937. 1971.

ERIOCAULON KOERNICKEI Britten, Journ. Bot. 1900: 481 & 482. 1900.

Additional bibliography: Moldenke, Phytologia 20: 413. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 509, 516, 776, & 937. 1971.

ERIOCAULON KÖRNICKIANUM Van Heurck & Muell.-Arg. in Van Heurck, Obs. Bot. 101. 1870.

Additional bibliography: Moldenke, Phytologia 21: 274. 1971; Moldenke, Fifth Summ. 1: 47, 52, & 55 (1971) and 2: 504, 765, 776, 777, & 937. 1971.

ERIOCAULON KUNTHII Körn.

According to the careful comparisons recently made by Dr. L. B. Smith, this taxon is indistinguishable from E. ligulatum (Vell.) L. B. Sm. and must be reduced to synonymy under the latter.

ERIOCAULON KURTZII Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 186—188, hyponym. 1969.

Additional bibliography: Moldenke, Phytologia 20: 413. 1970.

ERIOCAULON KUSIROENSE Miyabe & Kudo ex Satake, Journ. Jap. Bot. 15: 629—630. 1939.

Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 263, 266, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266 & 270. 1965; Moldenke, Phytologia 20: 413. 1970; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 494, 504, 511, & 937. 1971.

ERIOCAULON KWANTUNGENSE Ruhl., Notizbl. Bot. Gart. Berlin 10: 1042. 1930.

Additional bibliography: Moldenke, Phytologia 18: 255—256. 1969; Moldenke, Fifth Summ. 1: 289 (1971) and 2: 504. 1971.

ERIOCAULON LACUSTRE Ruhl. in Fedde, Repert. Spec. Nov. 22: 33. 1925.

Additional bibliography: Moldenke, Phytologia 20: 413. 1970; Moldenke, Fifth Summ. 1: 96 (1971) and 2: 937. 1971.

ERIOCAULON LANATUM H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 137—139, pl. 8, fig. 1, 2, & 4. 1955.

Additional bibliography: Moldenke, Phytologia 20: 413—414. 1970; Moldenke, Biol. Abstr. 52: 5935. 1971; Hocking, Excerpt. Bot. A.19: 43. 1971; Moldenke, Fifth Summ. 1: 243 (1971) and 2: 937. 1971.

ERIOCAULON LANCEOLATUM Miq. ex Steud., Syn. Pl. Glum. 2: [Cyp.] 271—272. 1855.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 21: 428. 1971; Moldenke, Fifth Summ. 1: 275 (1971) and 2: 505, 506, & 937. 1971.

ERIOCAULON LANCEOLATUM var. PILOSUM Moldenke, Phytologia 3: 164. 1949.

Additional bibliography: Moldenke, Phytologia 18: 257. 1969;

Moldenke, Fifth Summ. 1: 275 (1971) and 2: 937. 1971.

ERIOCAULON LANIGERUM H. Lecomte, Journ. de Bot. 21: 109. 1908.
Additional bibliography: Moldenke, Fifth Summ. 1: 301 (1971) and 2: 937. 1971; Moldenke, Phytologia 19: 73 (1971) and 20: 95. 1970.

ERIOCAULON LAOSENSE Moldenke, Phytologia 3: 309. 1950.
Additional bibliography: Moldenke, Phytologia 18: 258 & 434. 1969; Moldenke, Fifth Summ. 1: 301 (1971) and 2: 937. 1971.

ERIOCAULON LASIOLEPIS Ruhl. in Engl., Pflanzenreich 13 (4-30): 86. 1903.
Additional bibliography: Moldenke, Phytologia 21: 274. 1971; Moldenke, Fifth Summ. 1: 305 (1971) and 2: 546 & 937. 1971.

ERIOCAULON LATIFOLIUM J. Sm. in Rees, Cycl. 13: Eriocaulon. 1809.
Additional bibliography: Gledhill, Check List Flow. Pl. Sierra Leone 31. 1962; Moldenke, Phytologia 21: 274. 1971; Moldenke, Fifth Summ. 1: 210, 216, 218, 219, & 230 (1971) and 2: 494, 510, 571, 572, & 937. 1971.

ERIOCAULON LATIFOLIUM f. PROLIFERUM Moldenke, Résumé Suppl. 4: 6, nom. nud. (June 5, 1962); Phytologia 8: 387. December 10, 1962.
Additional bibliography: Moldenke, Phytologia 18: 259 (1969) and 20: 29. 1970; Moldenke, Fifth Summ. 1: 214 (1971) and 2: 937. 1971.

ERIOCAULON LAXIFOLIUM Körn., Linnaea 27: 600. 1856.
Additional bibliography: Moldenke, Phytologia 21: 274. 1971; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 504, 585, & 937. 1971.

ERIOCAULON LEPIDUM Koyama, Philip. Journ. Sci. 84: 371—372, pl. 3. 1956.
Additional bibliography: Moldenke, Phytologia 18: 260. 1969; Moldenke, Fifth Summ. 1: 296 (1971) and 2: 937. 1971.

ERIOCAULON LEPTOPHYLLUM Kunth, Enum. Pl. 3: 549. 1841.
Additional bibliography: Moldenke, Phytologia 21: 428—429. 1971; Moldenke, Fifth Summ. 1: 149, 189, & 195 (1971) and 2: 493, 504, 593, 636, & 937. 1971.
Krapovickas and his associates found this plant growing "en pantano, al borde de una isleta de selva", but misidentified it as E. crassiscapum Bong.
Additional citations: BRAZIL: Minas Gerais: Irwin, Onishi, Fonsêca, Souza, Reis dos Santos, & Ramos 25641 (N). ARGENTINA: Corrientes: Krapovickas, Cristóbal, Arbo, Maruñak, Maruñak, & Irigoyen 17252 (Rf).

ERIOCAULON LEUCOGENES Ridl., Trans. Linn. Soc. Lond. Bot., ser. 2,

9: 240. 1916.
Additional bibliography: Moldenke, Phytologia 21: 274. 1971; Moldenke, Fifth Summ. 1: 324 & 336 (1971) and 2: 937. 1971.

ERIOCAULON LEUCOMELAS Steud., Nom. Bot., ed. 2, 1: 585. 1840.
Additional & emended bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Kammathy, Rao, & Rao, Bull. Bot. Surv. India 9: 209 & 232. 1967; Moldenke, Phytologia 20: 15. 1970; Moldenke, Fifth Summ. 1: 275 & 283 (1971) and 2: 501, 503, 505, 507, & 937. 1971; Moldenke, Phytologia 23: 422. 1972.
Fyson (1919) implies that his fig. 2 represents this species, but its legend states definitely that it is meant to illustrate E. quinquangulare L.

ERIOCAULON LIGULATUM (Vell.) L. B. Sm., Contrib. Gray Herb., ser. 2, 124: 5. 1939 [not E. ligulatum Bong., 1959].
Additional synonymy: Eriocaulon elichrysoides Kunth apud Körn. in Mart., Fl. Bras. 3 (1): 482—483, in syn. 1863 [not E. elichrysoides Bong., 1831]. Eriocaulon kunthii Körn. in Mart., Fl. Bras. 3 (1): 482—483. 1863. Eriocaulon kunthii var. α Körn. in Mart., Fl. Bras. 3 (1): 482—483. 1863. Eriocaulon kunthii var. β Körn. in Mart., Fl. Bras. 3 (1): 482—483. 1863. Eriocaulon kunthii var. γ Körn. in Mart., Fl. Bras. 3 (1): 482—483. 1863. Eriocaulon kunthii var. j Körn. ex Alv. Silv., Fl. Mont. 1: [397] & 398. 1928. Eriocaulon callocephalum Alv. Silv. ex Moldenke, Résumé Suppl. 1: 16, in syn. 1959.
Additional & emended bibliography: Bong., Mém. Acad. Imp. Sci. St. Pétersb., sér. 6, 1: 631 (1831) and 3: 559, pl. 27. 1840; Kunth, Enum. Pl. 3: 525, 546, & 575. 1841; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 804, 878, & 879. 1893; Ruhl. in Engl., Pflanzenreich 13 (4-30): 41, 44—46, 285, 286, & 288. 1903; Wettst., Veg. Südbras. 54, pl. 56 & 57. 1904; Wettst., Handb. Syst. Bot., ed. 2, 814. 1911; Alv. Silv., Fl. Mont. 1: [397] & 398. 1928; Ruhl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 49. 1930; Stapf, Ind. Lond. 3: 90. 1930; A. Castell. in Descole, Gen. & Sp. Pl. Argent. 3: 82 & [103]. 1945; Moldenke, Known Geogr. Distrib. Erioc. 8, 30, 34, 36, & 41. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 804, 878, & 879. 1946; Moldenke, Phytologia 2: 494. 1948; Moldenke, Alph. List Cit. 3: 731 & 732. 1949; Moldenke, Phytologia 3: 328. 1950; Moldenke, Résumé 89, 218, 281, 287, 289, 481, & 483. 1959; Moldenke, Résumé Suppl. 1: 16 & 17 (1959) and 2: 5. 1960; Rennó, Levant. Herb. Inst. Agron. 68 & 69. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 804, 878, & 879. 1960; Hocking, Excerpt. Bot. A.4: 592. 1962; Moldenke, Phytologia 18: 87, 177, 253—255, 265, 266, 276, & 277 (1969) and 19: 72. 1969; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 172, 173, 187, 189, & 191. 1969; Reitz, Sellowia 22: 51. 1970; Moldenke, Phytologia 19: 341 (1970), 20: 413 (1970), and 21: 274. 1971; Moldenke, Fifth Summ. 1: 149, 362, & 482 (1971) and 2: 515 & 937. 1971; Moldenke, Phytologia 23: 430. 1972.

Illustrations: Wettst., Veg. Südbras. pl. 56 & 57. 1904; Wettst., Handb. Syst. Bot., ed. 2, 814. 1911.

My respected colleague and friend, Dr. Lyman B. Smith, has recently made very careful studies of this plant, with comparisons of type material, and has come to the conclusion that E. kunthii Körn., E. vaginatum Körn., and E. ligulatum are all conspecific. In a letter to me, dated October 21, 1971, he says, in part: "I have just received the loan of Eriocaulon kunthii from Berlin.... 5 sheets including the type and some detail sketches of the flowers. For a moment I thought that 'receptaculum pilosum' for E. kunthii and 'receptaculum glabrum' for E. vaginatum would give a basis [for separation], but our isotype of E. kunthii has the receptacle pilose. The sketches and the flowers themselves are no better. There is no way of distinguishing the two that I can find." In view of these findings, my previously expressed opinion about the validity of both species will have to be changed and all the notes and citations given by me in previous installments of this work under E. kunthii will now have to be shifted to E. ligulatum.

Material of E. ligulatum, in this new expanded sense, has been found growing at altitudes of 800 to 1500 meters, flowering from September to December, fruiting in September, October, December, and January. The Hemmendorff collection, cited below, does not actually indicate on its labels that it came from cultivated material, but the labels do say that it was collected in the Horto Florestal at Cantateira, São Paulo, not far from the city of São Paulo itself in the initial portions of the Mantiquera Mountains, so I am assuming that it was from cultivated material originally from Minas Gerais. The Irwin, Harley, & Onishi 29319 collection, cited below, was gathered with the "inflorescences dried and deteriorating" and the specimen seen by me is totally lacking in any flowers or fruit, so identification cannot be certain. It is described as a "rosette herb", growing in gray sandy soil on a wet campo (brejo) in an area of campo and gallery margin with outcrops.

Additional & emended citations: BRAZIL: Minas Gerais: Black 51-11001 (Z); A. Castellanos 24179 [Herb. Cent. Pesq. Florest. 2951] (An, Rf); Dusén 2045 (S, S); Glaziou 6742 [Macbride photos 22275] (N--photo, W--photo); Hemmendorff 468, in part (N, S); Irwin, Harley, & Onishi 29319 (Ld); R. S. Santos s.n. [12.9.63] (Bd--28326); Santos & Castellanos 24179 [Herb. Brad. 28327] (N); Sellow B.1290 (Br), B.1290 C.263 (B, B, B); A. Silveira 2939 (B); Stephan s.n. [Congonhas do Campo, 1843] (Br, N); Ule s.n. [Herb. Mus. Nac. Rio Jan. 28] (S). Paraná: Braga s.n. [28/8/59; Herb. Inst. Hist. Nat. 5271] (Mm); Dombrowski & Saito 350/159 (Ac); Hatschbach 7303 (Ca), 22965 (Ac, N), 24920 (Rf); Moure s.n. [Remessa 19, Número 1; 24-9-52] (Ft). Rio Grande do Sul: Bornmüller 591 (Mu--412, Mu--413); Friedrichs 30570 (S), 30670 (N, S); Gaudichaud 262 (P); Rambo 36785 (S), 52183 (S); Saint Hilaire C².1805 (P, P, P). Santa Catarina: Reitz & Klein 4794 (W--2268931); Smith & Klein 7351 (N, W--2251268, Z), 8242 (Ok, W--2251365). São Paulo: L. Riedel 2388 (B); Segadas-Vianna 3123 (Sm). CULTIVATED: Brazil: Hemmendorff 468, in part (N, S). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B).

