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A TRIFOLIOLATE SPECIES OF KOANOPHYLLON (ASTERACEAE-EUPATORIEAE)
FROM CHIAPAS, MEXICO

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Studies for a treatment of the Asteraceae of Mexico (Turner and Nesom, in prep.) have revealed a trifoliolate species of the genus Koanophyllon (sensu King and Robinson, 1971), a segregate from the large genus Eupatorium. The only two collections known possess both simple and trifoliolate leaves on the same plants, but trifoliolate leaves predominate. Fig. 1 reveals the range of variation found.

I have dubbed this, presumably undescribed taxon, K. tripartitum. It is related to the simple-leaved K. ravenii King & H. Rob. and differs by yet other characters including phyllary shape, peduncle length and pappus size.

KOANOPHYLLON TRIPARTITUM B. Turner, sp. nov.

K. ravenii King & H. Rob. simile sed foliis tripartitism phyllariis obtusis vel truncatis, et setis pappi numerosioribus longioribus differt.

Reportedly an arching shrub to 1.5 m high. Stems terete, striate, densely purplish puberulent. Leaves opposite, 5-9 cm long, 3-7 cm wide, predominantly trifoliolate, but a few simple leaves also present; petioles 10-15 mm long, densely pubescent like the stems; petiolules 0-8 mm long; leaflets ovate, irregularly dentate; simple leaves deltoid, 3-nervate from the base, dentate, densely glandular-punctate beneath. Heads white, ca 4 mm high, arranged in spike-like, terminal or axillary, interrupted globose clusters, the ultimate peduncles 2-5 mm long. Involucres subimbricate, 2-3 seriate, 2.5-3.5 mm long, the bracts truncate-lacerate or obtuse-lacerate at the apices. Florets ca 10 per head; corollas ca 2 mm long, the lobes atomiferous glandular. Achenes 2.5-3.0 mm long, hispidulous, the pappus of 30-40 persistent bristles 2-3 mm long.

TYPE: MEXICO. CHIAPAS: Mpio. de La Independencia, ridge with lower montane rain forest, 45-50 km E of Lagos de Montebello National Park on road to Ixcán from Santa Elena, 760 m, 22 Jan 1982, D. E. Breedlove & F. Almeda 57695 (holotype TEX; isotypes CAS, etc.).

Additional Specimen Examined: MEXICO. CHIAPAS, Mpio. de la Independencia, "rocky slope with Pinus, Acacia and Quercus above and SW of La Soledad on road to Las Margaritas", 1525 m, 29 Sep 1981, Breedlove 53093 (TEX).

The two sheets concerned were distributed as K. ravenii but they differ from that species in possessing 3-foliolate leaves; phyllaries with obtuse or truncate, lacerate, apices; longer ultimate peduncles;

and pappus bristles more numerous and longer (30-40 vs ca 20; 2-3 mm long vs ca 0.5 mm). In total characters K. tripartitum is somewhat intermediate to K. ravenii and K. solidaginoides (H.B.K.) King & H. Rob., but the 3-foliolate leaves and obtuse or truncate involucre bracts are diagnostic.

I am grateful to Dr. Guy Nesom for the Latin diagnosis.

LITERATURE CITED

King, R. and H. Robinson. 1971. The genus Koanophyllon. Phytologia 22: 147-152.

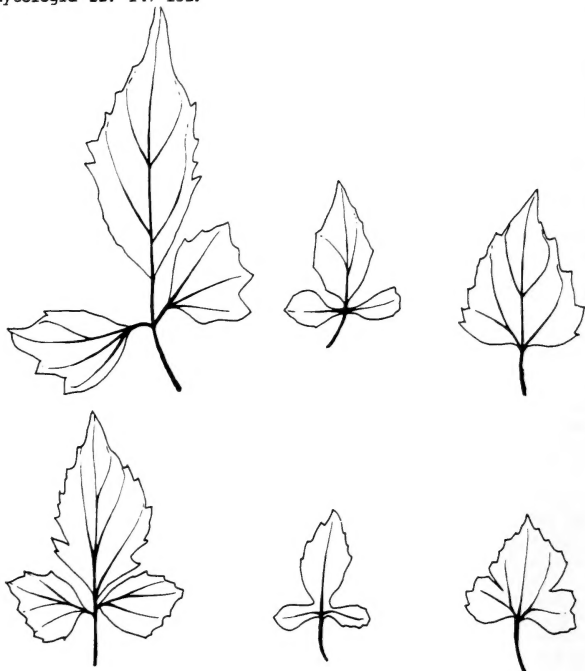


Fig. 1. Leaf variation in K. tripartitum. Top row from holotype; bottom row from Breedlove 53093.

SUBMERGENCE OF THE GENERA CATEROTHAMNUS AND OAXACANA
INTO HOFMEISTERIA (EUPATORIEAE, ASTERACEAE)

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The monotypic genera Oaxacana and Caterothamnus are interesting members of the tribe Eupatorieae since both possess well-developed pales on the receptacle and both relate to the well-known, widespread, genus Hofmeisteria.

Oaxacana was proposed by B. L. Robinson and Greenman in 1895 to accomodate a single, poorly known, bluff-dwelling species, O. malvaefolia from the canyons of northern Oaxaca. They compared the plant to Alomia and Trichocoronis, but its proper taxonomic position was not appreciated until the work of King (1972) who compared Oaxacana with his newly described genus Carterothamnus R. M. King. Robinson and King (1977) subsequently accepted both of the latter, placing them as the only genera of their "Oaxacana group" of the tribe Eupatorieae, next to the "Hofmeisteria group" which contained the single genus Hofmeisteria (from which several of its classically-conceived elements were removed and posited elsewhere; King and Robinson, 1966).

In a forth-coming treatment of the Asteraceae of Mexico (Turner & Nesom, in prep.), we intend to treat the genera Carterothamnus and Oaxacana as but chaffy members of the genus Hofmeisteria, and so propose the appropriate combinations herein.

Indeed, after a study of all members of the Hofmeisteria -Carterothamnus-Oaxacana complex (sensu King and Robinson) I can not find a single convincing character, or group of characters, that might lead to the retention of the latter two as distinct genera. Receptacular pales, which are emphasized in their treatment, occur sporadically in Hofmeisteria, and nearly every other character possessed by the two paleaceous genera are also found there in one form or the other. All of the taxa, except, perhaps, H. urenifolia, are more-or-less xeric members which occupy bluffs or saline seaward habitats. Of the three taxa, Oaxacana is the most distinct, occurring in a region remote from its congeners and possessing nearly epappose, flattened, achenes. Phyletically, it is perhaps best distinguished by the enlarged, sclerose, base of its stylar shaft. However, within Hofmeisteria and Carterothamnus specialization in the base of the stylar shaft varies from zilch (in H. urenifolia) to markedly nodose (in Carterothamnus) to a

lesser version of the Oaxacana-type (in H. malvaefolia).

King and Robinson (1970) have briefly discussed some of the differences that are said to distinguish between Oaxacana and Carterothamnus. They emphasize the following:

Oaxacana

1. achenes flattened
2. corolla glandular-pubescent
3. pappus obsolete
4. weakly-expanded style apices
5. firm collar-cells
6. anther-appendages longer, obtuse

Carterothamnus

1. achenes symmetrical
2. corolla glabrous
3. pappus well-developed
4. knob-like style apices
5. weak or lax collar-cells
6. appendages shorter, truncate

Nevertheless, they prefaced the above observations by the following, "One further point of great interest is that these [two] genera seem to be very closely related to each other."

In my opinion the Hofmeisteria-Carterothamnus-Oaxaca complex is a monophyletic assemblage, the basal members of which are Carterothamnus and Oaxacana, both of which have retained receptacular chaff, presumably a primitive or relic-trait in the Asteraceae generally. Appropriate name changes to accomodate these views follow.

HOFMEISTERIA MALVAEFOLIA (B.L. Rob. & Greenm.) B. Turner, comb. nov.

Based upon Oaxacana malvaefolia B.L. Rob. & Greenm., Amer. J. Sci. 50:151.1895.

HOFMEISTERIA ANOMALOAETHA (R.M. King) B. Turner, comb. nov.

Based upon Carterothamnus anomalochaeta R.M. King, Rhodora 69:45.1967.

LITERATURE CITED

King, R.M. 1967. Studies in the Eupatorieae (Compositae) I-III. 69:35-47.

_____. 1972. Studies in the Compositae-Eupatorieae. XV. Rhodora 72:100-105.

King, R.M. and H. Robinson. 1966. Generic limitations in the Hofmeisteria complex (Compositae-Eupatorieae). Phytologia 12:465-476.

_____. 1970. Studies in the Eupatorieae (Compositae). XIV. Phytologia 19:301-302.

STUDY OF THE *AGERATINA MAIRETIANA* COMPLEX (ASTERACEAE-EUPATORIAE)

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McVaugh (1972) rendered a conspectus of a group of species centering about *Ageratina mairetiana*, which I will refer to here as the *A. mairetiana* complex. The group is readily recognized by its often small-tree habit, relatively thick, trullate or broadly ovate leaves and large heads, but most of all, by its 2-seriate pappus, the outer series consisting of very short (1-2 mm long), narrow, ciliate scales or bristles, the inner series of bristles 5-7 mm long. In addition, the achene is relatively elongate and is, to some degree, viscid - glabrous or glandular-pubescent (rarely intermixed with hispid hairs).

In spite of its distinctive nature the taxa concerned clearly belong to the genus *Ageratina*, subgenus *Neogreenella*, as defined by King and Robinson (1970, etc.), possessing a base chromosome number of $x=17$ and tubular, glabrous, corollas.

McVaugh (1972) recognized five species in the complex, one of these possessing two forms. He provided a key to the taxa concerned which has proven very helpful in my taxonomic evaluation of the group. I recognize seven species, including all of those recognized by McVaugh. One of these, *A. pringlei*, was not treated by McVaugh and the other, *A. yecorana*, is described as new in the present treatment. In addition I have elevated his forma of *A. mairetiana* to varietal status. The species are all closely related and occasional hybrids presumably occur between these where they occur together.

The common, widespread species, *A. glabrata* H.B.K., superficially resembles members of the complex, but can be immediately recognized by its 1-seriate pappus and merely hispid achenes.

The most obviously related species to the complex is *A. cremastra* (B. Rob.) King & H. Rob. of Guerrero. It has most of the features of the species, including leaf shape and nervation, involucre features and 2-seriate pappus. Its strictly axillary, lax, flexuous corymbs appear to set it apart from the other taxa, but on phyletic grounds it should be included. Yet more remote, but still closely related, is *A. oaxacana* (Klatt) King & H. Rob. (= *A. breedlovei* King & H. Rob.), which has quite different, pinnately-nerved, leaves, yet it also has the double pappus and the distinctive involucre of the *A. mairetiana* complex. From *A. oaxacana* one must slip into *A. pelotropa* (B. Rob.) King & H. Rob. (= *A. cronquistii* King & H. Rob.). Beyond the latter one might suggest a link with *Eupatorium areolare* DC., which King & Robinson treat as

a member of the genus Piptothrix which Gage (1986) would transfer to Ageratina. But these are problems for the future. My present intent is to provide a more comprehensive treatment of the A. mairetiana complex than is accorded the group by McVaugh, this having been occasioned by my attempts to identify material referred to here as A. yecorana. To this purpose I provide a key to the taxa concerned, as follows:

1. Peduncles and phyllaries densely stipitate-glandular.
 2. Pubescence of foliage a dense tomentum of brownish hairs up to 2 mm long; leaf-blades broadest at or near the middle-----A. chiapensis
 2. Pubescence of foliage not as above; leaf-blades broadest at or near the base-----A. pringlei
1. Peduncles and phyllaries variously pubescent to glabrous, but not densely stipitate-glandular (i.e., plants with only a smidgen of such hairs will key here).
3. Involucres 5-6(7) mm long.
 4. Capitulescence a large ovoid or subcylindric, paniculate thyrse formed by both terminal and axillary corymbs; heads usually pink or purplish-----A. cylindrica
 4. Capitulescence a simple rounded, terminal corymbose panicle; heads white-----A. cerifera
3. Involucres (7)8-12 mm long.
 5. Flowers (30)45-70 per head; achenes with stipitate-glandular hairs or with hispid hairs intermixed.
 6. Involucral bracts ca 1/2 - 2/3 as long as the heads, the middle series elliptical, 2-4 mm wide-----A. yecorana
 6. Involucral bracts as long as the heads, the middle series linear-lanceolate, 1-2 mm wide-----A. lasioneura
 5. Flowers (10)15-35 per head; achenes either viscid-glabrous or with atomiferous unstalked glands (rarely a few hispid hairs)-----A. mairetiana.
 7. Ultimate peduncles and young involucres glabrous or glutinous; florets 25-35 per head; branchlets usually reddish; Jalisco & Durango, (intergrades with the below)-----var elucens
 7. Ultimate peduncles and young involucres thinly to densely

tomentulose; florets 10-25 per head; branchlets whitened by the tomentum; widespread-----var maireriana

AGERATINA CERIFERA (McVaugh), King & H. Rob., Phytologia 24:86. 1972.

Eupatorium ceriferum McVaugh, Contr. Univ. Michigan Herb. 9:390. 1972. TYPE: MEXICO. JALISCO: Sierra de Cuale, SW of Talpa, 19-21 Nov 1952, McVaugh 14392 (holotype MICH; isotype US!)

McVaugh (1984) has rendered a detailed description based upon 3 collections, including the type, all from Jalisco. I have examined an additional collection from Guerrero (Dist. Mina, Laguna, 1900 m, 29 Nov 1936, Hinton 9919, GH, US).

The species is readily recognized by its small involucre (mostly 5-6 mm long), heads in terminal congested corymbs and achenes copiously covered with white waxy globules.

AGERATINA CHIAPENSIS (B. L. Rob.) King & H. Rob., Phytologia 19: 213. 1970.

Eupatorium chiapensis B. L. Rob., Proc. Amer. Acad. Arts 25:332. 1900. TYPE: MEXICO. CHIAPAS: ca Pinabete, 8 Feb 1896, E. W. Nelson 3786 (lectotype US!, as selected by McVaugh).

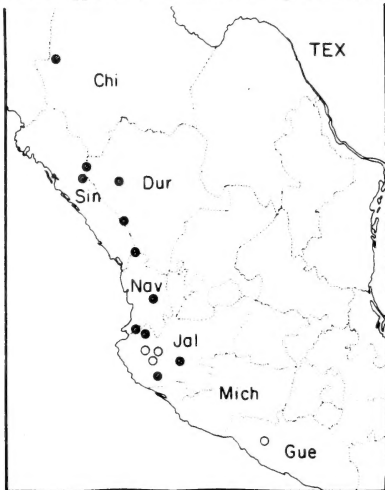


Fig. 1. Distribution of *A. cerifera* (O) and *A. lasioneura* (●).

McVaugh (1984) has rendered an excellent description of the taxon. As indicated in Fig. 4, the species is uncommon but widespread in southern Mexico, extending into adjacent Guatemala.

AGERATINA CYLINDRICA (McVaugh) King & H. Rob., Phytologia 24:89. 1972.

Eupatorium cylindricum McVaugh, Contr. Univ. Michigan Herb. 9: 393. 1972. (holotype MICH; isotype LL!, US!).