ERIOCAULON LINEARE Small, Fl. SE. U. S., ed. 1, 236 & 1328. 1903.
Additional bibliography: Hotchkiss, Bur. Sports Fish. & Wildlife U. S. Dept. Int. Res. Publ. 33:[Underw. & Float. Pl.] 25. 1967; Moldenke, Phytologia 21: 275. 1971; Cusick, Castanea 35: 323. 1971; Moldenke, Fifth Summ. 1: 26, 28, 31, & 32 (1971) and 2: 504 & 937. 1971; Hotchkiss, Common Marsh Underw. & Float. Pl. [2]: 25. 1972; A. L. Moldenke, Phytologia 24: 359. 1972.
I suspect that the records for Eriocaulon texense Körn. given by Cusick (1970) from Washington County, Alabama, and from George and Jackson Counties, Mississippi, actually refer to E. lineare.
It should be noted that Hotchkiss (1967) reduces E. lineare to what he calls E. septangulare With. [now known as E. pellucidum Michx. on this continent and E. aquaticum (J. Hill) Druce in Europe], but with this disposition I cannot agree.

ERIOCAULON LINEARIFOLIUM Körn., Linnaea 27: 601. 1856.
Additional bibliography: Moldenke, Phytologia 21: 275. 1971; Moldenke, Fifth Summ. 1: 149 & 182 (1971) and 2: 937. 1971.
Additional citations: BRAZIL: Mato Grosso: Hatschbach & Guimarães 24560 (N).

ERIOCAULON LIVIDUM F. Muell., Fragm. 1: 92. 1859.
Additional bibliography: Moldenke, Phytologia 19: 342 & 445. 1970; Moldenke, Fifth Summ. 1: 346 (1971) and 2: 937. 1971.

ERIOCAULON LONGICUSPE Hook. f., Fl. Brit. India 6: 573. 1893.
Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 21: 275. 1971; Moldenke, Fifth Summ. 1: 281 (1971) and 2: 504, 505, 774, & 937. 1971.

ERIOCAULON LONGIPEDUNCULATUM H. Lecomte, Not. Syst. 2: 380. 1913.
Additional bibliography: Moldenke, Phytologia 21: 275. 1971; Moldenke, Fifth Summ. 1: 341 (1971) and 2: 504 & 937. 1971.

ERIOCAULON LONGIPETALUM Rendle, Cat. Afr. Pl. Welw. 2 (1): 96--97. 1899.
Additional bibliography: Moldenke, Phytologia 19: 342. 1970; Moldenke, Fifth Summ. 1: 243 (1971) and 2: 973. 1971.

ERIOCAULON LONGIROSTRUM Alv. Silv. & Ruhl. ex Ruhl. in Engl., Pflanzenreich 13 (4-30): 113. 1903.
Additional bibliography: Moldenke, Phytologia 21: 275. 1971; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 505, 585, & 937. 1971.

ERIOCAULON LUZULAEFOLIUM Mart. in Wall., Pl. Asiat. Rar. 3: 28. 1832.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50 & 52. 1919; Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 158. 1971; Moldenke, Fifth Summ. 1: 269, 270, 275, 281, 283, 296, & 301 (1971) and 2: 505 & 937. 1971; Moldenke, Phytologia 21: 429 (1971) and 23: 422. 1972.

Charoenphol and his associates found this plant growing with Juncus along a stream in an evergreen forest, at 700 meters altitude, in Thailand.

Thwaites & Hooker (1864) have suggested that E. trilobum Hamilt. might be conspecific with E. luzulaefolium, but I regard Hamilton's name as belonging in the synonymy of E. sollyanum Royle instead.

Dr. Cook has found E. luzulaefolium growing in shallow water and on wet mud at the edge of rice fields, locally abundant, about 2 km. west of Gréggio and 2 km. north of Villarboit, soutn of the Autostrada, in the province of Piemonte, in northern Italy. He asserts that it has been growing here for at least the past thirteen years. He regarded it as E. cinereum R. Br., but it seems to me that it comes closer to E. luzulaefolium. It is possible that the California material hitherto uniformly regarded as E. cinereum may, on re-examination, also prove to represent E. luzulaefolium. It certainly should be re-studied.

Datta & Majumdar (1966) describe E. luzulaefolium as a "Perennial herb, found in rice-fields and wet places. Leaves pale gray-green, opaque. Head hemispheric, grey. Receptacle villous. Floral bracts densely hairy......Distributed in the tropics."

Additional citations: ITALY: Cook & Rix 45 (Ld, Z). THAILAND: Charoenphol, Larsen, & Warncke 4365 (Ac).

ERIOCAULON MACROBOLAX Mart. ex Körn., Linnaea 27: 599, nom. nud. (1856); Mart., Fl. Bras. 3 (1): 484--485, pl. 62, fig. 3. 1863.

Additional bibliography: Moldenke, Phytologia 21: 275. 1971; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 505, 585, & 938. 1971.

ERIOCAULON MACROPHYLLUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 77. 1903.

Additional bibliography: Moldenke, Phytologia 20: 12 & 14. 1970; Moldenke, Fifth Summ. 1: 324 (1971) and 2: 495 & 938. 1971.

ERIOCAULON MACULATUM Schinz, Bull. Herb. Boiss., sér. 2, 6: 709. 1906.

Additional bibliography: Moldenke, Phytologia 18: 275. 1969; Moldenke, Fifth Summ. 1: 256 (1971) and 2: 938. 1971.

ERIOCAULON MADAGASCARIENSE Moldenke, Phytologia 3: 414. 1951.

Additional bibliography: Moldenke, Phytologia 18: 275. 1969; Moldenke, Fifth Summ. 1: 261 (1971) and 2: 938. 1971.

ERIOCAULON MAGNIFICUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 48. 1903.

Additional & emended bibliography: Rambo, Sellowia 6: 130, 156, & 158. 1954; Reitz, Sellowia 22: 51. 1970; Moldenke, Phytologia 21: 276. 1971; Hocking, Excerpt. Bot. A.18: 444. 1971; Moldenke, Fifth Summ. 1: 149 & 362 (1971) and 2: 938. 1971.

Additional citations: BRAZIL: Santa Catarina: Ule 1689 (N--photo of isotype).

ERIOCAULON MAGNIFICUM var. GOYAZENSE Moldenke, Phytologia 18: 342. 1969.

Additional bibliography: Moldenke, Phytologia 21: 276. 1971; Hocking, Excerpt. Bot. A.18: 444. 1971; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 938. 1971.

ERIOCAULON MAGNUM Abbiatti, Rev. Mus. La Plata Bot., ser. 2, 6: 323--326, fig. 2 & 3, pl. 1. 1946.

Additional bibliography: Moldenke, Phytologia 21: 276. 1971; Moldenke, Fifth Summ. 1: 185 & 195 (1971) and 2: 493 & 938. 1971.

Additional citations: ARGENTINA: Corrientes: Irigoyen 45 (Rf).

ERIOCAULON MAJUSCULUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 44--45, fig. 6. 1903.

Additional bibliography: Moldenke, Phytologia 19: 77. 1969; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 505 & 938. 1971.

Recent collectors have found this plant growing at 2400 meters altitude, flowering and fruiting in July. The Eitens found it along a road on a planalto of steep hilly terrain, at 2300 meters altitude, in an area of many hills topped with mountainous outcrops of bare sienite quartz, the hillsides with frequent rounded outcropping quartz rocks and boulders and a thin black almost pure humus soil supporting a periodically burned natural tussock sedge-grassland with scattered low Chusquea bamboo and occasionally other shrubs, the lower valley sides with dense Chusquea brakes or brooks lined with a marsh of Cladium in tussocks, this plant growing in soaking soil of the brooksides, with its flowerheads grayish-white. [I want to take this occasion to compliment Dr. and Mrs. Eiten again on the painstaking care with which they prepare the printed labels for their plant collections and the most valuable detailed ecologic notes included on them. Would that there were more collectors like this!]

Additional citations: BRAZIL: Rio de Janeiro: Eiten & Eiten 6642 (Rf); Strang & Castellanos 26129 [Herb. Brad. 49652] (Rf).

ERIOCAULON MALAISSEI Moldenke, Phytologia 19: 343--345, pl. 1. 1970.

Additional bibliography: Moldenke, Biol. Abstr. 51: 9023. 1970; Moldenke, Phytologia 21: 276. 1971; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1970: 25. 1971; Moldenke, Fifth Summ. 1: 230 (1971) and 2: 938. 1971.

ERIOCAULON MALAISSEI f. VIVIPARUM Moldenke, Phytologia 19: 345--346. 1970.

Additional bibliography: Moldenke, Biol. Abstr. 51: 9023. 1970; Moldenke, Phytologia 21: 276. 1971; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Index 1970: 25. 1971; Moldenke, Fifth Summ. 1: 230 (1971) and 2: 938. 1971.

ERIOCAULON MANFEËNSE Meikle, Kew Bull. 22: 141--142. 1968.
Additional bibliography: Moldenke, Phytologia 19: 77. 1969; C. C. Townsend, Excerpt. Bot. A.15: 418. 1970; Moldenke, Fifth Summ. 1: 224 (1971) and 2: 938. 1971.

ERIOCAULON MANNII N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 241. 1901.
Additional bibliography: Moldenke, Phytologia 19: 346. 1970; Moldenke, Fifth Summ. 1: 226 & 243 (1971) and 2: 938. 1971.

ERIOCAULON MARGARETAE Fyson, Journ. Indian Bot. 1: 50, hyponym (1919) and 2: 316. 1921.
Additional bibliography: Cherian & Pataskar, Bull. Bot. Surv. India 11: 395. 1969; Moldenke, Phytologia 19: 346. 1970; Moldenke, Fifth Summ. 1: 275 (1971) and 2: 938. 1971.
Cherian & Pataskar (1969) encountered a few of these plants in marshy areas "near nala" in Kumbhala, India, flowering and fruiting in September, and cite their no. 111567.

ERIOCAULON MATOPENSE Rendle, Journ. Linn. Soc. Lond. Bot. 37: 475. 1906.
Additional bibliography: Moldenke, Phytologia 21: 276. 1971; Moldenke, Fifth Summ. 1: 248 (1971) and 2: 492 & 938. 1971.

ERIOCAULON MEGAPOTAMICUM Malme, Arkiv Bot. Stockh. 26A (9): 8. 1935.
Additional & emended bibliography: Rambo, Sellowia 6: 130 & 156--158. 1954; Reitz, Sellowia 13: 53. 1961; Moldenke, Phytologia 18: 276 & 279. 1969; Reitz, Sellowia 22: 51. 1970; Moldenke, Fifth Summ. 1: 149 (1971) and 2: 938. 1971.

ERIOCAULON MEIKLEI Moldenke, Phytologia 3: 164--165. 1949.
Additional bibliography: Moldenke, Phytologia 18: 279. 1969; Moldenke, Fifth Summ. 1: 214 (1971) and 2: 938. 1971.

ERIOCAULON MELANOCEPHALUM Kunth, Enum. Pl. 3: 549. 1841.
Additional & emended bibliography: J. A. Steyerm., Act. Bot. Venez. 1: 195. 1966; Hocking, Excerpt. Bot. A.16: 40. 1970; Moldenke, Phytologia 21: 276--277. 1971; Moldenke, Fifth Summ. 1: 96, 116, 123, 129, 133, & 150 (1971) and 2: 493, 495, 546, 586, & 938. 1971.

ERIOCAULON MELANOCEPHALUM var. LONGIPES Griseb., Cat. Pl. Cub. 226. 1866.
Additional bibliography: Moldenke, Phytologia 21: 277. 1971; Moldenke, Fifth Summ. 1: 96 (1971) and 2: 938. 1971.

ERIOCAULON MELANOCEPHALUM ssp. USTERIANUM Beauverd, Bull. Herb. Boiss., sér. 2, 8: 284—287, fig. 9 B 15—27. 1908.

Additional bibliography: Moldenke, Phytologia 21: 277. 1971; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 515 & 938. 1971.

ERIOCAULON MELANOLEPIS Alv. Silv., Arch. Mus. Nac. Rio Jan. 23: 163. 1921.

Additional bibliography: Moldenke, Phytologia 18: 302. 1969; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 938. 1971.

ERIOCAULON MERRILLII Ruhl. ex J. R. Perkins, Fragm. Fl. Philipp. 1: 136. 1904.

Additional bibliography: Moldenke, Phytologia 21: 277. 1971; Moldenke, Fifth Summ. 1: 301, 316, & 324 (1971) and 2: 505, 513, & 938. 1971.

ERIOCAULON MESANTHEMOIDES Ruhl. in Engl., Bot. Jahrb. 27: 79. 1899.

Additional bibliography: Moldenke, Phytologia 21: 277. 1971; Moldenke, Fifth Summ. 1: 237 & 249 (1971) and 2: 938. 1971.

ERIOCAULON MEXICANUM Moldenke, N. Am. Fl. 19: 33. 1937.

Additional bibliography: Moldenke, Phytologia 21: 277. 1971; Moldenke, Fifth Summ. 1: 69 (1971) and 2: 938. 1971.

ERIOCAULON MICROCEPHALUM H.B.K., Nov. Gen. & Sp. Pl., ed. quarto, 1: 253 (1816) & ed. folio, 1: 201—202. 1816.

Additional bibliography: Dwyer, Raymondiana 4: 27. 1971; Moldenke, Phytologia 21: 277. 1971; Moldenke, Fifth Summ. 1: 64, 69, 87, 116, 136, & 140 (1971) and 2: 506, 509, 592, & 938. 1971; Soukup, Biota 9: 19. 1972.

Rzedowski describes the flower-heads of this plant as "whitish" and found it growing "en lugar pantanoso" and on a "ladera andesítica con vegetación de bosque de Pinus hartwegii". Dwyer (1971) cites Woytkowski 6204 from San Martín, Peru.

Additional citations: MEXICO: Hidalgo: J. Rzedowski 26759 (Mi). México: J. Rzedowski 25963 (Mi).

ERIOCAULON MIKAWANUM Satake & Koyama, Journ. Jap. Bot. 30: 114—116. 1955.