McVaugh (1984) has rendered a detailed description based upon collections from Jalisco and a single sheet from Mexico State. In addition, I have examined collections as shown in Fig 2, including material from the following, previously unreported states: MICHOACAN: 10 km NW Quiroga, 20 May 1978, Nunez & Ramos 698 (WISC);

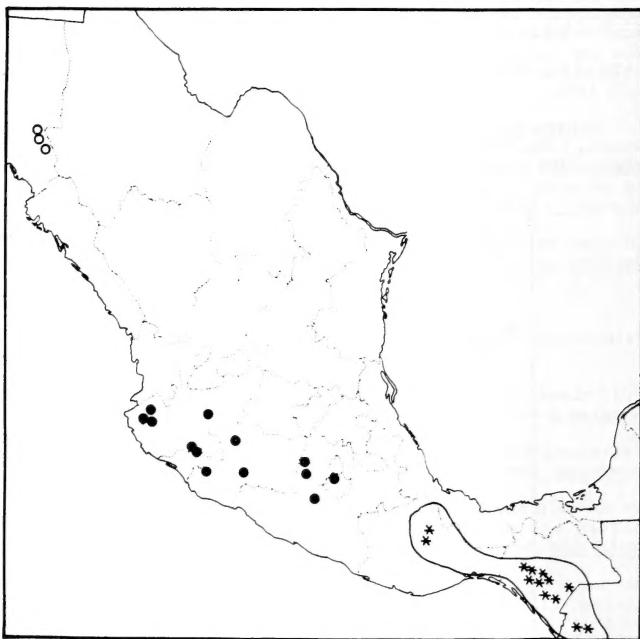


Fig. 2. Distribution of *Ageratina cylindrica* (●), *A. pringlei* (*), *A. yecorana* (○).

ca Morelia, Mar 1909, Arsene 2449 (GN, NY, UC, US). MORELOS: 19.2 mi NW of Cuautla, 3 Mar 1985, Luckow 2508 (TEX). GUERRERO: Taxco, 15 Feb 1936, Abbott 91, 93, 94 (GH).

As noted by McVaugh in his original description of the species, *A. cylindrica* is readily recognized by its very large capitulescence and relatively small heads (5-6 mm high) which superficially resemble those of *A. cerifera*.

AGERATINA LASIONEURA (Hook. & Arn.). King & H. Rob., *Phytologia* 19:224. 1970.

Eupatorium lasioneuron Hook. & Arn., Bot. Beechey Voy. 297. 1840. TYPE: MEXICO. JALISCO: w/o date, w/o locality, Beechey s.n. (holotype K; holotype tracing, GH!).

Eupatorium chapalense S. Wats., Proc. Amer. Acad. Arts 26: 138. 1891. TYPE: MEXICO. JALISCO: mountains near Lake Chapala, 17 Dec 1889, Pringle 2974 (holotype GH!).

Eupatorium chapalense S. Wats. var. *salicifolium* B. Rob., Proc. Amer. Acad. Arts 35: 332. 1900. TYPE: MEXICO. JALISCO: mountains near Lake Chapala, 18 Oct 1895, Pringle 7071 (holotype GH!).

Ageratina chapalensis (S. Wats.) King & H. Rob. 19:220. 1970.

McVaugh (1984) has described this species in some detail and my understanding of the taxon is essentially the same as his, except that I sink *A. chapalensis* into synonymy without hesitation. *Ageratina lasioneura* can be distinguished from *A. maireriana* by its achenes which are variously pubescent with hispid hairs or stalked glands; those of *A. maireriana* are invariably glabrous or beset with sessile atomiferous viscid globules.

The single collection from Chihuahua as shown in Fig 1 ("Lagotera", 21 Jul 1965, Pennington 89, TEX), definitely belongs to the *A. maireriana* complex, possessing the distinctive double pappus and associated features. It differs from *A. lasioneura* in having the achenes hispid only, but the specimen is well-past maturity and the glands may have shed.

AGERATINA MAIRETIANA (DC.) King & H. Rob., *Phytologia* 19:224. 1970.

Eupatorium mairerianum DC., Prod. 5: 167. 1836. TYPE: MEXICO. MEXICO STATE: w/o locality, 1833, Mairet s.n. (holotype G-DC; microfiche G-DC!)

Eupatorium cognatum Kunth & Bouche, Ind. Sem. Hort, Berol. 1847: 13. 1847. (according to B. Robinson, 1961).

Eupatorium rafaelense Coulter, Bot. Gaz. 16: 97. 1891. TYPE:

GUATEMALA. ZACATEPEQUEZ: San Rafael, 6500 ft, Apr 1890, J.D. Smith 2368 (lectotype F; isolectotype GH,US!).

Ageratina rafaensis (Coulter) King & H. Rob., *Phytologia* 19:225. 1970.

McVaugh (1984) has given an accurate and thorough description of this species. In addition he (1972) rendered a workable key to related taxa, pointing out most of the salient features which mark them. He acknowledges difficulty in separating A. lasioneura from A. mairetiana, but I find these two species to be readily distinguishable, largely by their achenes, as noted in my key to species (above). As indicated by McVaugh (1972), A. lasioneura occasionally has a few very short glandular-trichomes on its peduncles, these intermixed with an arachnoid-tomentose pubescence. Such glands are rarely, if at all, found in A. mairetiana. However, B. Robinson described a var. adenopodium of Eupatorium mairetianum from Guatemala, which was accepted as a synonym of the latter by Williams (1976). Examination of the type of var. adenopodium has convinced me that it is a synonym of A. pringlei.

As shown in Fig. 3, Ageratina mairetiana is a widespread variable species comprising two varieties which intergrade in southern Jalisco, Michoacan and adjacent Mexico State. Thus the var. elucens (below) is quite variable in the latter region; but the populations in Durango and adjacent Sinaloa are quite uniform. Similarly, the var. mairetiana is fairly uniform throughout most of

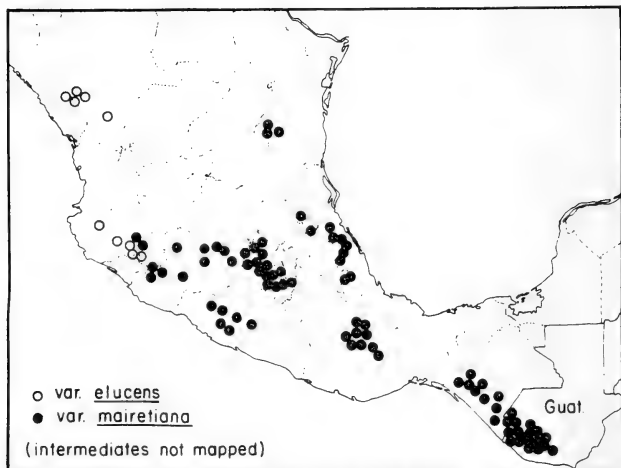


Fig. 3. Distribution of Ageratina mairetiana.

its range except in Michoacan and adjacent areas where intergrades occur.

As noted below, occasional putative hybrids between *A. mairetiana* and *A. pringlei* occur in the Cerro de San Felipe of Oaxaca where the two taxa are in close proximity. Occasional hybrids between these two taxa presumably also occur in Guatemala and these are discussed under *A. pringlei*.

In Oaxaca, *A. mairetiana* is more commonly encountered than is *A. pringlei*, at least 10 different collections having been made of the former by a number of workers (NY, TEX, US), mostly about the city of Oaxaca and along highway 175 toward Ixtlan de Juarez between 2400 and 2700 m. *Ageratina pringlei*, as noted under the discussion of this species, is known only by a few collections from Cerro San Felipe at about the same elevations. Regardless, *A. pringlei* is readily recognized by its smaller, more deltoid leaves and glandular-pubescent capitulescence (including involuclral bracts).

AGERATINA MAIRETIANA var. *ELUCENS* (McVaugh) B. Turner, comb. nov.

Eupatorium mairetianum f. *elucens* McVaugh, Contr. Univ. Michigan Herb. 9:400. 1972. (holotype MICH; isotype LL!)

Eupatorium multiserratum Sch.-Bip. in Seem., Bot. Voy. Herald 301, 1856. TYPE: MEXICO. SINALOA, DURANGO or NAYARIT: w/o locality, 1850, Seaman 1987 (P).

Ageratina multiserrata (Sch-Bip.) King & H. Rob., Phytologia 24:94. 1972.

McVaugh (1984) has rendered a detailed description of this taxon, which he designated a "forma". In my opinion the variation concerned more rightly applies to what most present-day systematist would call a variety : i.e., the characters which mark the taxon are relatively consistent over a broad region but appear to intergrade

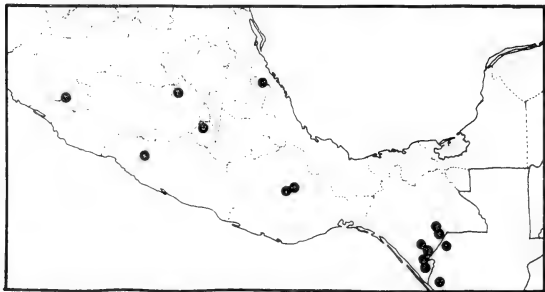


Fig. 4. Distribution of *A. chiapensis* (●).

peripherally with its adjacent regionally marked sister-taxon, var. mairetiana. So far as known, the variety in its "typical form" is confined to the states of Sinaloa, Durango and Jalisco (Fig. 3). The variety is readily distinguished by its elongate, narrow, glabrous or viscid involucre bracts, the outer members of which form a partial calyculum. The typical var mairetiana is more widespread and, as noted by McVaugh, is distinguished by its usually tomentulose head with fewer florets.

I place Eupatorium multiserratum in synonymy here, instead of with Ageratina lasioneura since its original describer, as well as McVaugh (1984), who examined the type, notes the achenes (albeit immature) to be glabrous. This character, along with the glabrescent involucre bracts, suggest that the plant belongs to A. mairetiana var elucens; certainly Seemann collected in the same region where the latter is known to occur (the Sinaloa-Durango border region WSW of Durango City.).

AGERATINA PRINGLEI (B. L. Rob. & Greenm.) King & H. Rob, Phytologia 19:225. 1970.

Eupatorium pringlei B. L. Rob. & Greenm., Amer. J. Sci. 50:152. 1895. TYPE: MEXICO. OAXACA: Sierra de San Felipe, 9500 ft, 24 Dec 1894, C. G. Pringle 6118 (holotype GH!; isotype A!).

Eupatorium mairetianum var. adenopodium B. L. Rob., Proc. Amer. Acad. Arts 51:534. 1916. TYPE: GUATEMALA. QUEZALTENANGO: Cerro Quemado, 21 Jan 1915, Holway 98 (holotype GH!).

This species was not included with the Ageratina mairetiana complex by McVaugh (1972). It clearly belongs to this group, however, possessing a dimorphic pappus, the outer series a group of short slender bristles. In addition, the foliage and achenes are like that species. Indeed Robinson, as noted above, described plants of this species from Guatemala as a variety of A. mairetiana.

Williams (1976) did not account for this species in his treatment of Eupatorium for the Flora of Guatemala. Apparently he included within his concept of E. mairetianum material which I would treat as E. pringlei. He takes the var. adenopodium to be a form of E. mairetianum in which the peduncles are densely glandular-puberulent (as opposed to tomentulose), and further alludes to the considerable "variation and integradation" in such characters. Actually, I find the glandular trichomes to be a valid marker of E. pringlei. It is probable that occasional hybridization produces the occasional intermediate (e.g., Dept. of Totonicapan, near Polagua, Williams et al. 22651, NY; etc). Future field workers should look into this problem, for as it now stands, the following treatments are possible: 1) acceptance of two species as treated here, 2) acceptance of a regional variety adenopodium with intergrades or 3) a single, highly variable, species with both tomentulose and glandular-pubescent peduncles. I think the first option to be the

best treatment based on present knowledge.

The type collection of *A. pringlei* is well endowed with glandular trichomes in the capitulescence, but the only two other collections known to me from Oaxaca are rather sparsely glandular. One of these (5 km N of hwy 175 at km post 20, E of Oaxaca, on logging road, Cerro San Felipe, 8600 ft, 14 Jan 1972, Spellenberg 2788, NY) is fairly typical *A. pringlei* but tends toward *A. maireriana*, while the other (Mcpio. Ixtepeji, ca 30 km S of the turn off to Ixtlan de Juarez on hwy 175, 2500 m, 2 Feb 1981, Martin 295, NY) is more or less intermediate between these taxa. It is possible that the two taxa hybridize in this area.

AGERATINA YECORANA B. Turner, sp. nov., Fig. 5.

A. lasioneuræ simile sed foliis 3(5)-nervibus ad basim et bracteis involucri valde imbricatis ellipticis vel oblongis flosculis enclisis multo brevioribus differt.

Erect shrub 1-2 m high. Stems at first white-tomentulose but with age glabrate and tan. Leaves opposite, 4-15 cm long, 3-9 cm wide; petioles 2-4 cm long; blades ovate to deltoid or rarely subcordate, 3(5)-nervate from the base, at first white-tomentulose above and below, with age puberulent or glabrate, the margins crenulate. Heads white, 10-25 in a terminal rounded corymb, 2-3 times as wide as high, similar but smaller corymbs also developing in the lower leaf axils immediately below. Involucres campanulate (8)10-12 mm high, 10-14 mm wide, 3-4 seriate, graduate; middle bracts decidedly elliptical or oblong 4.5-8.5 mm long, 2-4 mm wide, tomentulose. Receptacle convex, ca 3 mm across. Florets 45-55; corollas 7-9 mm long, tubular, glabrous except for a few hairs on the lobes. Achene both hispid and glandular-pubescent, ca 3 mm long; pappus double, an outer series of narrow ciliate scales ca 1 mm long and an inner series of 20-25 fragile ciliate bristles 6-8 mm long.

TYPE: MEXICO. SONORA: "Along the dirt road from Santa Rosa to Yecora, 8 mi E of Santa Rosa, about 10 mi W of Yecora" (ca 109° 02' W X 28° 28'N), along a small stream, bordering dry rocky volcanic slopes with *Quercus*, *Pinus* and *Lysiloma*; ca 5000 ft, 8 Apr 1982, A. C. Sanders, K. Kirtland & D. Emery 2643 (holotype TEX; isotype UC).

ADDITIONAL SPECIMENS EXAMINED: MEXICO. CHIHUAHUA: Arroyo Hondo, Sierra Charuco, 4500-5500 ft, 16-30 Apr 1948, Gentry 8062 (UC, US). SONORA: 11.1 mi (by road) W of Yecora (28° 03'N x 109° 01' W), 1575 m, moist seep along side of road, 2 May 1975, Carter et al. 75-55 (UC,US); Canyon de Tejas, Sierra Charuco, 4000-5000, 24 Apr 1948, Gentry 8124 (UC,US).

Strother (by annotation) identified type material of this species as *Eupatorium chapalense*, which is a synonym of *E. lasioneuron*. *Ageratina yecorana* differs markedly from the latter in

its large heads with elliptical or oblong-elliptical, markedly graduate, involucral bracts. The species is apparently a local endemic in the region about Yecora, Sonora (Fig. 2).

ACKNOWLEDGEMENTS

This study is based upon about 400 collections from the following herbaria: GH(110), LL(50), NY(75), TEX(125), UC(40). I am grateful to the institutions concerned for the loan of materials. Guy Nesom provided the Latin diagnosis and Linda Vorobik illustrated A. yecorana.