Additional bibliography: Moldenke, Phytologia 21: 277—278. 1971; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 506, 513, & 938. 1971.

ERIOCAULON MILHOENSE Herzog in Fedde, Repert. Spec. Nov. 29: 204—205, pl. 120, fig. a—d. 1931.

Additional bibliography: Moldenke, Phytologia 19: 79. 1969; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 938. 1971.

ERIOCAULON MINIMUM Lam., Tabl. Encycl. Méth. 1: 213. 1791.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919;

Moldenke, Phytologia 20: 14--15 & 23 (1970) and 21: 428. 1971; Moldenke, Fifth Summ. 1: 268, 275, & 281 (1971) and 2: 512, 515, & 938. 1971; Moldenke, Phytologia 24: 339 & 350. 1972.

ERIOCAULON MINUSCULUM Moldenke, Phytologia 8: 159. 1962.

Additional bibliography: Moldenke, Phytologia 21: 278. 1971; Moldenke, Fifth Summ. 1: 289 (1971) and 2: 938. 1971.

ERIOCAULON MINUTISSIMUM Ruhl. in Fedde, Repert. Spec. Nov. 22: 32. 1925.

Additional bibliography: Moldenke, Phytologia 21: 278. 1971; Moldenke, Fifth Summ. 1: 96 (1971) and 2: 938. 1971.

ERIOCAULON MINUTUM Hook. f., Fl. Brit. India 6: 579—580. 1893.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50, 51, & 53, fig. 6. 1919; Billore & Hemadri, Bull. Bot. Surv. India 11: 345. 1969; Moldenke, Phytologia 21: 428 & 429. 1971; Moldenke, Fifth Summ. 1: 268 & 275 (1971) and 2: 938. 1971.

Additional illustrations: Fyson, Journ. Indian Bot. 1: 51, fig. 6. 1919.

Billore & Hemadri (1969) encountered this plant on the top of a "ghat" at Sadrya and at the Kedarnath temple, in India, citing their nos. 115482 & 115563.

ERIOCAULON MIQUELIANUM Körn. in Miq., Ann. Mus. Bot. Lugd. Bat. 3: 162--163. 1867.

Additional & emended bibliography: Satake, Bot. Mag. Tokyo 51: 288 & 290 [Shib. Comm. Art. 17: 106 & 108]. 1937; Ohwi, Fl. Jap., [Jap. ed.], 263, 266, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266, 268, & 269. 1965; Moldenke, Phytologia 21: 429. 1971; Moldenke, Fifth Summ. 1: 310, 312, & 424 (1971) and 2: 506, 510, & 938. 1971.

ERIOCAULON MIQUELIANUM var. ATROSEPALUM Satake, Journ. Jap. Bot. 15: 629. 1939.

Additional bibliography: Moldenke, Phytologia 21: 278. 1971; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 938. 1971.

ERIOCAULON MIQUELIANUM var. INVOLUCRATUM Nakai, Bot. Mag. Tokyo 24: 6. 1910.

Additional bibliography: Moldenke, Phytologia 21: 429. 1971; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 506 & 938. 1971.

ERIOCAULON MIQUELIANUM var. LUTCHUENSE (Koidz.) Koyama in Ohwi, Fl. Jap., [Engl. ed.], 268. 1965.

Additional bibliography: Moldenke, Phytologia 21: 429. 1971; Moldenke, Fifth Summ. 1: 312 (1971) and 2: 505, 513, 938, & 972. 1971.

ERIOCAULON MISERRIMUM Ruhl. in Fedde, Repert. Spec. Nov. 22: 30. 1925.

Additional bibliography: Moldenke, Phytologia 21: 278. 1971;

Moldenke, Fifth Summ. 1: 98 (1971) and 2: 938. 1971.

ERIOCAULON MISERUM Körn., Linnaea 27: 607--608. 1856.
Additional bibliography: Fyson, Journ. Indian Bot. 1: 52. 1919; Moldenke, Phytologia 21: 278. 1971; Moldenke, Fifth Summ. 1: 268, 270, & 275 (1971) and 2: 497 & 938. 1971.

ERIOCAULON MISSIONUM Castell. in Descole, Gen. Sp. Pl. Argent. 3: 88--90, pl. 18, fig. A. 1945.
Additional bibliography: Moldenke, Phytologia 21: 278. 1971; Moldenke, Biol. Abstr. 52: 9948. 1971; Moldenke, Fifth Summ. 1: 195 (1971) and 2: 938. 1971.

ERIOCAULON MITOPHYLUM Hook. f., Fl. Brit. India 6: 575. 1893.
Additional bibliography: Fyson, Journ. Indian Bot. 1: 52. 1919; Moldenke, Phytologia 18: 313--314. 1969; Moldenke, Fifth Summ. 1: 268 & 275 (1971) and 2: 506 & 938. 1971.

ERIOCAULON MODESTUM Kunth, Enum. Pl. 3: 547. 1841.
Additional bibliography: Reitz, Sellowia 22: 51. 1970; Moldenke, Phytologia 21: 429. 1971; Moldenke, Fifth Summ. 1: 150 & 189 (1971) and 2: 503, 506, 509, 517, & 938. 1971; Moldenke, Biol. Abstr. 53: 5252. 1972; Anon., Biol. Abstr. 53 (10): B.A.S.I.C. S.85. 1972.
The Ratter, Richards, & Argent R.487, distributed as E. modestum, is actually E. neglectum Ruhl.

ERIOCAULON MODESTUM var. BREVIFOLIUM Moldenke, Phytologia 21: 417. 1971.
Additional bibliography: Moldenke, Phytologia 21: 429. 1971; Moldenke, Fifth Summ. 2: 938 & 968. 1971; Anon., Biol. Abstr. 53 (10): B.A.S.I.C. S.85. 1972; Moldenke, Biol. Abstr. 53: 5252. 1972.
Irwin and his associates describe this plant as a rosette herb, the inflorescences one to few [per plant], to 40 cm. tall, and the flower-heads white. They found it growing on a campo in an area of gallery forest and adjacent wet campo (brejo) at about 1250 m. altitude, flowering in March.
Additional citations: BRAZIL: Distrito Federal: Irwin, Souza, & Reis dos Santos 11677 (N). Goiás: Irwin, Grear, Souza, & Reis dos Santos 13498 (N); Irwin, Harley, & Smith 32195 (Ld).

ERIOCAULON MODESTUM f. GRANDIFLORUM Herzog ex Moldenke, Known Geogr. Distrib. Erioc. 8, nom. nud. 1946.
Additional bibliography: Moldenke, Phytologia 19: 80. 1969; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 506 & 938. 1971.

ERIOCAULON MODESTUM f. RIGIDIFOLIUM Herzog in Luetzelburg, Estud. Bot. Nordéste 3: 147 & 150, hyponym [as "rigidifolia"]. 1923.
Additional bibliography: Moldenke, Phytologia 19: 80--81. 1969; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 506 & 938. 1971.

ERIOCAULON MODESTUM f. VIVIPARUM Herzog in Luetzelburg, Estud. Bot.

Nordéste 3: 147, 149, & 150, hyponym [as "vivipara"]. 1923.
Additional bibliography: Moldenke, Phytologia 19: 80 & 81. 1969; Moldenke, Fifth Summ. 1: 150 & 189 (1971) and 2: 506 & 938. 1971.

ERIOCAULON MOKALENSE Moldenke, Phytologia 3: 414--415. 1951.
Additional bibliography: Moldenke, Phytologia 18: 319. 1969; Moldenke, Fifth Summ. 1: 261 (1971) and 2: 938. 1971.

ERIOCAULON MOLINAE L. O. Williams, Fieldiana Bot. 31: 255--256. 1967.
Additional bibliography: Moldenke, Fifth Summ. 1: 83 (1971) and 2: 939. 1971; Moldenke, Phytologia 21: 429 (1971) and 23: 414 & 416. 1972.
McVaugh describes this plant as having gray flower-heads, growing abundantly in mud which was recently submerged in muddy water-filled depressions in level grasslands, at an altitude of 2100--2200 meters, flowering and fruiting in November.
Additional citations: MEXICO: Jalisco: R. McVaugh 24384 (Mi).

ERIOCAULON MONOCOCCOS Nakai in Matsumura, Icon. Pl. Koisikav. 2: 35--36, pl. 102. 1914.
Additional synonymy: Eriocaulon miquelianum var. monococcon (Nakai) Koyama in Ohwi, Fl. Jap., [Engl. ed.], 269. 1965.
Additional & emended bibliography: Nakai in Matsumura, Icon. Pl. Koisikav. 2: 35--36, pl. 102. 1914; Ohwi, Fl. Jap., [Jap. ed.], 262, 264, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 269. 1965; Moldenke, Phytologia 21: 429--430. 1971; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 506 & 939. 1971.
Koyama (1965) records the vernacular variant "ezo-hoshi-kusa" for this plant, describes it as very slender, the receptacle glabrous, and the pistillate florets with a unilocular ovary and single stigma, and reports it as scarce in peaty soil on Hokkaido and Honshu [Yamato Province] islands, Japan.

ERIOCAULON MONOCOCCOS var. LATIFOLIUM Nakai in Matsumura, Icon. Pl. Koisikav. 2: 35--36. 1914.
Additional & emended bibliography: Nakai in Matsumura, Icon. Pl. Koisikav. 2: 35--36. 1914; Moldenke, Phytologia 18: 319. 1969; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 506 & 939. 1971.
Nakai (1914) describes this variety as "Folia latiore supra basin 6 mm. lata. Bracteae involucrantes plus minus dilatatae. Habitat in eodem loco supra citato [Tusikavi, Yeso]." This locality is on Hokkaido island, Japan.

ERIOCAULON MONODII Moldenke, Phytologia 3: 165--166. 1949.
Additional bibliography: Moldenke, Phytologia 18: 319--320. 1969; Moldenke, Fifth Summ. 1: 214 (1971) and 2: 939. 1971.

ERIOCAULON MONOSCAPUM F. Muell., Fragm. 1: 94--95. 1859.
Additional bibliography: Moldenke, Phytologia 18: 320. 1969;

Moldenke, Fifth Summ. 1: 346 (1971) and 2: 939. 1971.

ERIOCAULON MONTANUM Van Royen, Nov. Guin., ser. 2, 10: 40—41, fig. 3 N. 1959.
Additional bibliography: Moldenke, Phytologia 21: 430. 1971; Moldenke, Fifth Summ. 1: 336 (1971) and 2: 939. 1971.

ERIOCAULON MUTATUM N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 256—257. 1901.
Additional bibliography: Moldenke, Phytologia 21: 430. 1971; Moldenke, Fifth Summ. 1: 237, 243, 246, 248, & 261 (1971) and 2: 493, 503, 506, 510, & 939. 1971.

ERIOCAULON NAKASIMANUM Satake, Journ. Jap. Bot. 15: 143. 1939.
Emended synonymy: Eriocaulon atrum var. nakasimanum (Satake) Koyama in Ohwi, Fl. Jap., [Engl. ed.], 270. 1965.
Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 263, 266, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 270. 1965; Moldenke, Phytologia 21: 430. 1971; Satake, Journ. Jap. Bot. 46: 110 & 111. 1971; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 494 & 939. 1971; Anon., Biol. Abstr. 54 (1): B.A.S.I.C. S.88. 1972; Moldenke, Phytologia 24: 344. 1972.
Satake (1971) avers that this species resembles E. nasuense Satake and E. atrum Nakai.

ERIOCAULON NAKASIMANUM var. SUPERANS Satake, Bull. Tokyo Sci. Mus. 4: 54. 1940.
Additional bibliography: Moldenke, Phytologia 18: 322. 1969; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 939. 1971.

ERIOCAULON NAKAYENSE Koyama, Philip. Journ. Sci. 84: 372—373, pl. 2, fig. 1, & pl. 5, fig. A. 1956.
Additional bibliography: Moldenke, Phytologia 18: 322. 1969; Moldenke, Fifth Summ. 1: 296 (1971) and 2: 939. 1971.

ERIOCAULON NANELLUM Ohwi, Bot. Mag. Tokyo 44: 566. 1930.
Emended synonymy: Eriocaulon nanellum var. nanellum Koyama in Ohwi, Fl. Jap., [Engl. ed.], 270. 1965.
Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 263, 266, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266 & 270. 1965; Moldenke, Phytologia 21: 430 & 432. 1971; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 507 & 939. 1971.

ERIOCAULON NANELLUM var. ALBESCENS Satake, Journ. Jap. Bot. 15: 630. 1939.
Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 263, 266, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 270. 1965; Moldenke, Phytologia 21: 430. 1971; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 507 & 939. 1971.

ERIOCAULON NANELLUM var. FILAMENTOSUM (Satake) Satake, Journ. Jap.

Bot. 15: 631. 1939.

Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 263, 266, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 270. 1965; Moldenke, Phytologia 21: 430--431. 1971; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 500, 507, & 939. 1971.

ERIOCAULON NANTOENSE Hayata, Icon. Pl. Formos. 10: 51, fig. 28. 1921.

Additional bibliography: Moldenke, Phytologia 19: 82. 1969; Moldenke, Fifth Summ. 1: 310 & 313 (1971) and 2: 507 & 939. 1971.

ERIOCAULON NANUM R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 254. 1810.

Additional bibliography: R. Schomb., Fl. S. Austral. 62. 1875; Moldenke, Phytologia 20: 15. 1970; Moldenke, Fifth Summ. 1: 346 (1971) and 2: 939. 1971; Moldenke, Phytologia 23: 425. 1972.

ERIOCAULON NASUENSE Satake, Journ. Jap. Bot. 46: 109--111, fig. 1 & 2. 1971.

Bibliography: Satake, Journ. Jap. Bot. 46: 109--111, fig. 1 & 2. 1971; "D. J. P.", Biol. Abstr. 54: 75. 1972; Anon., Biol. Abstr. 54 (1): B.A.S.I.C. S.88. 1972; Moldenke, Phytologia 24: 344. 1972.

Illustrations: Satake, Journ. Jap. Bot. 46: 109 & 110, fig. 1 & 2. 1971.

This species is based on B. Kawamura 271724, collected at Minami-Kanamabu, near Otawara City, Tochigi Prefecture, Honshu, Japan, on October 11, 1970, and is deposited in the herbarium of the Tokyo Natural History Museum. Satake (1971) notes that "This new species resembles *E. atrum* Nakai and *E. Nakasimanum* Satake, but the plant is more robust with densely tufted peduncles, and distinguishable from the former in having glabrous receptacles and female petals and from the latter by the entirely glabrous floral bracts and female calyces."

ERIOCAULON NAUTILIFORME H. Lecomte, Journ. de Bot. 21: 89 & 105--106, fig. 2 & 3. 1908.

Additional bibliography: Moldenke, Phytologia 19: 348. 1970; Moldenke, Fifth Summ. 1: 301 (1971) and 2: 939. 1971.

ERIOCAULON NEESIANUM Körn., Linnaea 27: 628--630. 1856.

Additional bibliography: Moldenke, Phytologia 21: 431. 1971; Moldenke, Fifth Summ. 1: 281 (1971) and 2: 514 & 939. 1971.

ERIOCAULON NEGLECTUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 59. 1903.

Additional bibliography: Moldenke, Phytologia 21: 431. 1971; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 939. 1971.

This species has been found growing on sand on a low islet in a river, flowering and fruiting in August. Material has been misidentified in herbaria as *E. modestum* Kunth and *Paepalanthus* sp.

Additional citations: BRAZIL: Mato Grosso: Ratter, Ramos, Richards, & Argent R.487 (N).

ERIOCAULON NEO-CALEDONICUM Schlecht. in Engl., Bot. Jahrb. 40, Beibl. 92: 20. 1908.

Additional bibliography: Moldenke, Phytologia 21: 431. 1971; Moldenke, Fifth Summ. 1: 341 (1971) and 2: 507 & 939. 1971.

Erdtman (1969) describes the pollen grains of this species as anomotreme and gives an illustration of a single grain.

ERIOCAULON NEPALENSE Prescott ex Bong., Mém. Acad. Imp. Sci. St. Pétersb., sér. 6, 1: 610. 1831.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Mitra, Elem. Syst. Bot. Angiosp., ed. 2 abrdg., 165. 1967; Moldenke, Phytologia 20: 15. 1970; Hocking, Excerpt. Bot. A.16: 40 (1970) and A.18: 444. 1971; Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 158 & 160. 1971; Moldenke, Fifth Summ. 1: 268, 270, 271, & 275 (1971) and 2: 507, 509, 516, 939, & 969. 1971.

ERIOCAULON NIGERICUM Meikle, Kew Bull. 1950: 231. 1950.

Additional bibliography: Moldenke, Phytologia 21: 431. 1971; Moldenke, Fifth Summ. 1: 210, 216, 219, & 222 (1971) and 2: 939. 1971.

ERIOCAULON NIGRICEPS Merr., Philip. Journ. Sci. Bot. 10: 290. 1915.

Additional bibliography: Moldenke, Phytologia 18: 350. 1969; Moldenke, Fifth Summ. 1: 316 (1971) and 2: 939. 1971.

ERIOCAULON NIGRUM H. Lecomte, Journ. de Bot. 21: 89 & 107--108. 1908.

Additional bibliography: Moldenke, Phytologia 21: 431. 1971; Moldenke, Fifth Summ. 1: 292 & 301 (1971) and 2: 503, 507, & 939. 1971.

ERIOCAULON NIGRUM var. FUSCESCENS Koyama, Philip. Journ. Sci. 84: 373, pl. 6, fig. E. 1956.

Additional bibliography: Moldenke, Phytologia 18: 350--351. 1969; Moldenke, Fifth Summ. 1: 301 (1971) and 2: 939. 1971.

ERIOCAULON NILAGIRENSE Steud., Syn. Pl. Glum. 2: [Cyp.] 271. 1855.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Bate-Sm., Journ. Linn. Soc. Lond. Bot. 60: 334. 1968; Blasco, Inst. Franç. Pond. Trav. Secc. Scient. & Techn. 10: 401. 1971; Moldenke, Fifth Summ. 1: 275, 281, 283, & 289 (1971) and 2: 495, 507, & 939. 1971; Moldenke, Phytologia 21: 431 (1971) and 23: 422. 1972.

ERIOCAULON NIPPONICUM Maxim., Diagn. Pl. Nov. Asiat. 8: 9--10. 1893.

Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 263 & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 265 & 266. 1965; Moldenke, Phytologia 21: 431--432. 1971; Satake, Journ. Jap. Bot. 46: 372. 1971; Moldenke, Fifth Summ. 1: 208, 289, 308, & 310 (1971) and 2: 498, 500, 507, & 939. 1971.

ERIOCAULON NIPPONICUM var. GLABERRIMUM Satake, Journ. Jap. Bot. 14: 264. 1938.
Additional bibliography: Moldenke, Phytologia 3: 144 (1949) and 18: 356--357. 1969; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 498 & 939. 1971.

ERIOCAULON NOSORIENSE Ohwi, Bot. Mag. Tokyo 44: 567. 1930.
Emended synonymy: Eriocaulon nanellum var. nosoriense (Ohwi) Ohwi & Koyama in Ohwi, Fl. Jap., [Engl. ed.], 270. 1965.
Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 263, 267, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 270. 1965; Moldenke, Phytologia 21: 430 & 432. 1971; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 507 & 939. 1971.

ERIOCAULON NOVOGUINEENSE Van Royen, Nov. Guin., ser. 2, 10: 41--42, fig. 5. 1959.
Additional bibliography: Moldenke, Phytologia 21: 432. 1971; Moldenke, Fifth Summ. 1: 336 (1971) and 2: 939. 1971.

ERIOCAULON NUDICUSPE Maxim., Diagn. Pl. Nov. Asiat. 8: 19--20. 1893.
Additional & emended bibliography: Ohwi, Fl. Jap., [Jap. ed.], 262, 265--266, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266 & 268. 1965; Moldenke, Phytologia 21: 432. 1971; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 517 & 939. 1971.

ERIOCAULON NUTANS F. Muell. ex R. Schomb., Fl. S. Austral. 62, nom. nud. 1875.
Bibliography: R. Schomb., Fl. S. Austral. 62. 1875; Moldenke, Phytologia 23: 425. 1972.
Nothing is known to me about this supposed species and I cannot find that it has ever been validly published with a description. It is not listed in the Index Kewensis nor any of its supplements.

ERIOCAULON OBCLAVATUM Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 158--159, fig. 11. 1971.
Bibliography: Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 158--159, fig. 11. 1971; Moldenke, Phytologia 23: 422. 1972.
Illustrations: Satake in Hara, Univ. Mus. Univ. Tokyo Bull. 2: 158, fig. 11. 1971.
Satake (1971) describes the type locality and type collection of the species as follows: "Nepal. Ghorwa-Sanichare, 300--200 m (H. Hara, H. Kanai, S. Kurusawa, G. Murata & M. Togashi, Dec. 10, 1963 -- holotype in TI)", and comments that "This plant is near to Eriocaulon Duthiei Hook. f., but differs from it by the sparsely pilose receptacle, involucral bracts longer than the head, acute

female sepals, and linear female petals. The plant resembles very much E. Sieboldianum in appearance, but has three female petals."

ERIOCAULON OBTUSUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 46. 1903.

Additional bibliography: Moldenke, Phytologia 18: 358 (1969) and 19: 102. 1969; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 939. 1971.

ERIOCAULON ODASHIMAI Masamune, Trans. Nat. Hist. Soc. Taiwan 33: 26. 1943.

Additional bibliography: Moldenke, Phytologia 18: 358—359. 1969; Moldenke, Fifth Summ. 1: 292 (1971) and 2: 939. 1971.

ERIOCAULON ODORATUM Dalz. in Hook., Journ. Bot. Kew Misc. 3: 280-281. 1851.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 20: 16. 1970; Moldenke, Fifth Summ. 1:268, 275, 296, & 301 (1971) and 2: 939. 1971.

In addition to months previously reported by me, recent collectors have found this species in flower and fruit in November.

Additional citations: THAILAND: Charoenphol, Larsen, & Warncke 4694 (Ac).

ERIOCAULON OFFICINALE Körn. in Mart., Fl. Bras. 3 (1): 288, 475, 480, & 508, hyponym. 1863.

Additional bibliography: Moldenke, Phytologia 21: 432. 1971; Moldenke, Fifth Summ. 1: 289 (1971) and 2: 508 & 939. 1971.

ERIOCAULON OLIVACEUM Moldenke, N. Am. Fl. 19: 22. 1937.

Additional bibliography: Moldenke, Phytologia 21: 432. 1971; Moldenke, Fifth Summ. 1: 98 (1971) and 2: 939. 1971.

ERIOCAULON OLIVERI Fyson, Kew Bull. ?isc. Inf. 1914: 331. 1914.

Additional bibliography: Moldenke, Phytologia 19: 84 (1969) and 19: 246. 1970; Moldenke, Fifth Summ. 1: 275 (1971) and 2: 939. 1971.

ERIOCAULON OMURANUM Koyama in Ohwi, Fl. Jap., [engl. ed.], 266 & 267. 1965.

Additional bibliography: Moldenke, Phytologia 21: 432. 1971; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 939. 1971.

ERIOCAULON OREADUM Van Royen, Nov. Guin., ser. 2, 10: 34—35, fig. 1 E. 1959.

Additional bibliography: Moldenke, Phytologia 21: 432. 1971; Moldenke, Fifth Summ. 1: 336 (1971) and 2: 494 & 939. 1971.

ERIOCAULON ORYZETORUM Mart. in Wall., Plant. Asiat. Rar. 3: 28. 1832.

Additional bibliography: Mart., Nov. Act. Physico-med. Acad.

Caes. Leopold.-Carol. Nat. Cur. 17 (1): 29. 1835; Fyson, Journ. Indian Bot. 1: 50. 1919; Hansen, Excerpt. Bot. A.12: 520. 1967; Moldenke, Phytologia 20: 16. 1970; Moldenke, Fifth Summ. 1: 270, 271, 275, 283, 296, 301, & 305 (1971) and 2: 939. 1971.

Recent collectors in Nepal describe this plant as having "inflorescences whitish-black" and found it growing in "shady watery places" at 7000 feet altitude.

The Martius (1835) reference in the bibliography of this species is often dated "1833" by authors, but this was the date of its submission as a manuscript; according to J. H. Barnhart it wasn't actually published until 1835.

Additional citations: NEPAL: Shrestha & Upodhyang 620 (W—2582338).

ERIOCAULON OVOIDEUM Britton & Small in Britton, Bull. Torrey Bot. Club 44: 32. 1917.

Additional & emended bibliography: Moldenke, Phytologia 1: 320, 351, & 352 (1939) and 2: 378. 1947; Moldenke, Alph. List Cit. 2: 648. 1948; Moldenke, Phytologia 18: 363. 1969; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 186 & 191. 1969; Moldenke, Fifth Summ. 1: 98 (1971) and 2: 500 & 939. 1971.

ERIOCAULON OZENSE Koyama, Journ. Jap. Bot. 31: 6—7, fig. 1. 1956.

Additional bibliography: Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266 & 270. 1965; Moldenke, Phytologia 18: 363. 1969; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 939. 1971.

Koyama (1965) records the vernacular variant "hara-inu-no-hige" for this species and states that the plant is known only from the Sphagnum bogs of Oze Moor in Kodzuke Province on Honshu Island, Japan.

ERIOCAULON PACHYSTROMA Van Royen, Blumea 11: 224--225, fig. 1. 1961.

Additional bibliography: Kramer, Excerpt. Bot. A.11: 163. 1967; Moldenke, Phytologia 18: 363--364. 1969; G. Taylor, Ind. Kew. Suppl. 14: 54. 1970; Moldenke, Fifth Summ. 1: 324 (1971) and 2: 939. 1971.

ERIOCAULON PALLESCENS (Nakai) Satake, Journ. Jap. Bot. 15: 631—632. 1939.

Additional bibliography: Moldenke, Phytologia 3: 144. 1949; Ohwi, Fl. Jap., [Jap. ed.], 263, 266, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266 & 269. 1965; Moldenke, Phytologia 18: 364--365. 1969; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 508, 511, & 939. 1971.

Koyama (1965) records the vernacular variant "shiro-ezo-hoshikusa" for the plant and states that the species is known only from Iburi Province on Hokkaido island, Japan.

ERIOCAULON PALLIDUM R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 254. 1810.

Additional bibliography: R. Schomb., Fl. S. Austral. 62. 1875; Moldenke, Phytologia 20: 16. 1970; Moldenke, Fifth Summ. 1: 346 (1971) and 2: 939. 1971; Moldenke, Phytologia 23: 425. 1972.

ERIOCAULON PALMERI Ruhl. in Engl., Pflanzenreich 13 (4-30): 48. 1903.

Additional & emended bibliography: Moldenke, Phytologia 1: 320--321, 350, & 360. 1939; Moldenke, Alph. List Cit. 3: 785. 1949; Moldenke, Phytologia 18: 365. 1969; Moldenke, Fifth Summ. 1: 69 (1971) and 2: 939. 1971.

Webster found this plant growing in marshy ground at an elevation of 4500 feet, flowering in June, and describes the flowers as white.

Additional citations: MEXICO: Durango: J. R. Webster 83 (Mi).