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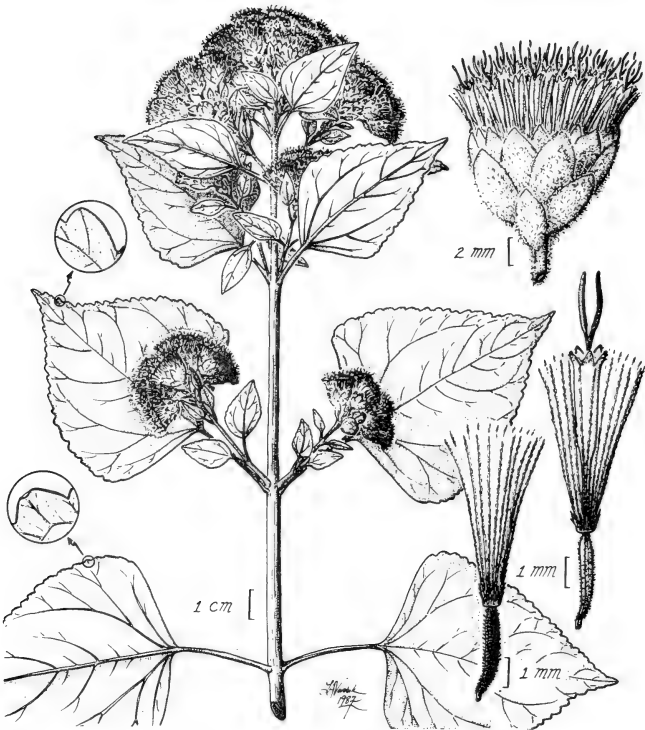


Fig. 5. *Ageratina yecorana*, from holotype.

REDUCTION OF THE GENERA PIQUERIOPSIS AND ILTISIA
TO MICROSPERMUM (ASTERACEAE-EUPATORIEAE)

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Preparation of a treatment of the Asteraceae of Mexico (Turner and Nesom, in prep.) has occasioned an evaluation of the monotypic genera Piqueriopsis R. M. King and Iltisia S. F. Blake, especially as these relate to Microspermum Lag.

Microspermum, as previously treated, is a genus of eight species, all of these confined to montane habitats of tropical and subtropical Mexico. Rzedowski (1970, 1972) has rendered an excellent account of the genus but would exclude the closely related Iltisia of Costa Rica and Panama. However, he clearly perceived the two taxa to be sister-groups, stating

Al comparar material de Iltisia repens con el de Microspermum se pudieron confirmar notables similitudes entre ambos generos, particularmente en cuanto a habito, indumento, morfologia de las hojas, de la corola, del androceo y del aquenio se refiere. Sin embargo, se detectaron los siguientes caracteres diferenciales:

Nevertheless, as he notes, there seem to be several characters which appear to distinguish them. He lists these as follows:

Microspermum

1. Peripheral florets bilabiate
2. Submarginal florets zygomorphic
3. Styler appendages linear or subulate
4. Ectexine of pollen ca as thick as the endexine
5. Corolla lobes (4)5(6)

Iltisia

1. not so (regular)
2. not so (regular)
3. Styler appendages triangular
4. Ectexine twice as thick as the endexine
5. Corolla lobes (3)4(5)

Pertinent to the above listing is the recent description of Iltisia echnadiensis King & H. Rob. of Costa Rica and adjacent Panama which is said to be a generally larger plant than the closely related I. repens but "differs markedly in the asymmetry of the peripheral flowers which have expanded outer lobes similar to those of the related genus Microspermum of Mexico". They note, however, that the characteristic 4-lobed condition is but a pair divided to the base, rather than a group of three

fused for half their length as in Microspermum.

Indeed, if one looks at the range of variation found in the eight species of Microspermum. There is not a single character, or significant group of characters, that might serve to distinguish between Microspermum and Iltisia. Thus I agree with Williams (1961) who views Iltisia as but a reduced Microspermum. I would also include in the latter the minute, monotypic, Piqueriopsis. While King (1965) compared the latter taxon with Piqueria, it would appear on all accounts to be a much-reduced member of Microspermum. He noted that the 8-10 ribbed achenes and 4-lobed corollas would distinguish it from other genera of the subtribe Piquerinae (cf. also King, 1967), but 8-ribbed achenes and 4-lobed corollas also occur in Microspermum (McVaugh, 1984; per. obs.), with which Piqueriopsis is certainly most closely allied.

In short, inclusion of Iltisia and the much-reduced Piqueriopsis in an "expanded" Microspermum makes sense on morphological, ecological and biogeographical grounds, for all share the same general characters, occupy similar ecological niches and occur in cool montane regions mostly along the Pacific slopes.

My nomenclature and generally account of the genera Iltisia and Piqueriopsis follows:

MICROSPERMUM REPENS (Blake) L. Wms., Fieldiana, Bot. 9:371. 1961.

Iltisia repens Blake, J. Washington Acad. Sci. 47:409. 1959. TYPE: COSTA RICA. CARTAGO: Cerro de la Muerte, 3400-3500 m, 25 Jul 1949, Holm & Iltis (holotype MO!).

Iltisia echandiensis King & H. Rob., Phytologia 56:251. 1984. TYPE: COSTA RICA/PANAMA. PUNTA ARENAS/BOCAS DEL TORO: Cordillera de Talamanca, Cerro Echandi, on the international border, 3050-3160m, 22 Aug 1983, Davidse et al. 23854 (holotype US; isotype MO!)

ADDITIONAL SPECIMENS EXAMINED: COSTA RICA. CARTAGO/SAN JOSE: NW of La Asuncion, 3000-3200m, 27 Oct 1975, Burger & Baker 9507 (F); Cerro Enchandi, 3700m, Aug 1983, Gomez et al. 21866 (MO); Cerro de la Muerte, 26 Aug 1967, Raven 22054 (F,GH,MSC,TEX). PANAMA: "1-2 km SWW of Itamut camp", Bocas del Toro, 3175m, 6-7 Mar 1984, Gomez et al. 22594 (F).

I consider Iltisia echandiensis to be but a form of

Microspermum repens with zygomorphic peripheral florets. In fact most of the peripheral florets of the above cited specimens have, more or less, zygomorphic corollas, the difference being one of degree and not quality.

MICROSPERMUM MICHOCANUM (R. King) B. Turner, comb. nov.

Based upon Piqueriopsis michoacana R. King, Brittonia 17:352.1965.

Known only from the TYPE: MEXICO. MICHOCAN: vicinity of Uruapan, ca 6100 ft, 11-15 Oct 1961, King & Soderstrom 4700 (holotype US; isotypes TEX!, etc).

A remarkably delicate, much-reduced species, originally placed in the monotypic Piqueriopsis and said to have relationships with Piqueria but clearly much closer to Microspermum, having most of the features of M. gracillimum Rzed.

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A NEW SPECIES OF AGERATINA (ASTERACEAE-EUPATORIEAE)

FROM COAHUILA, MEXICO

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Study of the large genus Ageratina for a treatment of the Asteraceae of Mexico, (Turner & Nesom, in prep.) has revealed the following novelty:

AGERATINA RISKINDII B. TURNER, sp. nov., Fig. 1.

A. grashoffii B. Turner simile sed foliis numerosioribus laminis late cordatis et lobis corollae pubescentibus differt.

Perennial suffruticose herbs to 70 cm high. Stems stiffly erect, puberulent, several arising from a woody rootstock, simple (i.e., mostly unbranched below). Leaves opposite, 7-11 cm long, 6-8 cm wide; petioles 2-3 cm long; blades firm, broadly cordate, about as wide as long, or wider, (3)5-nervate from the base, puberulent and epunctate beneath, the margins broadly crenulate. Heads white, 5-8 in terminal or axillary subfasciculate corymbs, the ultimate peduncles (immature) 5-15 m long, puberulent; bracts linear-lanceolate, 2-costate, the apices acute. Florets ca 40 per head; corollas (immature) tubular, the lobes markedly short-pubescent and atomiferous-glandular. Achenes (immature) hispidulous, the pappus of ca 40 bristles, 4-5 mm long.

TYPE: MEXICO.COAHUILA. Mpio. de Musquiz, Rincon de Maria (28° 27' 30" N x 102° 04' W), open deciduous woodland above road, with Quercus glaucoides, Q. gravesii, Prunus, etc., ca 1750 m, 23 Aug 1975, T. Wendt, E. Lott & D.H. Riskind 1972 (holotype TEX).

The species superficially resembles Ageratina cardiophylla (B.L. Rob.) King & H. Rob. and A. grashoffii B. Turner, of the subgenus Neogreenella (sensu King & Robinson, 1970) both from the Sierra Madre Occidental. From the former it differs in its eglandular vestiture and from the latter by its broadly cordate leaves. But from both it differs markedly in having pubescent corolla lobes, a diagnostic character of the subgenus Ageratina. In other characters, however, it appears to relate to the above mentioned species, and presumably can be positioned near them in the Neogreenella group.

It is a pleasure to name this species for David Riskind, noted travel-author and botanist working with the Texas Parks and Wildlife Division and who participated in its discovery.

ACKNOWLEDGEMENTS

I am grateful to Dr. J. Henrickson who called the collection to my attention and to Dr. Guy Nesom who provided the Latin diagnosis. The illustration was by Frances Runyon.

LITERATURE CITED

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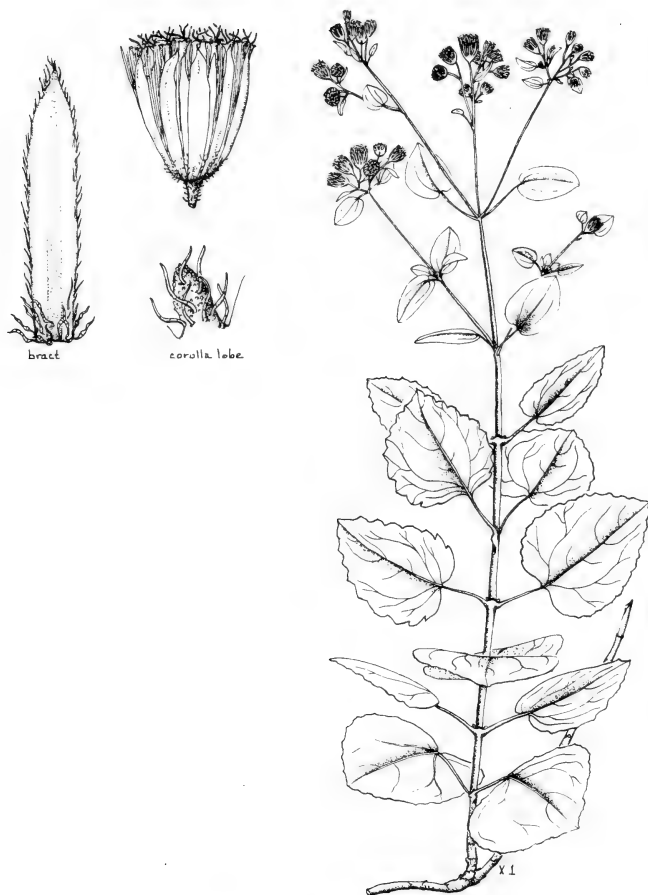


Fig. 1. *Ageratina Riskindii*, from holotype.

NEW TAXA AND COMBINATIONS IN VIGUIERA (ASTERACEAE, HELIANTHEAE)

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A forthcoming taxonomic treatment of the Asteraceae of Mexico (Turner and Nesom, in prep.) necessitates the following nomenclatural production:

VIGUIERA VOROBIAE B. Turner, sp. nov., Fig. 1.

V. kingii McVaugh affinis sed capitulis latioribus quam altioribus, flosculis disci et radii numerosioribus, et acheniis glabris sine pappo differt.

Shrub to 2.5 m high. Stems brittle, reddish, sparsely pubescent, the internodes up to 12 cm long. Leaves opposite or sometimes ternate, 8-12 cm long, 3-5 cm wide; petioles 1-2 cm long, scabrous; blades ovate, 3-nerved from at or near the base, scabrous-pubescent above and below, the margins crenulo-dentate. Heads 2-3, subumbellate at the termination of stems, the ultimate peduncles scabrous-pubescent, 3-7 cm long. Involucre hemispheric, 3-4 seriate, ca 5 mm high, 8-10 mm across; bracts ovate-lanceolate, ciliate, subequal, the outer series somewhat foliaceous and reflexed. Ray florets ca 11, neuter; corollas yellow, the ligules 8-10 mm long, 3-4 mm wide. Disk corollas yellow, sparsely hispidulous, ca 4 mm long, the tube ca 0.8 mm long, the limb tubular 3.0-3.3 mm long. Anthers brown, ca 2 mm long, the filaments glabrous. Achenes black, somewhat striate, 2.5-2.8 mm long, ca 1 mm wide; epappose.

TYPE: MEXICO. CHIHUAHUA: Mpio. Ocampo, confluence of Rio Basaseachic and Rio Durazno, ca 2 mi S of village of Basaseachic, in grassy clearing below steep part of ravine, above woods at bottom of Canyon Durazno, "abundant shrubs ca 8 ft tall", ca 1900 m, 18 Oct 1986, Guy Nesom & Linda Vorobik 5560 (holotype TEX; isotypes MEXU, TENN).

Additional specimen examined: MEXICO, CHIHUAHUA: Mpio. Ocampo, in canyon to S of Basaseachic falls where trail leads down, ca 188 m, 4 oct 1986, Spellenberg et al. 8758 (LL).

The present species belongs to the subgenus Viguiera (=Subg. Calanticaria) Section Viguiera (=Sect. Chloraca) but it is not easily placed in the five series recognized by Blake (1918) under that section. In Blake's key it will begrudgingly nestle near V. dentata of the ser. Dentatae but it does not have the pubescent stamens of that species nor its corolla characters. In McVaugh's (1984) Flora Novo-galiciana it will key to, or near, V. palmeri

(which was positioned in the genus *Rhysolopis* by Blake, discussed below). It does have the peculiar capitulescence and branching habit of the latter and might be looked upon as a "linking" species which brings *Rhysolopis* properly into *Viguiera*, as the group was so treated by McVaugh (1984).

In our forthcoming treatment of *Viguiera* for the Asteraceae of Mexico (Turner and Nesom, in prep.) we also intend to treat *Rhysolopis* within *Viguiera* and thus propose the following new taxon and combinations:

VIGUIERA PALMERI var. COALCOMANA B. Turner, var. nov.

Frutex subdecumbens 2-4 m altus; bracteae involucri glabrae, abrupte acutatae, seriei externae acute reflexae; flosculi discii antheris fuscis.

Weak or sprawling shrub 2-4 m high. Involucral bracts abruptly acute, the margins ciliate, otherwise glabrous or nearly so, the outer bracts sharply reflexed. Ray florets 13, up to 2 cm long. Disk florets with brown anthers.

TYPE: MEXICO. MICHOACAN: Mpio. Coalcoman, Coalcoman, 1000 m, 23 Oct 1938, G. B. Hinton et al. 12441 (holotype LL; isotype MICH).

Additional Specimens Examined: MICHOACAN. El Manquito de la Sierra, 22.5 km W Aguililla on road to dos Aguas, 1560 m, 18 Nov 1983, Barrie et al. 576 (MEXU, TEX); 15-16 km SE Aserradero Dos Aguas and nearly west of Aguililla, 1400-1400 m, 25-26 Nov 1970, McVaugh 24712 (LL).

McVaugh (1984), under his discussion of *V. palmeri* var. *rzedowskii*, singled out the holotype of var. *coalcomana* as being "perhaps another [undescribed] species". Nevertheless he cites, under his var. *palmeri*, the collection McVaugh 24712 (which I include under var. *coalcomana*, and so cite this here). The latter specimen is very much unlike McVaugh's var. *palmeri* but, except for the much shortened outer involucral bracts, closely matches what I call var. *coalcomana*. And, of course, it also occurs in the Coalcoman area of western Michoacan.

VIGUIERA REYROBINSONII B. Turner, nom. nov.

Based upon *V. kingii* H. Rob., Phytologia 24: 210. [Oct.] 1972. Not *Viguiera kingii* McVaugh (30 Mar 1972).

Robinson (1972) recognized three species in the genus, two of which (*V. moplensis* and *V. palmeri*) were placed in *Viguiera* by McVaugh (1984). *Viguiera kingii* is seemingly a well-marked taxon, what with its distinctive involucre and soft pubescence on the under surface of its leaves.

Viguiera benziorum B. Turner, sp. nov.

V. seemannii Sch.-Bip. simile sed follis angustis petiolis longioribus, involucellis angustioribus minus imbricatis bracteis paucioribus, et flosculis paucioribus.

Shrub, perhaps 1-2 m high. Stems terete, reddish, coarsely hispid. Leaves opposite, 8-12 cm long, 1.5-2.5 cm wide; petioles 0.6-1.3 mm long; blades lanceolate, 3-nervate from near the base, coarsely strigose-hispid on both surfaces, very rough to the touch, the margins remotely serrulate to nearly entire. Heads 2-15 in stout terminal clusters, the ultimate peduncles hirsute-hispid, 3-10 mm long. Involucres ca 4-seriate, imbricate, narrowly campanulate, 10-12 mm high, 7-9 mm across; bracts linear-lanceolate, stiffly erect, appressed-hispid, 4-12 mm long, the apices acute. Pales with scarious margins and stiffly apiculate. Ray florets 3-5, sterile; corollas yellow, the ligules 5-6 mm long. Disk florets 15-20; corollas ca 7 mm long, yellow below, the lobes reddish; tube ca 1 mm long, the limb tubular, ca 6 mm long, the lobes decidedly pubescent. Body of the achenes ca 4 mm long, 1.8 mm wide, maculate, appressed pubescent throughout; pappus of two elongate, lanceolate, scales, 3-4 mm long, between these a few deciduous scales 0.5 mm long, or less.

TYPE: MEXICO. OAXACA: Mpio. Yosondua, Rancheria Yervasanta, Paraje Quavendigui. "At the overlook at the cross at the water falls." (16°53'N x 97°34'W), 1930 m, 26 Nov 1982, B. & K. Benz, B. Hallberg & M. Burd 677 (holotype WIS).

A striking species, much resembling V. seemannii Sch.-Bip. of northwestern Mexico but readily distinguished by its narrower involucre with fewer, less imbricate, bracts, silky pubescent achenes, narrower leaves with longer petioles, and corolla lobes densely pubescent.

The species is named for the Benz family, who participated in its collection.

ACKNOWLEDGEMENTS

I am grateful to Dr. Guy Nesom for the Latin diagnoses and to Dr. Linda Vorobik for the illustration.

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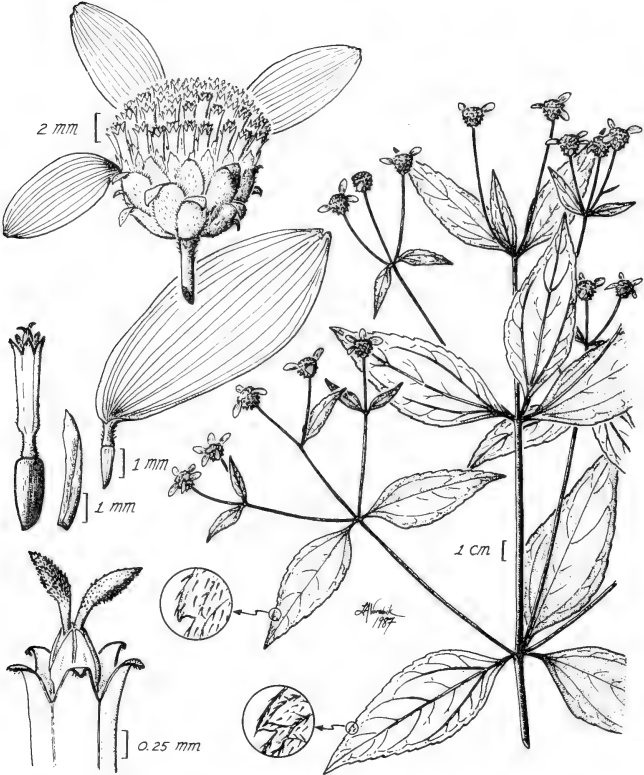


Fig. 1. *Viguiera Vorobikae*, from holotype.

A NEW SPECIES OF *PIQUERIA* (ASTERACEAE-EUPATORIEAE) FROM MICHOACAN, MEXICO

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Preparation of a treatment of *Piqueria* for the forthcoming Asteraceae of Mexico (Turner and Nesom, in prep.) has revealed the following novelty. It is related to the delicate annual, *P. laxiflora* B. L. Rob., and was first suggested as perhaps new to science by McVaugh (1984). I concur with his assessment and so describe it here.

PIQUERIA GLANDULOSA B. L. Turner, sp. nov.

P. laxiflora B. L. Rob. simile sed pedunculis ultimis longioribus trichomatibus glandulosis differt.

Delicate, erect, annual herbs 10-70 cm high. Stems striate or sulcate, glabrous below, arising from a small taproot. Leaves 1-7 cm long; petioles 3-15 mm long; blades thin, ovate to lanceolate, 3-nervate from the base, sparsely pubescent along the nerves, the margins dentate with 5-8 teeth along each side. Heads borne in diffuse, widely spreading, corymbose panicles, the ultimate peduncles slender, glandular-pubescent, mostly 7-20 mm long. Involucre narrowly turbinate, eximbricate, 2.0-2.5 mm high, ca 1.5 mm wide; bracts 4, glabrous or nearly so, except for the ciliate, erose, shortly cuspidate, apices. Florets 4 per head; corollas white, somewhat zygomorphic, ca 2 mm long; tube pubescent; lobes 5, 0.5-1.0 mm long. Anthers brown, ca 0.5 mm long. Achenes 1.5-1.7 mm long, glabrous, epappose.

TYPE: MEXICO, MICHOACAN: In open pine-oak woods in ravine 15 mi S of Ario de Rosales, ca 4200 ft, 22 Oct 1962, A. Cronquist 9735 (holotype TEX; isotypes MEXU, NY).

ADDITIONAL SPECIMENS EXAMINED: MEXICO. MICHOACAN: Uruapan, Cascadas de Tzararacua, ca 1400 m, 16 Dec 1984, Cowan 4875 (MEXU, TEX); 22 kms S of Uruapan, 3300-3700 ft, 16-22 Oct 1961, King & Soderstrom 4799 (TEX); 5 km S of Uruapan, ca 1900 m, 15 Nov 1983, Martinez et al 5326 (MEXU, TEX); ledges near Coru Station, 6000 ft, 13 Oct 1904, Pringle 13074 (TEX); 6 km S of Ario de Rosales, 1750 m, 27 Dec 1966, Rzedowski 23729 (TEX); El Cerro Piedra Parada, Mpio. Nuevo Urecho, 1100 m, 2 Oct 1970, Ventura 2502 (TEX).

The species is clearly related to *P. laxiflora* and several of the sheets cited above were singled out by McVaugh (1984; p.743), including the type itself, as perhaps representing a different species.

LITERATURE CITED

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SOME REMARKS ON TILLANDSIA CONFINIS (BROMELIACEAE)

Lyman B. Smith and Walter Till

Tillandsia confinis L. B. Smith (1953) is an epiphytic species of the montane rainforest and is disjunctively distributed (so far as known) from northern Colombia and adjacent Venezuela to Ecuador and central Perú, and has its southernmost locality in northern Bolivia (as "T. subtropicalis L. B. Smith", (1963). Apart from this East Andean distribution it has been found several times in southwestern Guayana.

Two varieties have been distinguished, the typical and var. caudata L. B. Smith (1963) (Smith & Downs 1977). The main difference, as indicated by the name, is the length of the lower primary bracts in relation to the spikes.

Most recently T. abyssophila L. B. Smith & Steyermark in L. B. Smith (1986) has been described as a new species from the Guayana Highland. Reexamination and comparison with the herbarium specimens deposited at the US have revealed the identity of T. abyssophila with T. confinis var. caudata, the former being consequently a synonym of the latter. Silva & Brazão 60942 (NY, S, US) collected in the Serra Pirapucú, Estado Amazonas, Brazil (southern Guayana Highland) and determined as T. confinis var. confinis (Smith & Downs 1977), obviously also is var. caudata which has been known from northern Colombia only and is new for both the floras of Venezuela and Brazil.

Finally it should be noted that in none of the protologs of the taxa mentioned above are the characters of the petals indicated, but in Flora Neotropica (Smith & Downs 1977) "white petals" are described. The herbarium label of Silva & Brazão 60942 bears "corolla purplish", and this in contrast to Smith & Downs (1977) information. At this moment it can not be decided if this is a further character to separate both varieties. A rather small postflowering specimen scarcely 30 cm high of T. confinis has been collected by the junior author in Perú (Dept. Huánuco, Cerros Sira, ca. 900 m s. m., August 1987) and is now cultivated at the Botanical Garden of the University of Vienna. Detailed floral studies are intended as soon as it comes into bloom.

This study has been supported by the "Fonds zur Förderung wissenschaftlichen Forschung in Oesterreich, Project no. P6399B. Literature:

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FOUR NEW SPECIES OF SAPIUM (EUPHORBIACEAE)
FROM CENTRAL AND SOUTH AMERICA

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Sapium remains one of the least understood of the large genera of Euphorbiaceae in the neotropics. Virtually all of the approximately 100 species in that area are large forest trees and consequently are poorly collected. Furthermore, the genus is highly stenomorphic, that is, the species are separated by relatively few characters. The primary taxonomic problem consists of determining the taxonomic value of those characters that do exist on the basis of an insufficient sample of collections.

Among the species of Sapium yet to be described, the following, which have been identified while working on floristic projects or while doing general determinations of neotropical Euphorbiaceae, are among the more distinctive.

SAPIUM ALLENII Huft, sp. nov. TYPE: Costa Rica. Puntarenas: region between Río Esquinas and Palmar Sur de Osa, climax forest, 30 m, 16 Jan. 1951, Paul H. Allen 5773 (holotype, F-1516348, F neg. 62129; isotype, GH).

Arbor ad 25 m alta; ramuli cicatricibus foliorum prominentibus et stipulis persistentibus. Folia aggregata versus apices ramorum; lamina oblonga-ovata, nervis utroque costae laterae 13-22 late arcuatis infra prominentibus; apice obtusa vel rotundata, plana, margine integra. Spicae laterales, aggregatae, ut videtur bisexuales, partibus masculinis non visis, floribus femineis usque ad 16, non visis, aggregatis. Capsula ovata, stipitata; semina subglobosa, tuberculata, carmina.

Tree to 25 m; monoecious; glabrous throughout; branchlets with prominent leaf scars 3-5 mm in diameter and persistent stipules. Leaves alternate, crowded toward apex of stem; petiole 3-5.5 cm long, the two apical glands opposite or subopposite, cylindrical, to

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2 mm long, at right angles to petiole or somewhat reflexed; stipules deltate, 5-7 mm long, 2.5-3(-5) mm wide, acuminate, hyaline, appressed, persistent; blade membranous or chartaceous, oblong-ovate, 11.5-18 cm long, 4-7.5 cm wide, 2-3 times as long as wide, the midvein prominent below, the connecting reticulum obscure; apex obtuse or rounded, plane; base obtuse; margin entire. Spikes lateral, crowded, below current year's leaves, apparently bisexual, the staminate portions not seen; pistillate portion at maturity 2.5-6 cm long, widely divergent from stem. Pistillate flowers not seen, to 16 per spike, crowded, solitary at basal nodes. Capsule ovoid, smooth, 4-5 mm in diameter, stipitate, the stipe 4-5 mm long, 1-1.3 mm in diameter; seeds subglobose, tuberculate, 3.5-4 mm in diameter, carmine.

This unusual species differs from all Mexican and Central American species of Sapium, except S. lateriflorum Hemsley, by its lateral spikes. The latter species is known only from Mexico and northern Central America and differs from S. allenii in having slenderer twigs without persistent stipules, more widely spaced spikes that never appear crowded, secondary foliar veins that are more strongly ascending, and larger fruits (10-13 mm in diameter vs. 4-5 mm). Among the species of southern Central America, S. allenii most closely resembles S. pachystachys Schum. & Pittier in having thick branchlets with large persistent stipules, long-petiolate leaves with large oblong blades that have numerous secondary veins diverging from the midrib at nearly right angles, spikes with thick rachises, and conspicuously red-arillate seeds. Sapium pachystachys differs, however, in having terminal inflorescences, much larger (10-12 mm in diameter) sessile capsules (stipitate in S. allenii), and a large persistent calyx (vs. a small, membranous calyx at the base of the stipe in S. allenii). In addition, S. pachystachys occurs largely in cloud forest habitats above 1500 m, whereas S. allenii has been collected only below 1000 m.

Additional specimens examined. COSTA RICA. SAN JOSÉ: basin of El General, 675-900 m, March 1940, Skutch 4821 (A, F, NY, US).

SAPIUM DUCKEI Huber ex Huft, sp. nov. TYPE: Brazil. Rondônia: Rio Machado, curso inferior, Jan. 1981, Michael Goulding 1367 (holotype, MG-86867, F neg. 62128).

Arbor ad 25 m alta; ramuli laeves, rubelli. Petioli 4-25 mm longi, canaliculati; glandulae apicales cupulatae, ascendentes, ad petiolum laterale affixi; lamina chartacea, anguste elliptica vel anguste oblonga, nervis utroque costae laterae (10-)14-18 arcuatis aliquantum apice acuta plana; margine integra vel serrulata. Spicae axillares bisexuales vel staminate, floribus masculinis 6-8-aggregatis, calyce bilabiato staminibus 2, floribus femineis 4 vel 5. Capsula obovoidea sessilis; semina globoso-obovoidea, plus minusve complanata.

Tree to 25 m; monoecious; glabrous throughout; branchlets terete, smooth, often reddish. Leaves alternate; petiole 4-25 mm long, deeply canaliculate, slender, the 2 apical glands subopposite, cupular, ascending, 1.2-1.8 mm long, attached laterally to petiole; stipules deltate, ca. 2 mm long, 1.6-2 mm wide, appressed, tardily deciduous; blade chartaceous, narrowly elliptic, oblanceolate, or narrowly oblong, 4-10.5 cm long, 2-3.7 cm wide, 2-3.8 times as long as wide, olive-green above, lighter green or brown below; midvein conspicuous, prominent below, the secondary veins (10-)14-18 per side, arcuate, much thinner and less conspicuous than the midvein, connected by a prominulous reticulum; apex acute, plane; base rounded or obtuse; margin entire or serrulate. Spikes axillary, (4-)6-9 cm long, slender, bisexual or staminate. Staminate flowers in groups of 6-8, the subtending bracts broadly deltate, 0.8-1 mm long, obtuse, the margin hyaline, minutely erose, biglandular, the glands oblong, 2.2-3 mm long, 0.7-1 mm wide; calyx cupular, ca. 1 mm long, deeply 2-lipped; anthers 2. Pistillate flowers 4 or 5, solitary at basal nodes, bracts as in the staminate flowers, the glands reduced, 0.9-1.2 mm long, ca. 0.5 mm wide; calyx 2-2.5 mm long, deeply 3-lobed, the lobes ca. 1/2 the length of the total; styles early dehiscent. Capsules obovoid, sessile, 7-8 mm long, 8-10 mm in diameter; seeds white, globose-obovoid, pinched distally into a narrow horizontal ridge, slightly compressed laterally.

Among a set of specimens of Euphorbiaceae recently collected by Dr. Michael Goulding of the Museu Paraense Emilio Goeldi in Belém, Brazil, in preparation for an atlas of Amazonian floodplain fruits, was an unusual *Sapium* that does not match any described species. I was able to match the specimens, however, with four sheets at the Field Museum from the state of Pará that had been annotated *Sapium duckei*, an unpublished name ascribed to Huber. In addition, fragments and photos of

putative type material at MG collected by Ducke are at F. As far as I can discover, this name has never been published. In order to make the name available for the atlas, I shall describe the species here and retain Huber's epithet, both to honor Adolfo Ducke, one of the premier botanists of the Amazonian region, and to assure the minimum possible nomenclatural upset should it later be found that Huber's name was in fact published.