ERIOCAULON PALUDICOLA Alv. Silv., Arch. Mus. Nac. Rio Jan. 23: 160. 1921.

Additional bibliography: Moldenke, Phytologia 2: 374 & 378 (1947) and 18: 365. 1969; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 940. 1971.

ERIOCAULON PALUSTRE Salzm. ex Steud., Syn. Pl. Glum. 2: [Cyp.] 280. 1855.

Additional bibliography: Moldenke, Phytologia 20: 16 & 94. 1970; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 940. 1971.

ERIOCAULON PANAMENSE Moldenke, N. Am. Fl. 19: 31--32. 1937.

Synonymy: Eriocaulon panamaense Moldenke ex Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 191. 1969.

Additional bibliography: Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 186 & 191. 1969; Moldenke, Phytologia 20: 16. 1970; Moldenke, Fifth Summ. 1: 90 (1971) and 2: 508 & 940. 1971.

ERIOCAULON PANCHERI H. Lecomte ex Guillaum. & Beauvis., Ann. Soc. Bot. Lyon 38: 40. 1914.

Additional bibliography: Moldenke, Phytologia 18: 366--367 (1969) and 19: 28 & 93. 1969; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 171, 172, & 189. 1969; Moldenke, Fifth Summ. 1: 341 (1971) and 2: 940. 1971.

ERIOCAULON PAPILLOSUM Körn. in Mart., Fl. Bras. 3 (1): 489. 1863.

Additional & emended bibliography: Körn. in Mart., Fl. Bras. 3 (1): 489 & 507. 1863; Moldenke, Phytologia 18: 367. 1969; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 940. 1971.

ERIOCAULON PAPUANUM Van Royen, Nov. Guin., ser. 2, 10: 37--38, fig. 3 O. 1959.

Additional bibliography: K. U. Kramer, Excerpt. Bot. A.6: 33. 1963; Moldenke, Phytologia 19: 85--86 & 91. 1969; G. Taylor, Ind. Kew. Suppl. 14: 54. 1970; Moldenke, Fifth Summ. 1: 336 (1971) and 2: 940. 1971.

ERIOCAULON PARADOXUM Moldenke, Phytologia 2: 133--134. 1948.

Additional bibliography: Moldenke, Phytologia 2: 378 (1947) and 19: 349. 1970; Moldenke, Fifth Summ. 1: 69 (1971) and 2: 940. 1971.

ERIOCAULON PARAGUAYENSE Körn. in Mart., Fl. Bras. 3 (1): 497--498. 1863.

Additional & emended bibliography: Körn. in Mart., Fl. Bras. 3 (1): 493, 497--498, & 507. 1863; Malme, Bih. Svensk. Vet. Akad. Handl. 27 (3), no. 11: 33. 1901; Moldenke, Phytologia 18: 368. 1969; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 940. 1971.

The initial letter of the specific epithet of this taxon is sometimes uppercased.

ERIOCAULON PARANENSE Moldenke, Phytologia 3: 166. 1949.

Additional bibliography: Moldenke, Phytologia 18: 368. 1969; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 508, 587, & 940. 1971; Moldenke, Phytologia 24: 356. 1972.

The Smith & Reitz 9187 collection, cited below, was previously erroneously cited by me as E. dictyophyllum Körn. It was collected at 1000 to 1300 meters altitude, flowering and fruiting in December.

Additional citations: BRAZIL: Santa Catarina: Smith & Reitz 9187 (N, Rf).

ERIOCAULON PARKERI B. L. Robinson, Rhodora 5: 175. 1903.

Additional bibliography: Eames in Harger, Graves, Eames, Bissell, Andrews, & Weatherby, Rhodora 19: 126. 1917; Woodward, Rhodora 21: 116. 1919; Harger, Graves, Eames, Bissell, Andrews, & Weatherby, Bull. Conn. Geol. & Nat. Hist. Surv. 48: 35. 1930; Benner, Fl. Bucks Co. 116. 1932; Muenscher, Aquat. Pl. U. S. 192--194, & 367, fig. 84 E--G, map 206. 1944; Hotchkiss, Bur. Sports Fish. & Wildlife U. S. Dept. Int. Res. Publ. 33: [Underw. & Float. Pl.] 25. 1967; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 274. 1969; Moldenke, Phytologia 20: 16. 1970; Domville & Dunbar, John Burroughs Nat. Hist. Soc. Bull. 8: 32. 1970; Britton & Br., Illustr. Fl., ed. 2, pr. 5, 1: 454, fig. 1141 (1970) and ed. 2, pr. 5, 3: 575. 1970; Hocking, Excerpt. Bot. A.18: 444. 1971; Moldenke, Fifth Summ. 1: 14--22 (1971) and 2: 500, 511, & 940. 1971; Moldenke, Phytologia 23: 413. 1972; Hotchkiss, Common Marsh Underw. & Float. Pl. [2]: 25. 1972; A. L. Moldenke, Phytologia 24: 359. 1972.

Additional illustrations: Muenscher, Aquat. Pl. U. S. 193, fig. 84 E--G. 1970; Britton & Br., Illustr. Fl., ed. 2, pr. 5, 1: 454, fig. 1141. 1970.

The Beetle collection cited below was originally distributed as "Lophtocarpus spongiosus (Engl.) Sm.", identified by M. L. Fernald, and is a mixture with a species of Potamogeton.

Harger (1930) records E. parkeri from Fairfield, New Haven, and New London Counties, Connecticut, but describes it as "Rare. Muddy shores within tidal limits." Hotchkiss (1967) reduces it to synonomy under what he calls E. septangulare With. [the American portion of which is now called E. pellucidum Michx. and the European part now called E. aquaticum (J. Hill) Druce].

Benner (1932) reports that E. parkeri is locally abundant in tidal mud on the shores of the Delaware River, and was collected by B. Long at Tullytown, by W. M. Benner at Bristol, and by S. Brown at Andalusia, in Bucks County, Pennsylvania.

Additional citations: MASSACHUSETTS: Barnstable Co.: Beetle 660, in part (Dt).

ERIOCAULON PARVICAPITULATUM Moldenke, Phytologia 3: 415--416. 1951.

Additional bibliography: Moldenke, Phytologia 18: 371. 1969; Moldenke, Fifth Summ. 1: 261 (1971) and 2: 940. 1971.

ERIOCAULON PARVUM Körn. in Miq., Ann. Mus. Bot. Lugd. Bat. 3: 163. 1867.

Additional bibliography: Moldenke, Phytologia 3: 143 & 144. 1949; Ohwi, Fl. Jap., [Jap. ed.], 262, 264, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266 & 267. 1965; Moldenke, Phytologia 19: 350. 1970; Satake, Journ. Jap. Bot. 46: 373. 1971; Moldenke, Fifth Summ. 1: 308 & 310 (1971) and 2: 508 & 940. 1971.

Koyama (1965) records the vernacular variant "kuro-hoshi-kusa" for this plant and asserts that the plant is only "occasional" on Honshu, Kyushu, and Shikoku and in southern Korea.

ERIOCAULON PECTINATUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 85. 1903.

Additional bibliography: Moldenke, Phytologia 18: 373. 1969; Blasco, Journ. Bombay Nat. Hist. Soc. 67: 525. 1970; Blasco, Inst. Franç. Pond. Trav. Sec. Scient. & Techn. 10: 260 & 401. 1971; Moldenke, Fifth Summ. 1: 275 (1971) and 2: 940. 1971.

ERIOCAULON PELLUCIDUM Michx., Fl. Bor. Am. 2: 166. 1803.

Additional & emended bibliography: G. P. Clinton, Rhodora 3: 79--82, fig. 1 & 2. 1901; Harshberger, Veg. N. J. Pine Barrens, pr. 1, 5, 122, 145, 146, 200, 307, & 324. 1916; Benner, Fl. Bucks Co. 115--116. 1932; Muenscher, Aquat. Pl. U. S. 192--195 & 367, fig. 84 H--J & 85 A & B, map 208. 1944; Hausman, Begin. Guide Wild Fls. 4. 1948; R. S. Lamotte, Geol. Soc. Am. Mem. 51: [Cat. Cenoz. Pl. N. Am.] 157. 1952; Hylander, Fls. Field & Forest 54, 55, & 220, fig. 1. 1962; Hotchkiss, Bur. Sports Fish. & Wildlife U. S. Dept. Int. Res. Publ. 44: [Underw. & Float. Pl.] 25. 1967; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 190. 1969; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 274. 1969; Moldenke, Phytologia 20: 16--17. 1970; Mohlenbrock, Illust. Fl. Ill. Flow. Pl. Flow. Rush 249. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 353, 354, & 1824. 1970; Harshberger, Veg. N. J. Pine Barrens, pr. 2, 5, 122, 145, 146, 200, 307, & 324. 1970; Domville & Dunbar, John Burroughs Nat. Hist. Soc. Bull. 8: 32. 1970; Wise, Rhodora 72: 513. 1970;

Britton & Br., Illustr. Fl., ed. 2, pr. 5, 1: 454, fig. 1140 (1970) and ed. 2, pr. 5, 3: 575 & 625. 1970; Brown & Wherry, Bartonia 13: 6. 1971; Hellquist, Rhodora 73: 256. 1971; Hocking, Excerpt. Bot. A.18: 444. 1971; Moldenke, Fifth Summ. 1: 14—22, 33, 36, 39—41, 310, & 376 (1971) and 2: 494, 495, 509, 511, 517, 523, 548, 764, 765, 792, & 940. 1971; Moldenke, Phytologia 23: 413. 1972; Hotchkiss, Common Marsh Underw. & Float. Pl. [2:] 25. 1972; Whitehead & Thirumalachar, Mycologia 64: 124, 126, & 128, fig. 2. 1972; A. L. Moldenke, Phytologia 24: 359. 1972

Additional illustrations: Muenscher, Aquat. Pl. U. S. 193 & 195, fig. 84 H—j & 85 A & B. 1944; Hylander, Fls. Field & Forest 55, fig. 1. 1962; Hotchkiss, Bur. Sports Fish. & Wildlife U. S. Dept. Int. Res. Publ. 44: [Underw. & Float. Pl.] 25. 1967; Britton & Br., Illustr. Fl., ed. 2, pr. 5, 454, fig. 1140. 1970; Hotchkiss, Common Marsh Underw. & Float. Pl. [2:] 25. 1972; Whitehead & Thirumalachar, Mycologia 64: 126, fig. 2. 1972.

Mohlenbrock (1970) asserts that this species is not definitely known from Illinois, even though Muenscher (1944) records it from that state. Harshberger (1916) comments that in New Jersey submerged forms have well developed leaves about as long as the scapes, other leaves only half as long, while plants growing at the edge of a pond or in a swamp are often only 7.5—10 cm. tall and have leaves 2.5 cm. long. It is often found in association with Castalia odorata.

Dreisbach 1722 is described by the collector as being the typical "land form", while Dreisbach 1797 is the "water form" of the species. Brown & Wherry (1971) record the species from Cape May County, New Jersey, while Wise found it on Isle au Haut (in the outermost part of Penobscot Bay, Knox County, Maine). Hotchkiss (1967) calls it the "northern pipewort" and notes that it "Resembles Littorella.....with which it often grows; but clumps of Pipewort leaves are not connected by rootstocks, and Pipewort roots are closely crosslined. Resembles the smaller Quillworts [Isoëtes]....but Pipewort leaves taper conspicuously from a wide base, and their roots are closely crosslined."

Benner (1932) states that the species has been reported from Bristol, Bucks County, Pennsylvania, but there is no herbarium material to substantiate the claim. He states further that there is no material of this species in the herbarium of the Philadelphia Botanical Club "from anywhere in southeastern Pennsylvania".

In regard to the separation of E. pellucidum from the European E. aquaticum (J. Hill) Druce, the comments of J. R. Beavdry in Canad. Journ. Gen. & Cyt. 5: 167 (1963) are worth noting: "It is the opinion of the author that plants which belong to different levels of ploidy are best considered, from a theoretical standpoint, as different species, even if they are morphologically identical, because the difference in the number of chromosomes constitutes a strong enough reproductive barrier to keep the population separate under conditions of sympatry."

Whitehead & Thirumalachar (1972) describe a smut, Dermatosorus eriocauli (Clint.) Whitehead & Thirum., from the ovaries of this species in Massachusetts. The fungus had previously been known as Tolyposporium eriocauli Clint.

Additional citations: NEW JERSEY: Burlington Co.: Dreisbach 1797 [Herb. Dreisbach 1723] (Mi). Cumberland Co.: Dreisbach 1722 [Herb. Dreisbach 1724] (Mi). MINNESOTA: Saint Louis Co.: Moore & Moore 10329 (N).

ERIOCAULON PERPLEXUM Satake & Hara, Bot. Mag. Tokyo 52: 400—401. 1938.

Additional bibliography: Moldenke, Phytologia 2: 493 & 494. 1948; Ohwi, Fl. Jap., [Jap. ed.], 262, 264, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 266 & 268. 1965; Moldenke, Phytologia 18: 354 & 387—388. 1969; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 507, 508, & 940. 1971.

Koyama (1965) records the vernacular variant "ezo-inu-no-hige" for this plant and states that the species is only "local" in Hidaka Province on Hokkaido island, Japan.

ERIOCAULON PERUVIANUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 58. 1903.

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13: 491. 1936; Moldenke, Phytologia 18: 388. 1969; Moldenke, Fifth Summ. 1: 140 (1971) and 2: 501 & 940. 1971.

ERIOCAULON PICTUM Fritsch, Bull. Herb. Boiss., sér. 2, 1: 1102—1105. 1901.