This species is easily recognized by its relatively narrow bicolored leaves, axillary and terminal inflorescences, and long petioles with laterally attached apical petiolar glands. The habitats reported on the labels are "igapó" (both of the Archer and Goulding collections), "várzea" (Capucho 328) and "swampy land" (Capucho 531). However, until recently the terminology of inundated forest in Amazonia has not been standardized (Prance, 1979), and the actual habitat is probably more restricted than the labels would indicate. The Rio Tapajós is a clear water river, and the adjacent floodplain would therefore fall into "seasonal igapó" in Prance's classification. Archer reports on the label of no. 8361 that the seeds are eaten by fish, a phenomenon that has recently been studied among Amazonian flood-plain species by Goulding (1980).

Common names reported for this species are "tararuginha da praia" (Archer 8361, 8409) and "tararuginha" (Capucho 328, 531).

Additional specimens examined. BRAZIL. AMAZONAS: Itacoatiara, Beira de Amazonas, 1 July, 1913, Ducke s.n. (MG-12473, not seen, F neg. 45808; fragment, F). PARÁ: Fazenda Urucuritiba, opposite Fordlândia on Rio Tapajós, 13 April 1943, Archer 8361 (F); E of Fazenda Urucuritiba, on Rio Tapajós, opposite Fordlândia, 17 April 1943, Archer 8409 (F); Tapajós, Itaituba, 27 July 1932, Capucho 328 (F); Tapajós, Boa Vista, 2 Jan. 1933, Capucho 531 (F); Óbidos, Beira de Amazonas, 9 March 1909, Ducke s.n. (MG-10223, not seen, F neg. 45809; fragment, F). RONDÔNIA: Rio Machado, curso inferior, Jan. 1981, Goulding 1239 (MG).

SAPIUM RIGIDIFOLIUM Huft, sp. nov. TYPE: Costa Rica.

Heredia: pastures above Río San Rafael, 3 km W of Vara Blanca, 1750 m, 8 Aug. 1971, R. W. Lent 2041 (holotype, F-1783961, F neg. 62130; isotypes, MO, NY, US), distributed as Sapium thelocarpum Schum. & Pittier.

Arbor ad 20 m alta. Petioli 1-2.5(-5) cm longi, canaliculati; glandulae apicales ad partem decurrentum laminae affixi; lamina chartacea, rigida, elliptico-oblonga, nervis utroque costae laterae (20-)30-40, prominentibus, rectis, sub angulo paene 90° abeuntibus; apice obtusa vel rotundata, plana, margine modice crenata, basi cuspidata aliquantum decurrens. Spicae apicales solitariae bisexuales. Floribus masculinis 5-8 aggregatis, calyce bilabiato, staminibus 2. Floribus femineis 4-10. Capsula late ovoidea vel suborbiculata, stipitata, columna styli persistenti. Semina matura non visa, ut videtur ovoidea complanata verrucata.

Tree to 20 m; monoecious. Leaves chartaceous, rigid; petiole 1-2.5(-3) cm long, canaliculate, the 2 apical glands opposite or subopposite, attached to the decurrent laminar tissue, ca. 1 mm in diameter, stipules deltate, 2-2.5(-3) mm long, 1.5-2 mm wide, the margin hyaline; blade elliptic-oblong, 5-11 cm long, 2-4.5 cm wide, 2.1-2.7 times as long as wide, glabrous; midvein prominent below, the secondary veins (20-)30-40 per side, prominent, diverging from the midvein at nearly right angles, straight, connected by a prominent reticulum, breaking up before reaching the margin; base cuspidate, slightly decurrent; margin shallowly crenate; apex rounded or obtuse, plane. Spikes solitary at the apex of lateral shoots, to 9 cm long, bisexual. Staminate flowers in groups of 5-8, the subtending bracts short, broad, rounded, ca. 1 mm long, 1-1.5 mm wide, biglandular, the glands suborbicular, 1.5-2 mm in diameter, flattened; calyx cupular, 1.5-2 mm long, 2-lipped; stamens 2. Pistillate flowers 4-10, solitary at basal nodes, the bracts and calyces as in the staminate flowers; ovary and styles not seen; style-column persistent on mature fruits. Capsule broadly ovoid to suborbicular, 6-8 mm long, smooth, thin-shelled, stipitate, the stipe 2-4 mm long; mature seeds not seen, apparently ovoid, flattened laterally, the surface warty.

This species was recognized as new by Jablonski (1968) in a treatment of the Caribbean species of *Sapium*, where he refrained from naming it because of the lack of good material, but surmised that it was related to the Cuban endemics, *S. daphnoides* Griseb. and *S. moasense* Alain. Now that much new material, including fruiting collections, from both Panama and Costa Rica has become available, it is clear that *S. rigidifolium* is not at all closely related to the Cuban species, but belongs instead to section *Emmenostylum* Hemsley, characterized by persistent style bases on the

mature fruits. Only four species have previously been described in this group, all from high elevations in the northern Andes. Two of these, S. stylare Muell. Arg. and S. putumayense Croizat, have auricular leaf bases, as does S. solisii Huft, described below. The others, S. verum Hemsley and S. tolimense Jumelle, are similar to S. rigidifolium in lacking auriculate leaf bases. There is some doubt as to the distinctiveness of the latter two species (see Croizat, 1943, for a discussion of these species), but both are clearly different from S. rigidifolium. The leaves of the South American species are longer (10-15 cm in S. verum, 15-18 cm in S. tolimense, vs. 5-11 cm in S. rigidifolium), the fruits are larger (8-10 mm long vs. 6-8 mm), the transition between the capsule proper and the persistent style base is gradual rather than abrupt as in S. rigidifolium, and the style base is longer (3-4 mm vs. 1.2-1.5 mm) and thicker (2-2.5 mm vs. 0.7-0.8 mm). Furthermore, the leaves of S. rigidifolium are more conspicuously bicolored than are those of the South American species, shiny above, and of a thicker texture.

Sapium rigidifolium is illustrated in Webster & Huft (in press).

Additional specimens examined. COSTA RICA.

ALAJUELA: Fila Volcán Viejo, San Carlos, 1800-2000 m, 11-14 Feb. 1986, Gomez-Laurito 11109 (F); Viento Fresco, 1600-1900 m, 13 Feb. 1926, Standley & Torres 47896 (F, F fragment). CARTAGO: Guarco, El Empalme, 2222 m, 4 Jan. 1967, González X-25-RMG-42 (CR, F, NY), X-25-RMG-43 (USJ-4822); near La Sierra, ca. 25 km S of Cartago, Cordillera de Talamanca, 2000 m, 23 Jan. 1965, Williams et al. 28121 (CR, F, MICH). Boundary between provinces ALAJUELA, PUNTARENAS, and GUANACASTE: Monteverde, Cordillera de Tilarán, 1540-1600 m, 12 July 1976, Dryer 434 (CR), 15 Aug. 1976, 592 (F), Nov. 1977, 1692 (CR, F, MO).

PANAMA. CHIRIQUÍ: Guadalupe Arriba, above Cerro Punta, 8°52'N, 82°33'W, 2100 m, 23 July 1985, de Nevers & Charnley 6057 (F); Boquete, Cerro Horqueta, 5000-6000 ft, 8 Aug. 1967, Dwyer & Hayden 7685 (MO); Cerro Punta, 2000 m, 14 Sept. 1971, Lao 391 (MO); slopes of Volcán Barú, near town of Cerro Punta, 6000 ft, 7 June, 1957, Stern & Chambers 85 (A, MO, US).

SAPIUM SOLISII Huft, sp. nov. TYPE: Ecuador. Pichincha: Quito, 2850 m, 20 Aug. 1949, M. Acosta Solis 13547 (holotype, F-1552477, F neg. 62132).

Arbor; ramuli crassi nodosi approximati, surculi laeves ad apicem ramorum interdum aggregati. Petioli 6-12 mm longi; glandulae apicales cylindricae, infra laminam 1-2 mm; lamina membranacea, oblonga vel oblongo-obovoidea, nervis utroque costae laterae 18-24, conspicuis, infra prominulis, quam costa multo tenuioribus, rectis, sub angulo paene 90° abeuntibus, apice rotundata, plana, basi obtusa bilobata glandulosa, margine serrulata dentibus setiformibus. Spicae axillares solitariae bisexuales pedunculatae, floribus masculinis 4 vel 5 aggregatis calyce bilabiato staminibus 2, floribus femineis 4-6. Capsula ovoideoglobosa, sessilis, columna styli persistenti; semina ovoidea, complanata, rugosa, nigra.

Tree; monoecious; branchlets thick, knobby from petiolar stumps and persistent stipules, closely spaced; smoother long shoots sometimes crowded near apex. Leaves alternate; petiole 6-12 mm long, the 2 apical glands opposite or subopposite, cylindrical, 0.8-1 mm long, at right angles to petiole or widely ascending, 1-2 mm below blade; stipules persistent, broadly deltate, ca. 4 mm long, 3.5-4 mm wide, the base auriculate; blade membranous, oblong to oblong-obovoid, 2.7-4.8 cm long, 1.4-3.2 cm wide, 1.8-2 times as long as wide; midvein conspicuous, prominulous below, the secondary veins 18-24 on a side, much thinner than the midvein, conspicuous, prominulous below, diverging from the midvein at nearly right angles, straight, connected by a fine reticulum; apex rounded, plane; base obtuse, glandular-auriculate; margin serrulate, the teeth setiform, ascending. Spikes axillary, solitary, bisexual, pedunculate, ca. 3 cm long at anthesis, the persistent fruiting portion to 5 cm long at maturity. Staminate flowers in groups of 4 or 5, the subtending bract flabellate, rounded, 1-1.2 mm long, entire or slightly erose, biglandular, the glands suborbicular to oblong, (1.5-)2-3 mm long, 1.5-2.5 mm long; calyx cupular, ca. 1.5 mm long, 2-lipped; stamens 2. Pistillate flowers 4-6, solitary at basal nodes, the bracts as in the staminate flowers; calyx deeply lobed, the lobes hardly exceeding the bracts; styles 3, 4-5 mm long, joined at base, only slightly divergent, the column persistent on mature fruit. Capsules ovoid-globose, ca. 1.5 cm in diameter, sessile, obtusely 3-angled, wrinkled, drying black, the persistent style-column 3.5-4 mm long; seeds ovoid, laterally compressed, 5-6 mm in diameter, rough, black.

As mentioned above in the discussion of *Sapium rigidifolium*, *S. solisii* belongs with the auriculate-

leaves species of section Emmenostylum. Both of the other species, however, have much larger leaves (8-12 cm in S. stylare, 15-18 cm in S. putumayense, vs. 2.5-5 cm) with longer petioles. Sapium stylare has smaller capsules (to 5 mm diam. vs. ca. 15 mm diam.). Sapium putumayense, on the other hand, which is unknown to me, has fruits that are considerably larger (2.5-3 cm in diameter) than those of S. solisii.

Sapium solisii is known only from the type.

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STABILITY OF MORPHOLOGICAL CHARACTERS OF BRYOPHYTES UNDER CULTIVATION: A COMPILATION FROM THE LITERATURE.

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Because different taxa of bryophytes respond in different ways to similar environmental conditions, the literature is rife with conflicting reports of the relative stability of certain morphological characters. Are any of these characters universally stable under a variety of environmental conditions? Can any be used for reliable and repeatable diagnoses of differences between taxa?

Cultivation of bryophytes can identify which characters of particular species remain stable under different environmental conditions. The contributions and methods of numerous investigators using axenic and non-axenic "common garden" cultivation have been reviewed recently (Smith 1978; Longton 1982; Zander 1982; Wyatt and Stoneburner 1984; Frahm and Nordhorn-Richter 1984; Mishler 1985). Although the literature for axenic culture of bryophytes is large, not many investigators have experimented with common garden propagation (Shaw 1986).

Table 1 summarizes reports on the stability of characters of bryophytes under cultivation. It also shows the frequency with which particular characters have been used by investigators. It is clear that although some characters are stable for some taxa, they are unstable in the majority of cases. Only twelve characters (marked with asterisks) have been reported to be stable, and lack reports to the contrary. Ten of these characters are based on a single report involving only one genus or one species complex within one genus. There is no basis for comparison with results from other studies, because the taxa, characters and methods of cultivation are too diverse to form any general conclusions.

Some of the variability reported by Meyer (1940, 1942) was based upon mosses grown under conditions radically different from those usually encountered in nature by the subject taxa. Non-aquatic species of Atrichum, Barbula, Hypnum, Phascum, Physcomitrium and Polytrichum were grown submerged in liquid culture media. These experiments, and observations from nature (e.g., Priddie 1979; Seppelt and Selkirk 1983) indicate that few characters of bryophytes are stable.

We must carefully compare cultivation methods and growth response in a wide array of bryophyte taxa before we can

formulate a list of universally stable characters, if any exist at all. Of the twelve characters herein reported to be stable, those that lack reports to the contrary are good candidates for further study.

Table 1 - Relative stability of morphological characters in cultivated bryophytes, as reported in literature.

Character	Sources in Literature	
	Stable	Unstable
* alar cells	11,14	-
awn base	-	28
awn color	-	28
awn length	-	28
awn serration	-	28
* branching pattern	27	-
bulbil morphology	20	20
costa anatomy	28	18
costa color	-	28
costa length	14,28	2,4,8,9,13,27
* costa papillae	28	-
* costa serration	28	-
costa width	16	11
gametophyte morphology	-	19
guide cells	-	13
leaf and bract apex	18,25,27	8,9,18,23,28,29
* leaf auricles	11	-
leaf cell length	30	11,15,18,22,28
leaf cell shape	16,18	7,8,9
leaf cell size	-	6,28
leaf cell wall pitting	-	13
leaf cell wall thickness	-	5,8,9,13,18
leaf cell width	-	15,18,21,22,28
leaf chloroplast number	-	8,18
leaf chloroplast size	-	8,18
leaf color	-	1,8,11,28
leaf concavity	-	28
leaf decurrency	16,26	17
leaf dentition	14,16,19	4,6,8,9,10,13,26
* leaf insertion angle	28,30	-
leaf lamellae	-	13
leaf length	-	11,13,21,22,27,28
leaf margin rolling	-	18,28
* leaf papilla number	18	-
* leaf papilla position	18	-
* leaf papilla shape	28	-
leaf papilla size	-	18

leaf plication	-	18
leaf shape	18,19,28	1,8,9,11,13,14,18
leaf and underleaf size	-	1,2,6,7,8,9,11,14 15,18,22
leaf spacing	-	5,7,8,9,18,28
leaf undulation	-	13
leaf width	-	8,21,22,28
oil bodies	22,26	18
phyllotaxy	-	18
plant size	-	13
propagula production	-	18,23,26
* protonemal morphology	27	-
pseudostereids	-	24
rhizoid abundance	-	18
* seta papillae	19	-
* sporophyte morphology	19	-
stem anatomy	28	8
stem diameter	-	8,9,22
stem length	-	4,5,18,27,28

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SOLANUM TENELLUM (SECT. PETOTA), NOVA SPECIE PERUVIANA

by C. Ochoa*

Herbaceum tuberiferum, planta parva, 20-30 cm alta, gracil, ramificada, pallide viridis, non pigmentata. Caulis basi, 3-4 mm diam., pilis sparsis, brevibus, albidis, vix perspiciendis ornatus. Stolones, 30-40 cm vel plus longi, 1-2 mm diam., tubercula parva, rotundata vel oblonga, 1-2 cm longa, alba. Folia delicatula, dilute viridia, 7.0-11.0 cm longa, 2.5-6.0 cm lata, 4-5-juga, foliolis interjectis, 6-12 ornata. Foliana ovalia, elliptica vel ellipticolanceolata, supra pilis brevibus obsita, subtus solum in venis venulisque pubescentia, petioli brevi. Foliolum terminale rhomboideo-lanceolatum, 2.0-2.7 cm longum, 0.7-1.3 latum, apice breviter acuminatum, basi longe attenuatum. Foliola primi jugis et secundin jugis amplitudine fere consimilis, vel primi jugis paululum minora 2.0-2.3 cm longa, 0.9-1.0 cm lata sessilia, apice obtusa. Foliola interjecta, 1.5-6.0 mm longa, orbicularia vel elliptica, sessilia. Inflorescentia cymosa 5-7 flora. Pedunculus, 8 cm longus, basi 5 mm diam., sparse pilosus, Pedicellus pilis brevis dense obsitus, 25-30 mm longus, 2/3 articulatus, pars distalis (superior) 6-7 mm longa. Calyx symmetricus, pilosus, lobi anguste ellipticolanceolati, apice angustati, acumina acuta vel anguste subspathulata, 2-3 mm longa. Corolla rotato-pentagonal, 2-5 cm diam., alba, stella interna viride-flava, acumina brevia. Antherae late lanceolatae, 6.0-6.5 mm longae, basi 1.8-2.0 mm latae. Filamenta, 0.4-0.5 mm longa, alba, glabra. Stylus, 8.5 mm longus, basi 2/3 dense pilosus, stigma parvum, capitatum, fissum. Baca globosa, 1.5 cm diam., viride. Numerus cromosomatum: $2n = 2x = 24$. Ad seriem Tuberosa pertinet.