Additional & emended bibliography: H. Hess, Bericht. Schweiz. Bot. Gesell. 65: 138—145 & 181, pl. 8, fig. 3, 4, 7, & 8. 1955; Moldenke, Phytologia 19: 351, 458, 459, & 470 (1970) and 20: 283. 1970; Moldenke, Fifth Summ. 1: 243 & 248 (1971) and 2: 493 & 940. 1971.

ERIOCAULON PILGERI Ruhl. in Pilg., Engl. Bot. Jahrb. 30: 147. 1901.

Additional bibliography: Moldenke, Phytologia 18: 391. 1969; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 940. 1971.

ERIOCAULON PILIFLORUM Ruhl. in Engl., Bot. Jahrb. 27: 80. 1899.

Additional bibliography: Moldenke, Phytologia 19: 351 & 472. 1970; Moldenke, Fifth Summ. 1: 261 (1971) and 2: 496 & 940. 1971.

ERIOCAULON PILIPHORUM Satake, Bot. Mag. Tokyo 51: 285—287, fig. 1. 1937.

Additional bibliography: Moldenke, Phytologia 2: 493 & 494. 1948; Ohwi, Fl. Jap., [Jap. ed.], 262, 265, & 1296. 1953; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 268. 1965; Moldenke, Phytologia 19: 87. 1969; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 508, 513, 776, & 940. 1971.

Koyama (1965) records the vernacular variant "nagato-hoshi-kusa" for this species and avers that the plant differs from E. sikokianum Maxim. only in having the "Receptacle pilose; some flowers with ovary 2-locular and the stigmas 3", and is known only from Nagato Province on Honshu island, Japan.

ERIOCAULON PILOSISSIMUM Van Royen, Blumea 10: 134--135, fig. 1 G. 1960.

Additional bibliography: K. U. Kramer, Excerpt. Bot. A.6: 33. 1963; Moldenke, Phytologia 19: 87. 1969; Moldenke, Fifth Summ. 1: 324 (1971) and 2: 940. 1971.

ERIOCAULON PINARENSE Ruhl. in Fedde, Repert. Spec. Nov. 22: 32. 1925.

Additional & emended bibliography: Moldenke, Phytologia 1: 321--322, 351, 353, & 355 (1939) and 19: 410. 1970; Moldenke, Fifth Summ. 1: 96 & 99 (1971) and 2: 940. 1971.

ERIOCAULON PLUMALE N. E. Br. in Thiselt.-Dyer, Fl. Trop. Afr. 8: 251. 1901.

Additional bibliography: Gledhill, Check List Flow. Pl. Sierra Leone 31, 1962; Moldenke, Phytologia 19: 88 (1969) and 20: 17 & 268. 1970; C. C. Townsend, Excerpt. Bot. A.15: 418. 1970; Moldenke, Fifth Summ. 1: 210, 214, 216, & 218 (1971) and 2: 502, 511, & 940. 1971.

ERIOCAULON PLUMALE subsp. JAEGERI (Moldenke) Meikle, Kew Bull. 22: 142. 1968.

Additional bibliography: Moldenke, Résumé Suppl. 12: 11. 1965; Moldenke, Phytologia 19: 88 (1969) and 20: 268. 1970; G. Taylor, Ind. Kew. Suppl. 14: 86. 1970; C. C. Townsend, Excerpt. Bot. A.15: 418. 1970; Moldenke, Fifth Summ. 1: 216 (1971) and 2: 503, 571, & 940. 1971.

ERIOCAULON PLUMALE subsp. KINDIAE (H. Lecomte) Meike, Kew Bull. 22: 142. 1968.

Additional bibliography: Moldenke, Résumé Suppl. 12: 11. 1965; Moldenke, Phytologia 20: 17 & 268. 1970; G. Taylor, Ind. Kew. Suppl. 14: 86. 1970; C. C. Townsend, Excerpt. Bot. A.15: 418. 1970; Moldenke, Fifth Summ. 1: 216 (1971) and 2: 504, 571, & 940. 1971.

ERIOCAULON PLUMBEUM Colla, Herb. Pedem. 5: 484. 1836.

Additional bibliography: Moldenke, Phytologia 18: 393. 1969; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 940. 1971.

ERIOCAULON POILANEI Moldenke, Phytologia 3: 310. 1950.

Additional bibliography: Moldenke, Phytologia 18: 395. 1969; Moldenke, Fifth Summ. 1: 301 (1971) and 2: 940. 1971.

ERIOCAULON POLUENSE Wang & Tang, Contrib. Inst. Bot. Nat. Acad. Peiping 2: 133. 1934.

Additional bibliography: Moldenke, Phytologia 18: 395. 1969; Moldenke, Fifth Summ. 1: 289 (1971) and 2: 940. 1971.

ERIOCAULON POLYCEPHALUM Hook. f., Fl. Brit. India 6: 573. 1893.
Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Santapau, Excerpt. Bot. A.11: 176. 1967; Moldenke, Phytologia 19: 351. 1970; Moldenke, Fifth Summ. 1: 275 (1971) and 2: 504, 505, & 940. 1971; Moldenke, Phytologia 23: 422 & 424. 1972.

Ellis and his associates (1967) collected this species at 950 meters altitude. Saldanha and his associates describe it as "common herbs to 50 cm. tall, the heads large, in moist rice fields after the harvest" and "on moist sand in semi-evergreen forests in full sun". They found it flowering and fruiting in January and May. Charoenphol and his associates found it growing in evergreen forests in Thailand, flowering and fruiting in October.

Additional citations: INDIA: Mysore: Nicholson, Saldanha, & Ramamoorthy HFP.39 (W); Saldanha 12242 (W). THAILAND: Charoenphol, Larsen, & Warncke 4237 (Ac), 4802 (Ac).

ERIOCAULON ? POROSUM Lesq., U. S. Geol. & Geogr. Surv. Terr. Ann. Rep. 7: 396. 1874.
Additional bibliography: Moldenke, Phytologia 2: 377 (1947) and 18: 422--424. 1969; Moldenke, Biol. Abstr. 51: 459. 1970; Hocking, Excerpt. Bot. A.18: 444 (1971) and A.19: 42. 1971; Moldenke, Fifth Summ. 1: 376 (1971) and 2: 940. 1971.

ERIOCAULON PRINGLEI S. Wats., Proc. Am. Acad. 23: 283. 1888.
Additional & emended bibliography: Moldenke, Phytologia 1: 322, 350, & 360 (1939) and 19: 410. 1970; Hocking, Excerpt. Bot. A.19: 43. 1971; Moldenke, Fifth Summ. 1: 69 (1971) and 2: 940. 1971.

ERIOCAULON PSEUDOCOMPRESSUM Ruhl. in Urb., Symb. Ant. 1: 492. 1900.
Additional & emended bibliography: Moldenke, Phytologia 1: 322, 351, 354, 355, & 363 (1939) and 19: 330 & 351. 1970; Moldenke, Biol. Abstr. 51: 9023. 1970; Moldenke, Fifth Summ. 1: 96 (1971) and 2: 501 & 940. 1971.

ERIOCAULON PSEUDOQUINQUANGULARE Ruhl. in Engl., Pflanzenreich 13 (4-30): 73. 1903.
Additional bibliography: Moldenke, Phytologia 19: 410. 1970; Moldenke, Fifth Summ. 1: 275 (1971) and 2: 509 & 940. 1971.

ERIOCAULON PUBIGERUM Bong., Mém. Acad. Imp. Sci. St. Pétersb., sér. 6, 1: 628. 1831.
Additional bibliography: Moldenke, Phytologia 20: 17. 1970; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 940. 1971.

ERIOCAULON PULCHELLUM Körn., Linnaea 27: 622--624. 1856.
Additional bibliography: Gledhill, Check List Flow. Pl. Sierra Leone 31. 1962; Moldenke, Phytologia 20: 17. 1970; Moldenke, Fifth Summ. 1: 214, 218, & 219 (1971) and 2: 509, 513, & 940. 1971.

Jaeger found this plant growing at 1600 meters altitude.

Additional citations: SIERRA LEONE: Jaeger 9425 (Ld).

ERIOCAULON PULLUM Koyama, Journ. Jap. Bot. 31: 11--12, fig. 4. 1956.

Additional bibliography: Moldenke, Phytologia 18: 426--427. 1969; Moldenke, Fifth Summ. 1: 289 (1971) and 2: 940. 1971.

ERIOCAULON PULVINATUM Van Royen, Nov. Guin., ser. 2, 10: 32--33, fig. 3 P. 1959.

Additional bibliography: K. U. Kramer, Excerpt. Bot. A.6: 33. 1963; Moldenke, Phytologia 19: 410 & 481. 1970; G. Taylor, Ind. Kew. Suppl. 14: 54. 1970; Moldenke, Fifth Summ. 1: 336 (1971) and 2: 940. 1971.

ERIOCAULON PUMILIO Hook. f., Fl. Brit. India 6: 581--582. 1893.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 50. 1919; Moldenke, Phytologia 18: 427. 1969; Moldenke, Fifth Summ. 1: 275 (1971) and 2: 940. 1971.

ERIOCAULON PUSILLUM R. Br., Prodr. Fl. Nov. Holl., pr. 1, 1: 254--255. 1810.

Additional bibliography: Moldenke, Phytologia 20: 17. 1970; Moldenke, Fifth Summ. 1: 346 (1971) and 2: 940. 1971.

ERIOCAULON PYGMAEUM Soland. ex J. E. Sm. in Rees, Cycl. 13: Eriocaulon. 1809.

Additional bibliography: Moldenke, Phytologia 20: 17, 27, 413, 414, & 417. 1970; Moldenke, Fifth Summ. 1: 346 (1971) and 2: 507 & 940. 1971.

ERIOCAULON QUINQUANGULARE L., Sp. Pl., ed. 1, pr. 1, 1: 87. 1753.

Additional synonymy: Eriocavlon quinquangulare Raeusch., Nom. Bot. 30. 1797. Ericaulon quinquangulare L. apud Majumdar, Bull. Bot. Soc. Bengal 19: 15, sphalm. 1965.

Additional bibliography: J. F. Gmel. in L., Syst. Nat., ed. 13, 2: 206. 1791; Pers., Sp. Pl. 1: 284. 1817; Mart., Nov. Act. Physico-med. Acad. Caes. Leopold.-Carol. Nat. Cur. 17 (1): 24 & 29. 1835; Fyson, Journ. Indian Bot. 1: 50--53, fig. 1 & 2. 1919; Majumdar, Bull. Bot. Soc. Bengal 19: 15. 1965; Ramaswamy, Bull. Bot. Soc. Bengal 21: 89 & 90. 1967; Santapau, Excerpt. Bot. A.11: 176. 1967; Rao & Kumari, Bull. Bot. Surv. India 9: 110 & 189. 1967; Ellis, Swaminathan, & Chandrabose, Bull. Bot. Surv. India 9: 3. 1967; Shah & Suryanarayana, Bull. Bot. Surv. India 11: 298. 1969; Gaussen, Legris, Blasco, Meher-Homji, & Troy, Trav. Sec. Scient. & Techn. Inst. Franç. Pond., Hor. ser., 10: 82 & 128. 1970; Moldenke, Phytologia 20: 15, 18, 20, 23, & 357 (1970) and 21: 429. 1971; Balapure, Journ. Bomb. Nat. Hist. Soc. 68: 365 & 374. 1971; Moldenke, Fifth Summ. 1: 218, 265, 268, 275, 281, 283, 296, 301, & 346 (1971) and 2: 492--494, 497, 500, 504, 508--512, 515, 517, 525, 533, 548, 616, 619, 623, 767, 792, & 940. 1971.

Additional illustrations: Fyson, Journ. Indian Bot. 1: 51, fig. 1 & 2. 1919.

The Martius (1835) reference in the bibliography of this species is often cited as "1833", the date of its submission to the Academy for publication, but according to Dr. J. H. Barnhart it was not actually published until 1835.

Fyson (1919) intimates that his fig. 2 illustrates E. leucomelas Steud. (called E. geoffreyi by him), but its legend plainly states that it is meant to represent E. quinquangulare L.

In Ceylon E. quinquangulare was found by Koyama to be "locally abundant in wet sand around tree islands in periodically flooded pond margins", at 192 meters altitude, flowering and fruiting in March. Sebastine & Vivekananthan (1967) refer to it as "common" at 1675 m. altitude in Kerala, flowering there in October, and Rao & Kumari (1967) refer to it also as "common" in Andhra Pradesh, flowering in December. In Madras it was found by Sebastine & Ellis (1967) "near beach", flowering in January. Ellis and his associates (1967) encountered it "in portion of forest cleared for rice cultivation". Balapure (1971) found it in the hill forests of Maharashtra and cites Balapure 70631.

Ramaswamy (1967) tells us that the species is "prominent" from September to November in Savandurga, inhabiting "marshy slopes and tank edges" there, citing his no. 269. Majumdar (1965) says that it blooms from October to February. Datta & Majumdar (1966) describe it as a "Perennial herb of wet places and rice-fields. Leaves reddish, semi-translucent. Heads globose, snow-like. Receptacle villous. Floral bracts densely hairy, acuminate....... Distributed in the tropics." Shah & Soryanarayana (1969) report it as common in moist but drying cultivated fields in Gujarat. In Mysore it has been found growing "in wet flush on granite hills", flowering and fruiting in November.

Material has been misidentified and distributed in some herbaria under the name E. luzulaeifolium Mart.

Additional citations: INDIA: Mysore: Cook & Gut 171 (Rf). CEYLON: Koyama 13315 (N).

ERIOCAULON QUINQUANGULARE var. MARTIANUM Wall. ex Fyson, Journ. Indian Bot. 2: 204 [as "martiana"]. 1921.