Typus: PERU, departamenti Apurimac, provinci Cotabambas, circa Quillo, 4000 m supra mare, in itinere Tambobamba-Cotabambas. C. Ochoa 4101, Martius 1973 (holotypus, OCH; isotypus, US).

Affinitas: Aspectus delicatulus, corolla alba, foliola parva et folia viridia proxima videtur cum S. gracilifrons, sed. S. gracilifrons bene diversum est forma foliolis, foliolis pseudostipulaceis atque folius valde vernicosis.

Habitat: In regionis altis, frigidis, vulgo "puna" species tipica est.

* International Potato Center, P.O. Box 5969, Lima-Peru



Solanum tenellum Ochoa. Holotypus
OCH-4101, ca. $\times 1/2$

UNA NUEVA ESPECIE DE Muhlenbergia (GRAMINAE) DEL ESTADO DE DURANGO*

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RESUMEN

Se describe e ilustra una nueva especie: Muhlenbergia durangensis, con base en material colectado en el Sur de la Sierra Madre Occidental.

ABSTRACT

On the basis of material collected in the Sierra Madre Occidental of Durango state, one new species: Muhlenbergia durangensis is described and illustrated.

INTRODUCCION

Como resultado de los constantes viajes de colecta realizados por el personal del CIIDIR-IPN, Unidad durango, tanto para la formación de un herbario regional, como para el estudio de la flora y vegetación del Estado de Durango, se colectaron ejemplares correspondientes a una especie que hasta el momento no había sido posible ubicar en algún taxón conocido, lo que hace pensar se trata de una nueva entidad.

Muhlenbergia durangensis Herrera, sp. nov.

Herba perennis rhizomata breve, 40-70 cm alta; ligulae hyalinae 0.5-0.7 (-1) mm longae, 2-3.5 (-5) mm la-
vel involutae 10-25 (-30) cm longae, 2-3.5 (-5) mm la-
tae; inflorescentia paniculata angusta, virides-luteovi-
rides (10-) 12-18 (-25)cm longa, 0.5-1 cm lata, ramosis
infirmis 5-6.5 (-7) cm longa, pedicelli 1-3 mm longi; glu-
ma (5-) 6-7 (-7.5) mm longa, 1- nervae vel leviter 3-ner-
vae; lemma membranaceae, subulata, 5-6.5 (-7) mm longa,
lemma aristatum luteolae (1-) 1.5-2 (-2.5) cm longum; -
palea longitudineum lemmatis prope aequans; antherae -
purpureae (2.5-) 3-3.5 mm longae,

Planta perenne de 40 a 70 cm de longitud, con la -
base amacollada a manera de rizoma corto, hojas por lo
general basales, vainas redondeadas, glabras a escábridas,
más cortas que los entrenudos; aurículas presentes
cortas, hialinas, que se continúan con la lígula, lígula
en forma de una membrana erosa o ciliada, de 0.5 a -
0.7 (1) mm de long.; láminas foliares de 10 a 25 (30) -
cm de longitud y de 2 a 3.5 (5) mm de ancho, planas a -
involutas, glabras a escábridas en el envés y escábridas

* Trabajo parcialmente subvencionado por el CONACyT, -
en el marco del Proyecto Flora de Durango.

** Becaria de la COFAA del Instituto Politécnico Nal.

das a escabroso-pubescentes en el haz, con los ápices - atenuados, flexuosas (especialmente cuando secas); inflorescencia una panícula angosta, como espiga abierta, color verde a verde amarillento en la madurez, de (10) 12 a 18 (25) cm de longitud, y 0.5 a 1 cm de ancho, las ramas inferiores de 3 a 5 (7) cm de longitud, las inferiores de 5 a 6.5 (7) cm de long., pedicelos escabrosos, de 1 a 3 mm de longitud; glumas subiguales, ligeramente mayores que la lema (5.5) 6 a 7 (7.5) mm de longitud, glabras a escábridas, con el ápice atenuado a agudo o mucronado, la segunda en ocasiones corta aristada, uninervada o con un par de nervaduras laterales poco aparentes; lema membranacea, subulada, de 5 a 6.5 (7) mm de longitud, con pubescencia corta (a veces escasa) en la mitad inferior, especialmente alrededor de las nervaduras, la arista amarilla, de (1) 1.5 a 2 (2.5) cm de longitud, recta o ligeramente flexuosa; palea casi del largo de la lema, anteras color morado, de (2.5) 3 a 3.5 mm de longitud.

Tipo: MEXICO, DURANGO: Mpio. del Mezquital, 32 km de Los Charcos por el camino a La Guajolota, altitud - 2040 m, bosque de pino-encino, 15-III-85, M. González - et al 1659 (CIIDIR)

Material adicional examinado: DURANGO (Mpio. del - Mezquital), 33 km de La Guajolota, por el camino a Platanitos, 2220 m, bosque abierto de pino-encino, - 16-III-85, M. González et al. 1962 (CIIDIR); 5 km del - entronque del camino de Charcos al Mezquital, bosque de pino-encino, O. García. 83 (CIIDIR); Cerro Blanco, Reserva de la Biósfera "La Michilía", bosque de pino-encino, 2650 m, 17-IV-86, S. González 3739 y 3742 (CIIDIR).

M. durangensis es una especie de la Sección Podosemum del subgénero Podosemum, grupo de plantas perennes cespitosas y no-robustas. Se encuentra muy emparentada con M. watsoniana por presentar la arista de color amarillo y por compartir características morfológicas y de hábitat semejantes, de la que difiere en primera instancia por presentar las glumas casi iguales de (5.5) 6 a 7 (7.5) mm de longitud, glabras a escábridas, la lema - de 5 a 6.5 (7) mm de longitud, la arista de (1) 1.5 a - 2 (2.5) cm de longitud y las anteras moradas de (2.5) 3 a 3.5 mm de longitud.

M. durangensis

M. watsoniana

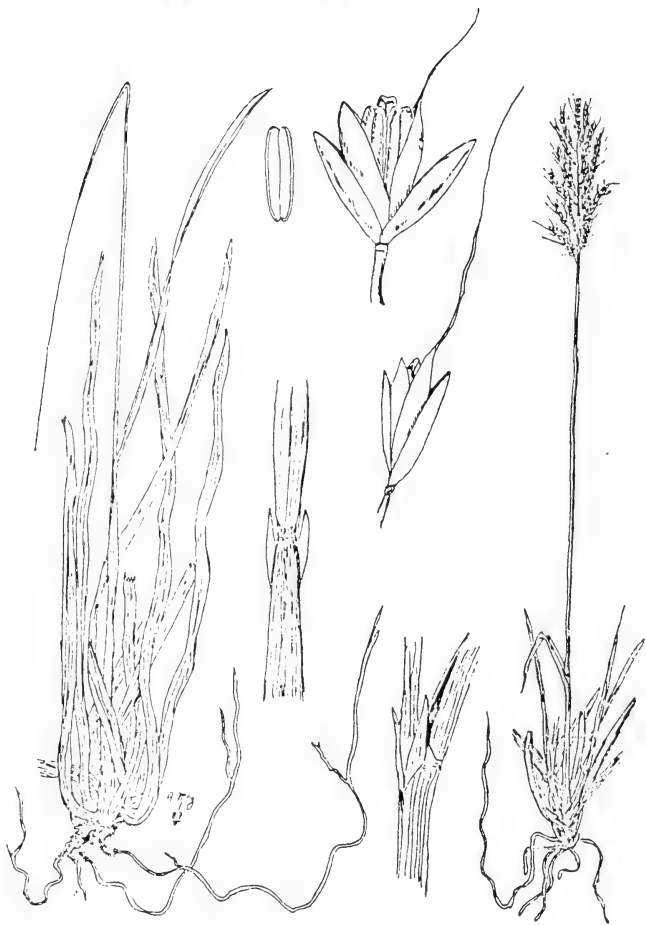
Aurículas	- membranáceas, cortas	- faltantes
Lígula	- membranacea, hialina	- café, firme

Glumas	- casi iguales de 6 a 7 (7.5) mm de long., glabras a escábridas	- subiguales, primera de 3 a 5 mm y segunda de 4 a 5.5 mm de long.; hispidulas.
Lema	- angosta, subulada de 5 a 6.5 (7) mm de long.	- elipsoidea subulada de 3 a 5 mm de long.
Arista	- de (1) 1.5 a 2 (2.5) cm de long.	- de 2 a 2.5 cm de long.
Anteras	- moradas (2.5) 3 a 3.5 mm de long.	- 2.7 a 2.9 mm de long.

Muhlenbergia watsoniana Hitchc. es una especie poco conocida, aparentemente colectada solamente por Schaffner en San Luis Potosí, en bosque de pino-encino entre los 1700 y 1800 m.s.n.m. Posteriormente McVaugh (1983, 264-265) incluye un ejemplar colectado en Jalisco bajo este nombre, sin embargo al final escribe una nota aclaratoria de las diferencias entre su colecta (McVaugh 25604) y la especie tipo de Shaffner, poniendo en duda de que se trate de la misma especie. La especie aquí descrita presenta características morfológicas en general mayores que las de ambas plantas.

LITERATURA CITADA

- McVaugh, R. 1983. Flora Novo-Galiciana. Vol 14 - Gramínae. Univ. of Michigan. 1032 pp.



Muhlenbergia durangensis (Tipo)

Pablo E. Sánchez Vindas
Museo Nacional de Costa Rica
Departamento de Historia Natural
Apdo. 749, San José
Costa Rica

Eugenia zelayensis P.E Sánchez sp. nov.

Arbor 6-15 metralis; ramulis juvenilibus fusco-aureus vel ferrugineus tomentosus. Folia glabra, elliptica vel elliptico-ovata, (8.2-) 10-13.8 cm longa, apicem acuminatus; petioli 3-5 mm longi. Flos solitarius vel 2 ad nodus, dense fusco-aureus tomentosus; pedicelli 1-2.5 cm longi; bracteolae 2, separatae, 5-7 mm longae; calycis lobi elliptico-lanceolati, inaequales, (3-) 4-8 mm longi. Fructus ignotus.

Arbol de 6-15 m de altura; ramitas jóvenes densamente café-dorado o ferrugíneo tomentosas; pelos simples, de 1-2 mm de largo. Hojas verde-oscuro en la haz, pálidas en el envés, elípticas u ovado-elípticas, (8.2-) 10-13.8 cm de largo, (2.9-) 3.3-6.5 cm de ancho, subcoriáceas, cuando jóvenes tomentosas principalmente en los nervios, glabras en ambas superficies en la madurez, ápice acuminado o largo-acuminado, base redondeada, nervio central inmerso en la haz, prominente en el envés, nervios laterales 10-12 de cada lado, escasamente visibles en la haz, prominentes en el envés, nervio marginal arqueado entre los laterales, 2.5-4 mm del margen; pecíolo rugoso, de denso ferrugíneo tomentoso a glabro, acanalado, 3-5 mm de largo, 1-1.5 mm de ancho. Flores solitarias en los brotes de las ramitas nuevas, usualmente 1-2 por nudo y opuestas; brácteas de densamente tomentosas a glabras, glandulosas, caducas en la antesis, elíptico-lanceoladas, 4-5 mm de largo, hasta 2 mm de ancho; pedicelo densamente café-dorado tomentoso, 1-2.5 cm de largo; bracteolas separadas, denso café-dorado tomentosas, glabras internamente, lanceoladas, 5-7 mm de largo, 1-1.5 mm de ancho; hipanto densamente tomentoso, campanulado, 2-2.5 mm de largo; yemas glabras en el globo de los pétalos, globosas, 5-7 mm de largo, 3-4 mm de ancho; lóbulos del cáliz 4, de iguales, denso café-dorado tomentosos externamente, elíptico-lanceolados, ápice acuminado, (3-) 4-8 mm de largo; pétalos blancos, glabros, obovados, 4.5-6 mm de largo, 3.5-4.2 mm de ancho; disco redondeado, tomentoso en la base del estilo, 2.5-3 mm de ancho; estambres 80-100, de 5-7 mm de largo; estilo glabro, 5-7 mm de largo. Frutos desconocidos.

TIPO: NICARAGUA. DPTO. DE ZELAYA: Costado Sur del Cerro El Inocente; 1000-1500 m.s.n.m; bosque nuboso, *D. Stevens* 6755 (Holotipo MO; isotipos: CR, F, NY, US).

MATERIAL ADICIONAL EXAMINADO: NICARAGUA DPTO. DE ZELAYA: Costado Sur del Cerro La Pimienta y N del Cerro Hormiguero, 800-900 m.s.n.m; bosque húmedo tropical, *A. Grijalva* 273 (MO); Caño El Hormiguero, 700-800 m.s.n.m, bosque húmedo tropical, *J. Pipoly* 5890 (MO); Finca al S de la Pimienta, *J. Pipoly* 6284 (MO).

Las flores solitarias, tamaño del pedicelo, longitud y forma de las brácteas, bracteolas y lóbulos del cáliz, además del indumento de la mayoría de las estructuras florales, difieren notoriamente de cualquier otra especie conocida por mí.

AGRADECIMIENTOS: Al personal del Herbario del Missouri Botanical Garden por las facilidades en el uso de sus valiosas colecciones, a la Biol. Luz María Ortega por el mecanografiado del manuscrito.

NEOTROPICAL MYRSINACEAE — XXI

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ARDISIA Sw., Prod. Veg. Ind. Occ. 3. 48. 1788

ARDISIA MORAVIANA (Lundell) Lundell, comb. nov. Auricular-
disia moraviana Lundell, Phytologia 63: 74. 1987. Costa Rica:
R. L. Wilbur 24919 (holotype, Duke).

ARDISIA MURPHYAE (Lundell) Lundell, comb. nov. Graphardisia
Murphyae Lundell, Phytologia 63: 77. 1987. Costa Rica: H. Murphy
1248 (holotype, Duke).

ARDISIA SARAPIQUIENSIS (Lundell) Lundell, comb. nov.
Auriculardisia sarapiquiensis Lundell, Phytologia 63: 74. 1987.
Costa Rica: B. Hammel & J. Trainer 13262 (holotype, LL).

ARDISIA SPATHULATA (Lundell) Lundell, comb. nov. Auricular-
disia spathulata Lundell, Phytologia 63: 75. 1987. Costa Rica:
D. E. Stone & A. L. Welden 3440 (holotype, Duke).