Additional synonymy: Eriocaulon quinquangulare var. martiana Fyson, Journ. Indian Bot. 1: 52, hyponym. 1919.

Additional bibliography: Fyson, Journ. Indian Bot. 1: 52. 1919; Moldenke, Phytologia 20: 18. 1970; Moldenke, Fifth Summ. 1: 283 (1971) and 2: 505, 510, & 940. 1971.

ERIOCAULON RAVENELII Chapm., Fl. South. U. S., ed. 1, pr. 1, 503. 1860.

Additional bibliography: Muenscher, Aquat. Pl. U. S. 192, 194, & 367, map 207. 1944; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 149, 161, 162, & 190. 1969; Moldenke, Phytologia 20: 18, 41, 48, 50, & 52. 1970; Long & Lakela, Fl. Trop. Fla. 259--261 & 938, fig. 38. 1971; Moldenke, Fifth Summ. 1: 24 & 28 (1971) and 2: 510 & 940. 1971.

Additional illustrations: Long & Lakela, Fl. Trop. Fla. 261, fig. 38. 1971.

ERIOCAULON RECURVIFOLIUM C. H. Wright, Kew Bull. Misc. Inf. 1919: 264. 1919.
Additional bibliography: Moldenke, Phytologia 18: 437--438. 1969; Moldenke, Fifth Summ. 1: 230 (1971) and 2: 941. 1971.

ERIOCAULON REDACTUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 113--114. 1903.
Additional & emended bibliography: Ruhl. in Engl., Pflanzenreich 13 (4-30): 13, 104, 113--114, & 287. 1903; Moldenke, Phytologia 19: 411. 1970; Moldenke, Fifth Summ. 1: 275 & 296 (1971) and 2: 499 & 941. 1971.

ERIOCAULON REGNELLII Moldenke, Phytologia 3: 35--36. 1948.
Additional bibliography: Moldenke, Phytologia 3: 80 (1949) and 19: 411. 1970; Moldenke, Fifth Summ. 1: 150 (1971) and 2: 941. 1971.

ERIOCAULON REMOTUM H. Lecomte, Bull. Soc. Bot. France 55: 643. 1909.
Additional bibliography: Gledhill, Check List Flow. Pl. Sierra Leone 31. 1962; Moldenke, Phytologia 19: 411. 1970; C. C. Townsend, Excerpt. Bot. A.15: 418. 1970; Moldenke, Fifth Summ. 1: 216 & 218 (1971) and 2: 941. 1971.

ERIOCAULON RICHARDI Körn.
This binomial is now reduced to synonymy under E. abyssinicum Hochst.

ERIOCAULON RITCHIEANUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 1903.
Additional & emended bibliography: Fyson, Journ. Indian Bot. 1: 51--53, fig. 9. 1919; Billore & Hemadri, Bull. Bot. Surv. India 11: 345. 1969; Moldenke, Phytologia 19: 90 & 100. 1969; Kulkarni & Desai, Journ. Bombay Nat. Hist. Soc. 67: 134--135, fig. 1--8. 1970; Moldenke, Fifth Summ. 1: 275 (1971) and 2: 503 & 941. 1971.
Additional illustrations: Kulkarni & Desai, Journ. Bombay. Nat. Hist. Soc. 67: betw. 134 & 135, fig. 1--8. 1970.
Kulkarni & Desai (1970) describe and illustrate tubers produced by this species and comment that the "Tuberiferous habit has not been reported in any member of the Eriocaulaceae so far". They found the tuberiferous habit characteristic of all the individual plants of this species observed by them in two separate localities in the Kolhapur District of Maharashtra, India. They tell us that the "Dried tubers germinate readily in a petridish with a thin layer of moist soil. The plants attain maturity within 45 to 60 days." Billore & Hemadri (1969) found the species on hillslopes and plateaus at Kedarnath, citing their nos. 115510 & 115933.

ERIOCAULON ROBINSONII Moldenke, Phytologia 2: 220. 1947.
Additional & emended bibliography: Moldenke, Phytologia 2: 220, 376, & 379 (1947) and 19: 412. 1970; Moldenke, Fifth Summ. 1: 301

(1971) and 2: 941. 1971.

ERIOCAULON ROBUSTIUS (Maxim.) Mak., Journ. Jap. Bot. 3: 26 [as "robustium"]. 1926.

Additional bibliography: Ohwi, Fl. Jap., [Jap. ed.], 262, 265, & 1296. 1953; Koyama in Ohwi, Fl. Jap. [Engl. ed.], 266 & 268. 1965; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 191. 1969; Moldenke, Phytologia 20: 18. 1970; Moldenke, Fifth Summ. 1: 208, 289, 308, 310, & 312 (1971) and 2: 492, 493, 495, 510, & 941. 1971; Moldenke, Phytologia 24: 343 & 344. 1972.

Koyama (1965) records the vernacular variant "hiroha-inu-no-hige" for this species and states that the plant is "quite common" in wet places and paddy fields in the lowlands of Hokkaido, Honshu, Shikoku, Kyushu, Korea, Manchuria, and eastern Siberia.

Additional citations: JAPAN: Honshu: Tagawa s.n. [29.IX.1931] (W--2409633).

ERIOCAULON ROBUSTIUS var. NIGRUM Satake, Journ. Jap. Bot. 27: 268. 1952.

Additional bibliography: Koyama in Ohwi, Fl. Jap., [Engl. ed.], 268. 1965; Moldenke, Phytologia 18: 441 & 442. 1969; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 493 & 941. 1971.

Koyama (1965) records the vernacular name "kuro-hiroha-inu-no-hige" for this plant and states that it differs from the typical form of the species only in having the "floral bracts and calyx dark-brown, relatively small, otherwise almost as in the typical variety, endemic to Honshu island."

ERIOCAULON ROBUSTIUS var. PERPUSILLUS (Nakai) Satake, Journ. Jap. Bot. 15: 629. 1939.

Additional synonymy: Eriocaulon robustius f. perpusillum (Nakai) Satake ex Koyama in Ohwi, Fl. Jap., [Engl. ed.], 268. 1965.

Additional bibliography: Moldenke, Phytologia 2: 377 (1947) and 3: 144. 1949; Koyama in Ohwi, Fl. Jap., [Engl. ed.], 268. 1965; Moldenke, Phytologia 18: 442--443. 1969; Moldenke, Fifth Summ. 1: 310 (1971) and 2: 493, 510, & 941. 1971.

Koyama (1965) records the vernacular name "chabo-inu-no-hige" for this variety and avers that the plant is merely "a dwarf form" of E. robustius (Maxim.) Mak. He does not indicate its geographic distribution.

ERIOCAULON ROBUSTO-BROWNIANUM Ruhl. in Engl., Pflanzenreich 13 (4-30): 77. 1903.

Additional synonymy: Eriocaulon robustobrownianum Ruhl. ex Fyson, Journ. Indian Bot. 1: 50. 1919.

Additional bibliography: Moldenke, Phytologia 2: 379. 1947; Hansen, Excerpt. Bot. A.12: 520. 1967; Das & Mukerjee, Bull. Bot. Soc. Bengal 23: [185]. 1969; Moldenke, Phytologia 19: 412, 490, & 491. 1970; Moldenke, Fifth Summ. 1: 275, 283, & 296 (1971) and 2: 507, 510, 516, & 941. 1971.

[to be continued]

FOUR NOVELTIES FROM BRAZIL

Harold N. Moldenke

GHINIA CURASSAVICA var. AUSTRALIS Moldenke, var. nov.

Haec varietas a forma typica speciei ramis ramulisque foliorum laminisque subtus longior pilosulis recedit.

This variety differs from the typical form of the species in having the pubescence on its branches, branchlets, and lower leaf-surfaces longer, more coarse, more spreading, and decidedly whitish.

The type of the variety was collected by H. S. Irwin, R. M. Harley, and G. L. Smith (no. 31404) in wet places in the cerrado on the slopes of the Espigão Mestre, about 25 km. west of Barreiras, at about 600 meters altitude, in the valley of the Rio das Ondas, Bahia, Brazil, on March 3, 1971, and is deposited in my personal herbarium at Plainfield, New Jersey. The collectors describe the plant as an ascending herb about 75 cm. tall, with dark red-violet "heads". Since the flowers are actually borne in thin, open spikes, I am not certain that the description on the label actually applies to this plant.

LEIOTHRIX FLAVESCENS var. PARVIFOLIA Moldenke, var. nov.

Haec varietas a forma typical speciei foliis maturis usque ad 4 cm. longis recedit.

This variety differs from the typical form of the species in having its mature leaves only to 4 cm. long.

The type of the variety was collected by H. S. Irwin, R. M. Harley, and E. Onishi (no. 28946) in a sedge meadow (brejo) in an area of cerrado, sedge meadows, and gallery forest, on gray sandy soil, on the lower slopes of the Serra da Caraça about 10 km. west of Barão de Cocais, altitude about 1400 meters, Serra do Espinhaço, Minas Gerais, Brazil, on January 23, 1971, and is deposited in my personal herbarium at Plainfield, New Jersey. The collectors describe the plant as a rosette herb, the inflorescences (in fruit) to about 35 cm. tall, and the fruiting-heads pale gray-brown.

PAEPALANTHUS ELONGATUS var. NIGER Moldenke, var. nov.

Haec varietas a forma typica speciei bracteis involucrantibus coriaceo-chartaceis usque ad 11 mm. longis 5.5 mm. latis valde recurvatis praeter basin atro-nigris, bracteis receptaculorum similibus angustioribus recedit.

This variety differs from the typical form of the species in having the involucral bractlets and receptacular bractlets firmly thick-chartaceous or coriaceous, mostly conspicuously recurved (the outermost decidedly reflexed from about the midpoint), jet-black on both surfaces except for the base, the outermost to 11 mm. long and 5.5 mm. wide.

The type of the variety was collected by H. S. Irwin, R. M. Harley, and G. L. Smith (no. 32187) on a campo in an area of gallery forest and adjacent wet campo (brejo) about 20 km. north of Alto do Paraíso, at an altitude of 1250 meters, in the Chapada dos Veadeiros, Goiás, Brazil, on March 19, 1971, and is deposited in my personal herbarium at Plainfield, New Jersey. The collectors describe the inflorescences as about 1 meter tall and the flower-heads white.

SYNGONANTHUS DENSIFOLIUS var. MAJUS Moldenke, var. nov.

Haec varietas a forma typica speciei foliis usque ad 6 cm. longis et pedunculis 12--17 cm. longis recedit.

This variety differs from the typical form of the species in having its basal leaves mostly to 6 cm. long and the peduncles 12--17 cm. long.

The type of the variety was collected by H. S. Irwin, R. M. Harley, and G. L. Smith (no. 32982) on a campo in an area of campo and cerrado on outcrops, about 25 km. north of Alto do Paraíso, at an altitude of about 1250 meters, in the Chapada dos Veadeiros, Goiás, Brazil, on March 22, 1971, and is deposited in my personal herbarium at Plainfield, New Jersey. The collectors describe the plant as a rosette herb, the inflorescences to about 20 cm. tall and the flower-heads white.

- - - - - - - - - - - - - - -

## ADDITIONAL NOTES ON THE GENUS HIEROBOTANA. III

Harold N. Moldenke

HIEROBOTANA Briq.

Additional & emended bibliography: R. W. Br., Compos. Scient. Words 833. 1954; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 610 & 631--632. 1960; Soukup, Raymondiana 3: 26 & 60. 1970; Anon., Biol. Abstr. 52 (11): B.A.S.I.C. S.117 (1971) and 52 (19): B.A.S. I.C. S.115. 1971; Moldenke, Biol. Abstr. 52: 5926 & 10542. 1971; Moldenke, Fifth Summ. 1: 5, 6, 136, & 140 (1971) and 2: 527, 666, 674, 678, 752, & 880. 1971; Moldenke, Phytologia 21: 31, 219, 319, & 507 (1971) and 23: 370 & 507. 1972.

HIEROBOTANA INFLATA (H.B.K.) Briq.

Bibliography: see under the genus as a whole; it is monotypic.

Macbride (1960) comments: "Strongly apart by the fruiting calyx widened at base, the stamens only 2 (Briquet); expediently, however, it could be retained among the species it resembles otherwise, but it is more clearly defined and probably more remotely derived than the traditionally separated Lippia; however, the only basic difference is the stamen reduction, the calyx character appearing in other species, as in V. juniperina Lag." He cites only Weberbauer 5749 from Ayacucho, Peru.

Alma L. Moldenke

"THE BIOLOGY AND CHEMISTRY OF THE UMBELLIFERAE" edited by V. H. Heywood. Supplement I to the Botanical Journal of the Linnean Society, Volume 64, 1971, x & 438 pp., illus., Academic Press, Inc., London NW1 7DX & New York, N. Y. 10003. 1971. £ 8.50 or $26.00.

These valuable papers were presented at an international symposium with ninety umbellifer-minded members from nine nations at the University of Reading, England, in September 1970 under the joint sponsorship of the Linnean and Phytochemical Societies.

This highly informative book has groupings as follows: 1st - systematic and evolutionary ones by Constance, Mathias, Heywood, Dawson and Rodríguez; 2nd - floral biology, pollen morphology with superb scanning electron micrographs, anatomy, inflorescences and chromosomes by Bell, Cerceau-Larrival, Froebe, Theobald, Guyot, Heywood and Dakshini, Moore and Cauwet; 3rd - chemosystematic distribution of the different classes of chemical constituents with their importance in detecting relationships by Hegnauer, Bohlmann, Harborne, Fairbrothers and Pickering, Molho et al., Nielsen, Fairbairne and Hiller and an interesting and detailed ethnobotanical survey by French.