ARDISIA TRICHOMATA (Lundell) Lundell, comb. nov. Auricular-
disia trichomata Lundell, Phytologia 63: 75. 1987. Costa Rica:
R. L. Wilbur 24906 (holotype, Duke).

ARDISIA WILBURIANA (Lundell) Lundell, comb. nov. Auricular-
disia Wilburiana Lundell, Phytologia 63: 76. 1987. Costa Rica:
B. Jacobs 2917 (holotype, LL; isotypes, Duke).

ICACOREA Aubl., P. Guian. 2: Suppl. 1. 1775

ICACOREA BURGERI (Lundell) Lundell, Phytologia 48: 347. 1981.
Ardisia Burgeri Lundell, Wrightia 7: 23. 1981.

Costa Rica: Prov. Alajuela, Llanura de San Carlos, wet tropi-
cal rain forest near Los Angeles, alt. 100 m., Feb. 21, 1966,
Antonio Molina R., Louis O. Williams, William C. Burger & Bruce
Wallena 17670 (F, holotype; LL, xerox copy & fragment), small tree
5 meters tall. Prov. Puntarenas: forests along S side of Quebrada
Bonita, to ca. 1 km. E of Costanera highway, Carara Reserve, elev.
ca. 30-40 m., Jan. 11, 1985, Michael Grayum et al. 4752 (LL, MO),
slender, understory treelet ca. 3.5 m. tall.

Described from specimen with immature fruits, the Grayum collection, also from lowland wet forest, is in flower. Its sepals are oblong-lanceolate, 2—3 mm. long, thin, punctate with scattered black glands. The corolla is 7—8 mm. long, with thin lanceolate petals connate at base and punctate like the sepals. The stamens subequal the petals, with slender filaments, and slender lanceolate tapering anthers 3.5—4 mm. long, dehiscent by 2 small apical pores.

ICACOREA DURIPETALA Lundell, sp. nov. — Frutex, 3 m.; ramuli, crassiusculi; folia parva, glabra, petiolata, petiolo 3—5 mm. longo, late marginato; lamina coriacea, elliptica, 3—6.5 cm. longa, 1.5—3 cm. lata, apice apiculata vel subacuminata, basi acuta, punctata, integra; inflorescentia terminalis, glabra, parva, paniculata, 3—5.5 cm. longa, densiflora; flores 5-meri, corymbosi, pedicelli 1.3—3 mm. longi; sepala ovata, ca. 1.5 mm. longa, punctata, symmetrica, integra; petala ca. 6 mm. longa, anguste lanceolata, dura, basi connata, apice obtusiuscula; stamina 3 mm. longa; filamenta ca. 1.5 mm. longa; antherae lanceolatae, ca. 2 mm. longae, apice birimosae; ovarium glabrum.

Panama: Chiriqui, southern slopes of Cerro Horqueta north of Boquete, elev. ca. 6500 ft., Jan. 21, 1971, R. L. Wilbur, J. A. Teeri, Robin Foster 13471 (holotype, LL), shrub 3 m. tall.

The species is notable for its short leafy branchlets, densely flowered small inflorescences, short pedicels, coriaceous narrowly lanceolate petals, and stamens with slender filaments subequaling anthers. It resembles *Icacorea rigidifolia* (Lundell) Lundell.

ICACOREA HATOANA Lundell, sp. nov. — Arbor parva, 5 m. alta; ramuli graciles, minute lepidoti; folia glabra, petiolata, petiolo 5—7 mm. longo, lepidoto, canaliculato; lamina chartacea vel subcoriacea, lanceolata vel anguste elliptica, 7.5—10.5 cm. longa, 3—4.2 cm. lata, apice subabrupte acuminata vel acutiuscula, basi late obtusa et acutiuscula; inflorescentia terminalis, pyramidalis, paniculata, ad 8 cm. longa et lata, laxa, minute et parce lepidota; flores 5-meri, corymbosi; pedicelli 5 mm. longi; sepala symmetrica, late ovata vel ovata, ad 2 mm. longa, minute punctata, maculata; corolla ca. 5.5 mm. longa, apice minute punctata; petala 5, basi connata; stamina ca. 5.5 mm. longa; filamenta libera, ca. 2.75 mm. longa; antherae ca. 3 mm. longae, late lanceolato-oblongae, apice birimosae, apertae; ovarium glabrum; ovula parva, pluriseriata; stylus ca. 4.5 mm. longus.

Panama: Provincia de Chiriqui, woods and pastured borders near Las Lagunas, west of El Hato del Volcan, about 1400 m. elevation, Jan. 15, 1970, R. L. Wilbur, R. E. Weaver, R. Foster, M. Correa 11002 (holotype, LL; isotype, Duke), tree 5 m. tall, corolla white, anthers yellow.

I. hatoana resembles *I. rigidifolia* (Lundell) Lundell, differing in its longer filaments subequaling anthers, with calyx and corolla conspicuously punctate with small red-black glands, with somewhat larger calyx and corolla, and larger, thinner,

longer petioled leaves. Icacorea Storkii (Lundell) Lundell and Icacorea Scheryi (Lundell) Lundell are both of this relationship, but have much smaller sepals and anthers.

ICACOREA LAJANA Lundell, sp. nov. — Arbor parva, 2—3 m. alta; ramuli graciles, minute lepidoti; folia parva, basi minute lepidota, petiolata, petiolo late marginato, 2.5—5 mm. longo; lamina chartacea, oblanceolato-elliptica, 5—9.5 cm. longa, 2.5—3.5 cm. lata, apice subacuminata, acumine obtusiuscula, basi acuta, parvipunctata, subtus reticulata, margine integra; inflorescentia subsessilis, paniculata, ad 6 cm. longa, basi minute lepidota; flores corymbosi, 5-meri; pedicelli 5—7 mm. longi, graciles; sepala hyalina, minute punctata, late ovata, ca. 1.5 mm. longa; petala 5—5.5 mm. longa, lanceolata, basi connata; stamina ca. 4 mm. longa; filamenta ca. 1 mm. longa, gracilis; antherae 3—3.5 mm. longae, anguste lanceolatae, apice minute biporosae; ovarium glabrum; ovula pluriseriata; stylus ca. 5 mm. longus.

Mexico: Estado de Veracruz, Mun. Zapata, La Laja, entre Corral Falso y Pinaltepec, a 900 m. de carretera Xalapa-Veracruz por camino Falso-Pinaltepec, alt. 900 m., Jan. 8, 1985, H. M. Hernandez y Rafael Torres 769 (holotype, LL), arbusto ripario de 2—3 m. con frutos inmaduros.

With immature fruits, the flowers are described from dried fragments in the inflorescence.

ICACOREA ALBIPETALA Lundell, sp. nov. — Arbor, 8 m.; ramuli graciles, minute lepidoti; folia parva, petiolata, petiolo crasso, marginato, 2—4.5 mm. longo; lamina coriacea, integra, basi revoluta, anguste elliptica vel lanceolata, 4—7.5 cm. longa, 2—3.5 cm. lata, basi acutiuscula vel rotundata, apice acuminata, acumine obtusiuscula, supra glabra, subtus pallida, parce punctata, reticulata; inflorescentia terminalis, paniculata, ad 8 cm. longa, densiflora, glabra, basi lepidota; flores 5-meri, corymbosi; pedicelli 4—7.5 mm. longi; sepala hyalina, late ovata, ca. 1.3 mm. longa, minute punctata; corolla ad 7.5 mm. longa; petala lanceolata, ad 7 mm. longa, basi connata ca. 1 mm.; stamina 5—6 mm. longa; filamenta ca. 3 mm. longa; antherae lanceolatae, ca. 3 mm. longae, apice biporosae; ovarium glabrum; stylus ca. 5.5 mm. longus; ovula pluriseriata, ca. 22.

Panama: Prov. Bocas del Toro, region of Cerro Colorado, on trails from continental divide, 7 miles from Champi Camp, in cloud forest, ca. 1500 m., April 12, 1986, Gordon McPherson 8832 (holotype, LL), tree 8 m., corolla white.

Icacorea albipetala resembles Icacorea monteverdeana Lundell but differs in its entire leaves and slender filaments which equal anthers.

A NEW VARIETY OF EUPHORBIA CELASTROIDES (EUPHORBIACEAE)

HAWAIIAN PLANT STUDIES 150

Harold St. John

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This novelty has been checked against the revision by Koutnik (1987). There the Hawaiian species are all placed in the genus *Chamaesyce*. This segregate genus is separated by several invisible characters. In the writer's opinion these species are best left in the traditional genus *Euphorbia*.

Euphorbia celastroides Boiss. in DC., var. *arenisaxosa* var. nov.

Frutex perennis est, ramis usque ad 30 cm longis decumbentibus, internodis puberulis, petiolis 0.7-2 mm longis puberulis, laminis 5-15 \times 4-7 mm ellipticis, capitula terminali 1-3 mm alta puberula, capsula 2 mm longa subglobosa. Typus: Molokai I., Kaluakoi, sand dunes, 200 ft alt., H. St. John 23,486.

Perennial shrub; rootstock woody, as much as 12 mm in diameter; branches decumbent, up to 30 cm in length, slender, 0.5-3 mm in diameter, freely branching; internodes 8-15 mm long, puberulous, but early glabrate; nodes cuneate enlarged; leaves opposite; stipules interpetiolar, hemispheric, puberulous; petioles 0.7-2 mm long, puberulous; blades 5-15 \times 4-7 mm, fleshy, subcoriaceous, broadly elliptic to elliptic, appressed serrulate to entire, above dark green and glabrous, (except that the base at first is sparsely puberulous), below whitish on the surface, but the major veins dark, the finely reticulate venation somewhat visible below, but conspicuous above, secondary veins 3-5 in each half; heads solitary, sessile, mostly terminal; involucre 1.3 mm tall, widely campanulate, puberulous to glabrate; receptacle densely puberulous; glands 0.5 mm wide, figure eight shaped, reddish black, separate; anthers 0.15 mm in diameter, subglobose; ovary 4 mm long, ovoid, glabrous; 3 styles 0.8 mm long, cernuous; capsules 2 mm long, subglobose, 3-lobed, brown, smooth.

Discussion: The new var. *arenisaxosa* is most closely related to *Euphorbia celastroides*, var. *halawana* of Molokai, a variety with the herbage glabrous; blades 1-3.5 \times 0.8-2 cm, the base rounded or subcordate, secondary veins 7-9 in each half; involucre tomentose at least above; glands oblong elliptic; and the capsule 3 mm long. The var. *arenisaxosa* has the internodes, stipules and petioles puberulous; blades 5-15 \times 4-7 mm, secondary veins 3-5 in each half; involucre puberulous to glabrate; glands figure eight shaped; and the capsules 2 mm long.

The new epithet is formed from the Latin arena, sand, and saxum, rock, and it refers to the habitat of the variety on stabilized, consolidated sand dunes.

Reference

Koutnik, Daryl L. 1987, A Taxonomic Revision of the Hawaiian Species of the Genus *Chamaesyce* (Euphorbiaceae). *Allertonia* 4(6): 331-357, figs. 1-24.

TWO PITTOSPORUM SPECIES (PITTOSPORACEAE)

HAWAIIAN PLANT STUDIES 151

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Pittosporum is an evident element in the Hawaiian native forests. At present there are known 26 species and 35 varieties. Here there are added two more species.

Pittosporum molokaiense sp. nov. (sect. Bivalvae).
Frutex glaber est, petiolis 8-21 mm longis, laminis 5.5-10.8 \times 1.9-5.1 cm coriaceis spatulatis integris, umbelis 5-floriferis, capsulis 27-33 \times 21-23 \times 9-12 mm bivalvatis oblongo-ellipsoideis rugosis et tomentosis.
Typus: Molokai I., Waialua Valley, R. Hobdy 1,839.

Pittosporum radiculatum sp. nov. (sect. Bivalvae).
Arbor 3.3 m alta est, petiolis 1-2 cm longis tomentosis, laminis 4-8 \times 1.2-2.7 cm spatulatis supra in nervis puberulis infra tomentosis, racemis 1.5-2 cm longis tomentosis, corollis 10.5 mm longis luteis, capsulis 18-24 \times 16-25 \times 14-16 mm subglobosis laevibus glabris.
Typus: Hawaii I., Natl. Park, Kalapana, J. Jacobi et al. 275.

The types of these species are in the Bishop Museum, Honolulu.

DIAGNOSES OF CYRTANDRA SPECIES (GESNERIACEAE) SECT.
CHAETOCALYCES

HAWAIIAN PLANT STUDIES 152

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The section *Chaetocalyces* is distinguished by the ligulate shape of its long calyx lobes. It now is known to contain 31 species and 3 varieties. They occur on Molokai, Maui, Lanai, and Hawaii, but not on the two northern others.

The types of the following species are in the Bishop Museum, Honolulu.

Cyrtandra adine sp. nov. Novellae villosae sunt, foliis oppositis, petiolis 25-38 mm longis villosis, laminis 7-10.2 X 3.8-6 cm ellipticis subacuminatis basi rotundata supra pilosis infra pilosis, cymis 3.5-4 cm longis 3-6-floriferis villosis, pedicellis 6-8 mm longis, calycibus 8-9 mm longis villosis lobis 7-9 mm longis 1-1.5 mm latis ligulatis. Typus: Maui I., C. N. Forbes 1,078.M.

Cyrtandra adpressa sp. nov. Novellae adpresse puberulae sunt, foliis oppositis inaequalibus, petiolis 6-30 mm longis puberulis, laminis 4.5-8 X 1.9-3.7 cm oblanceolatis supra hirsutulis infra nervis puberulis, cymis 2.5-3 cm longis 1-floriferis puberulis, calycibus 12-15 mm longis puberulis lobis 11-13 mm longis, corollis 16-17 mm longis puberulis tubo 12-13 mm longo, loba infera 5.5 mm longa suborbiculari. Typus: Maui I., F. R. Warshauer 2,536.

Cyrtandra adusta sp. nov. Ramulae pilosae sunt, foliis oppositis, petiolis 3.5-6 cm longis pilosulis, laminis 14.5-17 X 6-7 cm ellipticis acuminatis basi cuneata et decurrentibus supra hirsutulis infra nervis hirsutulis, cymis 5-6 cm longis 3-5-floriferis pilosulis, pedicellis 10-23 mm longis, gemmis fusiformibus, calycibus 19-20 mm longis adpresse pilosulis lobis 12-16 mm longis ligulatis, corollis 30 mm longis adpresse pilosulis. Typus: Maui I., F. R. Warshauer 2,889.

Cyrtandra alikaensis sp. nov. Novellae pilosulae sunt, foliis oppositis inaequalibus, petiolis 4-8.5 mm longis pilosulis, laminis 16-21.5 X 5.5-7.5 cm oblanceolatis supra hispidulis infra puberulis, cymis 3-5 cm longis 7-11-floriferis. Typus Maui I., Nahiku, H. St. John et al. 17,897.

Cyrtandra badia sp. nov. Novellae hirsutae sunt, foliis oppositis, petiolis 8-20 mm longis hirsutis, laminis 5-9.5 \times 2.5-4.5 cm fusiformi-ellipticis acuminatis hirsutis, cymis 2-6 cm longis 1-floriferis hirsutis, pedicellis 20-35 mm longis, calycibus 20-24 mm longis lobis 19-23 mm longis subulatis, corollis hirsutis. Typus: Maui I., F. R. Warshauer 2,719.

Cyrtandra biformalis sp. nov. Novellae hirsutulae sunt, foliis oppositis inaequalibus, petiolis 10-55 mm longis hirsutulis, laminis 7-16 \times 3-7 cm ellipticis subacuminatis supra hirsutulis infra pilosulis, cymis 4.5-7 cm longis 2-4-floriferis hirsutulis, pedicellis 17-22 mm longis, calycibus 13-15 mm longis hirsutulis, 2 lobis inferis dimidio infero 1-1.2 mm lato ligulato dimidio supero 2.7-3.5 mm lato elliptico, corollis 15-18 mm longis. Typus: Maui I., Nahiku, P. K. Higashino 9,184.