Each paper has its own detailed references. There are three indexes — for authors, for subject matter and for scientific names.

This work will surely be highly useful to many taxonomic and biochemical scientists and students.

"THE LEAF BOOK" - A Field Guide to Plants of Northern California by Ida Geary, xii & 388 pp., illus., A. Philpott, The Tamal Land Press, Fairfax, California 94930. 1972. $4.95 paperback.

The beauty of this book is the artistic appeal and botanical accuracy of the more than 350 prints made by the author — good enough for identification purposes and certainly good enough to enjoy.

On each print sheet common and scientific names (verified by Tom Howell) are given, as well as habitat and special features. The prints are arranged according to the following groups: marine algae, fungi and lichens and mosses, ferns and fern allies, grasses and sedges and rushes, wildflowers, shrubs and trees. There are notes on the making of these plant prints, a bibliography and an index.

"FLOWERING PLANTS — Origin and Dispersal" by Armen Takhtajan, translated by C. Jeffrey, x & 310 pp. & 13 plates, illus., Smithsonian Institution Press, Washington, D. C. 20560, distributed in the U. S. by Random House, New York, N. Y. 10022. 1969. $6.95.

This is the first authorized English edition of this very important Russian work, made from what became its third edition. "I have confined myself to stating, and as far as possible substantiating, those ideas and concepts that seem to me to be correct or at least plausible." For other views, that space does not permit here, the author refers to the critiques of Parker and Eames and to the works of Croizat, Lam, Melville and Meeuse.

The author uses cogent arguments to defend the monophyletic origin of "angiosperms from some very ancient group of gymnosperms, which must have had primitive secondary xylem of scalariform tracheids at least in the early wood and primitive bisexual strobili...

"The earliest angiosperms carried within themselves a large reserve of genetic potentiality that undoubtedly created a favourable genetic situation for rapid adaptive radiation.... Their evolution was closely tied to the evolution of insects and was based on the complex and pecúliar mechanism of mutual selection....

"It appears highly probable that the basic number of chromosomes of the early flowering plants was a low one (7 or 6)....

"There is no monocot order that could occupy the place in their family tree that is occupied by the Magnoliales among the dicots. A possible explanation of this is a more rapid rate of evolution in the monocots than in the lower, woody, dicots."

The site of origin is still debatable, but the author chooses South East Africa, where a multitude of comparatively complete phylogenetic series, which start with a series of species and finish with a series of families and even orders, is found. The most remarkable example of this type is afforded by the family Magnoliaceae.

The author discusses the development of the major phytochoria and the flora of extra-tropical regions. He then gives his outline of the classification of the flowering plants. This first appeared with detailed explanations in 1967 in his Russian text "A System and Phylogeny of the Flowering Plants."

The translator has provided a valuable service for botanists and botanical students who are unable to read the original language of publication. He misspells Skottsberg's surname with a "c".

An excellent bibliography is compiled as well as a detailed index.

"ADVANCES IN ECOLOGICAL RESEARCH" Volume 7 edited by J. B. Cragg, xi & 254 pp., illus., Academic Press, London NW1 7DX & New York, N. Y. 10003. 1971. £4.00 or $11.50.

This book consists of four important reviews by six authors from as many different countries. The first deals with heavy metal tolerances. Those plants successful in metal-contaminated areas are of significance not only to prospectors but also to students of evolution and ecology. The second divides plants into those with high and those with low photosynthetic capacity. The former are characterized by highly developed bundle sheath cells and high concentration of organelles, by higher temperature optimum, by virtually no photorespiration, and by greater success in plant competition and in stress environments. The third considers the ecological aspects of fishery research and hopes "that there will be a more efficient and less wasteful exploitation of the fishery resources of the world". The fourth is about vegetational distribution, tree growth and crop success in relation to recent climate change the world over during the last two millenia along with comparisons with post-Pleistocene times. "Changes in plant growth and vegetational distribution for which a climatic explanation is possible appear to have been broadly synchronous throughout the world for the past two millenia."

Much thought-provoking material that is well documented is included in this valuable book.

"MANUAL OF THE GRASSES OF THE UNITED STATES", 2 volumes by A. S. Hitchcock, replication of 2nd revised edition by Agnes Chase, 1051 pp., illus., Dover Publications, Inc., New York, N. Y. 10014. 1971. $4.00 each volume, paperbound.

This is a photo-offset copy of the 1950 edition that was published by the United States Government Printing Office as the U. S. Department of Agriculture Miscellaneous Publication No. 200. No similar comprehensive work has yet superceded this one, and its available copies are far too few now. Consequently this inexpensive new printing is indeed most welcome.

"STURTEVANT'S EDIBLE PLANTS OF THE WORLD" edited by U. P. Hedrick, vii & 686 pp., republication by Dover Publications, Inc., New York, N. Y. 10014. 1972. $5.00 paper-back.

This is an unabridged facsimile of the 1919 Annual Report of the New York Agricultural Experiment Station in which the editor admits for practical purposes "the unused material amounts to several times that used". Even so, so much valuable, but necessarily dated material is now readily available in this new inexpensive printing.

"ASPECTS OF THE BIOLOGY OF SYMBIOSIS" edited by Thomas C. Cheng, x & 327 pp., illus., University Park Press, Baltimore, Maryland 21202 & Butterworths, London. 1971. $14.50.

These twelve interesting papers — introduced and indexed — comprise the proceedings of a symposium in Boston, Massachusetts, under the auspices of the American Society of Zoologists, the American Association for the Advancement of Science, and the Society for Invertebrate Pathology. They cover schistosome penetration, the cleaning fish, nudibranchs and their coral hosts, respiratory metabolic changes in trematodes in polychaetes, growth increases in parasitized mollusks (mainly shell?), the goodness of parasitism, nutritional interplay between the crustacean Echinoecus pentagonus and the sea urchin Echinothrix calamaris, light effects in green hydra, Chlorohydra viridissima, containing Chlorella vulgaris, bluegreen algae (unnamed) in two echiuroids, cell-mediated immunity in invertebrates, and protection of anemone fishes from sea anemone nematocysts experimentally indicating chemical changes in the mucous coating.

Symbiosis is here treated in its original broad sense to include parasitism, commensalism and mutualism. D. R. Lincicomes' paper on the "Goodness of Parasitism" shows how these conditions verge and overlap. For him "parasitism is viewed as a metabolic ecological association of two organisms, the basis of which is chemical and the function of which is fundamentally one of molecular exchanges of social, ecological, and evolutionary values."

This book will prove of value to many kinds of biologists, students and libraries.

"THE COLUMBIA RIVER ESTUARY AND ADJACENT OCEAN WATERS — Bioenvironmental Studies" edited by A. T. Pruter & D. L. Alverson, xiii & 868 pp., illus., University of Washington Press, London & Seattle, Washington 98105. 1972. $22.00.

Prepared here under the auspices of the U. S. Atomic Energy Commission (and therefore its editing) are 34 papers researched through the University of Washington, Oregon State University, Battelle Memorial Institute and the National Marine Fisheries Service. They are prefaced, indexed, carefully developed, and organized into four groups: (1) background papers dealing with the history of the Hanford nuclear activator and physical aspects of the Columbia River that catches its effluent, (2) chemical relationships among the river, its estuary, and the nearby Pacific Ocean, involving variations in salinity, nutrients, chlorophyll a, organic carbon, suspended particulate matter and sediments, (3) composition and distribution of marine-environment biota of many kinds of listed invertebrates and many named fishes, and (4) radionuclides in this whole ecosystem.

The second editor concludes that "most investigators who have examined levels of radionuclides in the flora and fauna of both the river and the ocean adjacent to the river do not feel that the concentrations involved are harmful to man....

"Not only will this [book's] information be of considerable value in helping us interpret the ultimate fate of radionuclides discharged into the Columbia River system but it will also enhance our capacity to interpret the likely downstream features of other pollutants accidentally or purposely discharged into the river and their possible impact on the associated biota."

"TREES, SHRUBS AND VINES — A Pictorial Guide to the Ornamental Woody Plants of the Northern United States Exclusive of Conifers" by Arthur T. Viertel, pp. unnumbered, illus., Syracuse University Press, Syracuse, New York 13210. 1970. $3.95 paper-back, spiral binding.

This work had its origin in 1959 as Bulletin 43 of the State University College of Forestry at Syracuse, revised in 1961 and again for this edition. With clear line drawings and short descriptions of 593 numbered plants, glossary, short key, literature citations and index, this book should continue to be useful to the amateur naturalists, the gardeners, the nurserymen, the landscape and horticulture and forestry students and professionals.

"MAIZE ROUGH DWARF — A Planthopper Virus Disease Affecting Maize, Rice, Small Grains and Grasses" by Isaac Harpaz, xvi & 251 pp., illus., Israel University Press, Jerusalem or Halsted Press of John Wiley & Sons, Inc., New York 10016. 1972. $24.00.

The author and his students have been studying all phases of this problem very carefully for a couple of decades. The outstanding quality of this scientific work is the most important impression garnered from reading this book. This deleterious disease was first noticed on U. S. hybrid corn introduced into Italy as part of postwar aid programs. The U. S. Department of Agriculture has financed this research program. The author proved the viral etiology of the disease in 1959. Besides maize it affects barley, sorghum and a few other grasses. Mechanical, graft, dodder and seed transmission did not prove possible; only transovarian transmission did through Laodelphax striatella, Javesella pellucida, Delphacodes propinqua and Sogatella vibix. The disease seems to be periodically epiphytotic (9--10 yrs.). Control is discussed.

The text is well illustrated with tables and many figures including electron micrographs. There is a very full bibliography. Many scientists and students will find this excellent, but so expensive, book valuable.

"PASSION TO KNOW — The World's Scientists" by Mitchell Wilson, xiii & 409 pp., Doubleday & Co., Inc., Garden City, New York 11530. 1972. $10.00.

During the previous decade the author (a former physicist, now a writer) was assigned to "travel around the world to the most interesting centers of science, meet the most interesting people he could find, and write a book about it."

"What interested me more than celebrity was the differences in national styles in doing science; in the way young men and women selected themselves in different countries to be scientists; the different ways they educated themselves in science; how variously ideas could be translated into experiments; how differently experiments could be performed. Most important of all the different ways in which various societies react to the results of these experiments."

Very interesting accounts are given, including conversations with young and old, famous and ordinary, basic and applied scientists from the United States where over one third of the total work of the world's science is being performed, from fund-pinching France and England where modern science commenced and continues with high quality, from Russia where much research of merit has emanated lately, from Germany where once it stood in rank with France and England, slipped during Hitlerian times and now re-emerges, from Australia with its CSIRO program and drive for industrialization, from poverty-ridden people-swarming India with its few good schools, limited laboratories and unemployed degreed scientists and engineers, and from endangered Israel with its famous scientific institutions and workers. "The passion to know" is what drives all these workers usually from early childhood times. This book should provide interesting and profitable reading for many people, young and older.

"SOME COMMON FLOWERING PLANTS OF UGANDA" by E. M. Lind & A. C. Tallantire, 259 pp., illus., Oxford University Press, Lusaka, Dar Es Salaam, Addis Ababa, London, New York, N. Y. 10016. 1972. $4.50 paper-back.

Simply describing and usually illustrating about 450 of the commonest herbs (exclusive of grasses) found in the East Africa area now becoming so popular with American and European tourists, this book should prove a very popular enrichment to them and to the native students in Uganda, Tanzania, Kenya, Zaire, Rwanda and Burundi.

How I wish that we had this book a few months ago when we were in East Africa so that we could have confirmed, amplified, or altered our guesses on identifications which usually had to be made from moving microbus windows!

"ENVIRONMENTAL CONSERVATION", 3rd edition by Raymond F. Dasmann, xi & 473 pp., illus., John Wiley & Sons, Inc., New York, N. Y. 10016. 1972. $10.50 cloth-bound, $6.95 paper-bound.

I consider this book the best text in the conservation field. It holds this position of excellence because the author is an excellent teacher, an active field man of long standing, a fluid and convincing writer, an observant traveler through much of this world, and a wisely oriented scientist-naturalist as indicated by the dedication of the book "to the memory of Aldo Leopold whose philosophy remains a permanent source of inspiration".

This book is aimed at the beginning university or college student and the interested public. High school seniors in special or honors courses could also profit from using it; high school biology teachers, especially urban ones, should study this book.

Dasmann covers the following topics: nature of the environment, major biotic regions, man's record on earth, conservation of environment, soil, agriculture and world food supplies, civilization and water, forests and timber, livestock on the range, management of wildlife, aquatic and urban environments, problems of population, need for energy and minerals, action for conservation, and our vanishing heritage of wild nature untouched by man's activities.

- - - - - - - - - - - - - - - -

Index to authors in Volume Twenty-four



- - - - - - - - - - - - - - - -

Index to supra-specific scientific names in Volume Twenty-four

- - - - - - - - - - - - - - -

Dates of publication for Volume Twenty-three (emendations)

No. 1 — March 2, 1972
No. 2 — April 7, 1972
No. 3 -- May 20, 1972
No. 4 — June 29, 1972
No. 5 — July 13, 1972

- - - - - - - - - - - - - - -

Dates of publication for Volume Twenty-four

No. 1 -- August 17, 1972
No. 2 -- September 26, 1972
No. 3 — October 26, 1972
No. 4 — November 13, 1972
No. 5 -- December 7, 1972

PHYTOLOGIA is published irregularly, depending on the availability of typescripts. A volume consists of 512 printed pages and is closed when that number of pages has been published, regardless of the number of individual issues. The next volume begins as soon as the previous on is closed. Subscribers must realize that a single volume may extend over several years or several volumes may be issued in whole or in part during a single calendar year.