Cyrtandra capillata sp. nov. Novellae puberulae sunt, foliis oppositis inaequalibus, petiolis 9-32 mm longis puberulis, laminis 4-11.5 \times 1.3-5 cm ellipticis acuminatis supra hirsutulis infra puberulis, cymis 5-6 cm longis 3-7-floriferis, calycibus 12-13 mm longis puberulis, 10bis 11-16 mm longis dimidio basali 1-3 mm latis ligulato dimidio apicali 3-4 mm lato elliptico, corollis 17 mm longis. Typus: Maui I., Kipahulu, P. K. Higashino 9,411.

Cyrtandra depressa sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 3-5 cm longis pilosulis, laminis 10-19.5 \times 3.3-5.4 cm fusiformibus infra pilosulis, cymis 3.5-4 cm longis 1-2-floriferis pilosulis, pedicellis 10-17 mm longis, calycibus 17-18 mm longis pilosulis, loba infera 8 mm longa lanceolata, corollis 26 mm longis, loba infera 9 mm longa suborbiculari. Typus: Hawaii I., Hamakua, F. R. Warshauer 1,281.

Cyrtandra fruticosa sp. nov. Novellae hirsutulae sunt, foliis oppositis, petiolis 10-60 mm longis hirsutulis, laminis 9-14.5 \times 2.5-6 cm oblanceolatis acuminatis supra hirsutulis infra puberulis, cymis 5.5-10 cm longis 3-5-floriferis hirsutulis, pedicellis 18-38 mm longis, calycibus 15-20 mm longis pilosulis, lobis 12-17 mm longis eis superis ligulatis, corollis 24-26 mm longis pilosulis. Typus: Maui I., F. R. Warshauer 2,607.

Cyrtandra haelaauensis sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 13-50 mm longis hirsutis, laminis 5.5-12 \times 2.5-4.3 cm ellipticis acuminatis supra hirsutis infra nervis hirsutulis, cymis 4-5 cm longis 3-5-floriferis hirsutis, pedicellis 12-22 mm longis, calycibus 13-15 mm longis pilosulis lobis 13-14 mm longis subulatis ciliatis, corollis 18 mm longis. Typus: Maui I., Haelaau, H. St. John 10,213.

Cyrtandra heliothine Novellae hirsutulae sunt, foliis oppositis inaequalibus, petiolis 8-50 mm longis, laminis 4-12 X 2.3-5.2 cm ellipticis subacuminatis cuneatis hirsutulis, cymis 3.5-5.5 cm longis 1-floriferis hirsutulis, pedicellis 10-25 mm longis, calycibus 13-16 mm longis hirsutulis lobis 11-14 mm longis 1.5 mm latis ligulatis, corollis 25 mm longis loba infera 8 mm diametro suborbiculari. Typus: Maui I., Ke'anae, F. R. Warshauer 2,583.

Cyrtandra hians sp. nov. Novellae hirsutae sunt, foliis oppositis inaequalibus, petiolis 10-55 mm longis hirsutulis, laminis 8.5-16.5 X 3-8 cm ellipticis acuminatis supra hirsutulis infra pilosulis, cymis 3.5-9 cm longis 3-floriferis pilosulis, pedicellis 9-23 mm longis, calycibus 20-21 mm longis pilosulis lobis 17-18 mm longis dimidio basali 3 mm lato ligulato dimidio apicali 4.3 mm lato elliptico, corollis 24 mm longis villosulis. Typus: Maui I., Keanae Gap, F. R. Warshauer 2,833.

Cyrtandra ligulata sp. nov. Petiolae 4 cm longae pilosulae sunt, laminis 10.5-11 X 5.5-6 cm ellipticis acuminatis supra nervis hirsutis infra nervis pilosis, cymis 5.5-7 cm longis 3-floriferis pilosis, pedicellis 17-24 mm longis, calycibus 20-24 mm longis pilosis lobis superis 10-11 mm longis subulate ligulatis, baccis lanceo-ovoideis glabris. Typus: Hawaii I., Hamakua, F. R. Warshauer 1,639.

Cyrtandra occidentalis sp. nov. Novellae hirsutae sunt, foliis oppositis, petiolis 12-24 mm longis hirsutis, laminis 7-19.5 X 2-3.5 cm lanceolatis supra hirsutis infra pilosulis, cymis 3-4 cm longis (3-) 1-floriferis hirsutis, pedicellis 8-15 mm longis, calycibus 14-15 mm longis lobis 12.4-14.5 mm longis ligulatis, corollis 22 mm longis pilosulis. Typus: Maui I., P. K. Higashino 9,498.

Cyrtandra oopuolaensis sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 3-7 cm longis pilosulis, laminis 8-16.5 X 3.9-7.2 cm ellipticis acuminatis basi cuneata et decurrentis supra pilosulis infra puberulis, cymis 4-5 cm longis 3-floriferis pilosulis, pedicellis 12-18 mm longis, calycibus 12-14 mm longis, lobis 11-13 mm longis apice spathulato 2.3-2.8 mm lato, Typus: Maui I., Oopuola Stream, H. St. John et al. 25,620.

Cyrtandra orientalis sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 16-30 mm longis pilosulis, laminis 13-18 X 4-6.7 cm coriaceis lanceolatis acuminatis hirsutulis, cymis 5 cm longis 7-floriferis pilosulis, pedicellis 7-10 mm longis, calycibus 17-18 mm longis pilosulis, lobis 14-15 mm longis ligulatis subspathulatis, corollis 25 mm longis pilosulis. Typus: Maui I., F. R. Warshauer 2,830.

Cyrtandra petiolata sp. nov. Novellae villosae sunt. foliis oppositis, petiolis 5-9 cm longis villosis, laminis 15-17 \times 7.2-8 cm ellipticis acuminatis basi elongate cuneatis supra villosis infra hirsutis, cymis 25-35 cm longis 5-13-floriferis villosis, pedicellis 4-10 mm longis, calycibus 9-10 mm longis villosis tubo 1.5-2 mm longo lobis inaequalibus apice spatulato, corollis 18 mm longis villosis. Typus: Maui I., Waikamoi, C. N. Forbes 1,285.M.

Cyrtandra phae sp. nov. Novellae hirsutae sunt, foliis oppositis, petiolis 3-4.7 cm longis hirsutis, laminis 9-14 \times 3.5-4.3 cm ellipticis acuminatis supra hirsutis infra nervis hirsutis, cymis 4 cm longis 1-floriferis hirsutis, calycibus 18 mm longis hirsutis lobis 10-11.5 mm longis ligulatis, corollis 19 mm longis hirsutis. Typus: Hawaii I., Glenwood, O. Degener 30,307.

Cyrtandra puberula sp. nov. Novellae puberulae sunt, foliis oppositis inaequalibus, petiolis 14-35 mm longis puberulis, laminis 7-10.5 \times 2.4-4 cm ellipticis subacuminatis puberulis, cymis 3-5 cm longis 2-4-floriferis puberulis, pedicellis 9-14 mm longis, calycibus 10-12 mm longis puberulis lobis 9-10.5 mm longis ligulatis, corollis 23 mm longis puberulis. Typus: Maui I., Kipahulu, P. K. Higashino 9,402.

Cyrtandra quinquefasciata sp. nov. Novellae pilosulae sunt, foliis oppositis inaequalibus, petiolis 14-35 mm longis pilosulis, laminis 6-12 \times 2.2-3.7 cm oblanceolatis supra hirsutulis infra pilosulis, cymis 3.5-5 cm longis pilosulis, pedicellis 9-14 mm longis, calycibus 10-11 mm longis pilosulis lobis 9-10 mm longis parte $\frac{3}{4}$ basali 0.7-1.2 mm lata ligulata parte $\frac{1}{4}$ apicali 1.5 mm lata elliptica, corollis 14-17 mm longis pilosulis. Typus: Maui I., Kipahulu, P. K. Higashino 9,402.

Cyrtandra terna sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 1-4 cm longis pilosulis, laminis 6.5-14 \times 2.7-4.2 cm oblanceolatis ellipticisve acuminatis basi cuneata decurrenti supra hirsutulis infra nervis pilosulis, cymis 4-5.5 cm longis 3-floriferis puberulis, pedicellis 9-14 mm longis, calycibus 15-18 mm longis lobis 12-16 mm longis ligulatis subobtusis, corollis 22-24 mm longis. Typus: Maui I., Kipahulu, F. R. Warshauer 2,854,

Cyrtandra terniflora sp. nov. Novellae hirsutulae sunt, foliis oppositis inaequalibus, petiolis 1-4 cm longis hirsutulis, laminis 5-11.8 \times 3-6.2 cm ellipticis acuminatis supra hirsutulis infra pilosulis, cymis 5-6 cm longis 3-floriferis hirsutulis, pedicellis 14-16 mm longis, calycibus 16-17 mm longis hirsutulis lobis 14-15 mm longis in apice spathulatis, corollis 22 mm longis. Typus: Maui I., P. K. Higashino 9,102.

DIAGNOSES OF CYRTANDRA SPECIES, SECT. VERTICILLATAE
(GESNERIACEAE)

HAWAIIAN PLANT STUDIES 153

Harold St. John

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The types of the following species are in the Bishop Museum, Honolulu.

Cyrtandra cinnamomea sp. nov. Novellae pilosulae sunt, foliis 3-verticillatis, petiolis 11-13 mm longis pilosulis, laminis 12-17 \times 3.7-6.4 cm oblanceolatis basi rotundata supra midnervo pilosulo infra nervis pilosulis, cymis 3 cm longis 1-floriferis, pedunculo et pedicello 6 mm longis pilosulis, calycibus 24-25 mm longis pilosulis, lobis 8-10 mm longis lanceolatis apice subulato, corollis 27 mm longis glabris. Typus: Maui I., Transect 11, P. K. Higashino 9,328.

Cyrtandra hamakuaensis sp. nov. Novellae pilosae sunt, foliis 4-verticillatis sessilibus oblanceolatis supra midnervo pilosulo infra nervis pilosulis, cymis 2.5-3 cm longis 5-7-floriferis pilosis, pedicellis 4-10 mm longis, gemmis fusiformibus 18-20 mm longis rostro 5 mm longo, calycibus 16-17 mm longis pilosis, corollis 23 mm longis glabris. Typus: Hawaii I., Paauhau 3, J. F. Rock 4,062.

Cyrtandra infrafissa sp. nov. Novellae hirsutulae sunt, foliis 3-verticillatis, petiolis 3-7 mm longis hirsutulis, laminis 15-32 \times 2.5-6.3 cm oblanceolatis acuminatis infra nervis pilosulis, cymis 3.5-4 cm longis 1-floriferis pilosulis, pedicellis 10 mm longis, calycibus 25-28 mm longis fusiformibus rostro 4-5 mm longo indiviso, corollis 30-33 mm longis glabris. Typus: Maui I., Kipahulu, B. H. Gagne 1.

Cyrtandra latior sp. nov. Novellae pilosae sunt, foliis verticillatis, petiolis 4-10 mm longis pilosis, laminis 24-30 \times 4-5 cm spatulatis acuminatis basi subcordata infra nervis pilosulis, cymis 3.5-4 cm longis 3-5-floriferis pilosis, pedicellis 2-4 mm longis, gemmis fusiformibus rostro 7 mm longo, calycibus 30 mm longis $\frac{1}{4}$ -lobatis, 4 lobis lanceolatis, corollis 30 mm longis pilosulis. Typus: Molokai I., Mapulehu, J. F. Rock 12,518.

Cyrtandra mapulehuensis sp. nov. Novellae pilosae sunt, foliis 3-verticillatis, petiolis 2-4 cm longis pilosulis, laminis 9-19 \times 4-6.2 cm ellipticis acuminatis basi cuneata et decurrenti, cymis 5 cm longis 3-floriferis pilosulis, pedicellis 10-12 mm longis, calycibus 18-19 mm longis fusiformibus in basi pilosulis $\frac{1}{3}$ lobatis, lobis 8 mm longis lanceolatis,

corollis 22-24 mm longis pilosulis. Typus: Molokai I., Mapulehu, D. Herbst 1,891.

Cyrtandra opeatos sp. nov. Novellae pilosulae sunt, foliis 3-verticillatis sessilibus, laminis 21-24 X 4.5-5 cm oblanceolatis subacuminatis supra midnervo pilosulo infra nervis pilosulis, cymis 2.5-3 cm longis 5-floriferis caulifloribus pilosulis, pedicellis 3-5 mm longis, gemmis 18-20 mm longis fusiformibus pilosulis rostro 4 mm longo, calycibus 18-19 mm longis ellipsoideis, 4 lobis 10-12 mm longis basi ovata apice subulato, corollis 20 mm longis puberulis. Typus: Hawaii I., Glenwood, O. Degener 7,682.

Cyrtandra quadrata sp. nov. Novellae pilosae sunt, foliis 4-verticillatis, petiolis 6-20 mm longis pilosulis, laminis 5-12 X 1.5-2.5 cm oblanceolatis subacuminatis infra nervis pilosis, cymis 1-floriferis pilosis, pedicellis 1-2 mm longis, gemmis 27-32 mm longis fusiformibus rostro 7-9 mm longo, corollis 24 mm longis glabris, loba infera 10 mm longa ovata. Typus: Molokai I., Wailau, H. St. John et al 23,533.

Cyrtandra quadrilobata sp. nov. Novellae pilosulae sunt foliis 3-verticillatis sessilibus, laminis 33-37 X 5.2-6.3 cm oblanceolatis acuminatis basi rotundata infra nervis pilosulis supra puberulis, cymis 2.5-3.5 cm longis 3-7-floriferis pilosulis, pedicellis 9-11 mm longis, calycibus 31 mm longis fusiformibus pilosulis rostro 5-6 mm longo 4 lobis 9-14 mm longis, corollis 25 mm longis glabris. Typus: Hawaii I., Manuka, F. R. Warshauer 1,986.

Cyrtandra sessilis sp. nov. Ramulae pilosae sunt, foliis 3-4-verticillatis 17-38 X 6-8 cm oblanceolatis sessilibus perfoliatis supra midnervo pilosulo infra nervis pilosulis, cymis 4-4.5 cm longis 7-9-floriferis pilosulis, pedicellis 5-7 mm longis, gemmis 20-21 mm longis fusiformibus rostro 3.5-5 mm longo, calycibus 20-21 mm longis puberulis tubo 10-12 mm longo 3 lobis subulatis, corollis 30 mm longis glabris tubo 20 mm longo, loba infera 9 X 8 mm suborbiculari. Typus: Molokai I., Wailau, L. Stemmermann 2,067.

Cyrtandra straminea sp. nov. Novellae pilosulae sunt, foliis 3-verticillatis, petiolis 4.5-7.5 cm longis pilosulis, laminis 9.5-18.5 X 4.3-6.8 cm ellipticis acuminatis basi cuneata supra puberulis infra pilosulis, cymis 7-10.5 cm longis 3-5-floriferis pilosulis, pedicellis 28-32 mm longis, calycibus 17-20 mm longis fusiformibus puberulis stramineis 1/3-1/2-lobatis lobis lanceolatis, fructibus 17 X 3 mm glabris. Typus: Molokai I., Mapulehu, D. Herbst 1,887.

Cyrtandra subulata sp. nov. Novellae sericeae sunt, foliis 3-verticillatis sessilibus, laminis 21-29 \times 7.2-10.3 cm oblanceolatis basi rotundata supra nervis pilosulis, cymis 5.5 cm longis 11-floriferis puberulis, pedicellis 10 mm longis, calycibus 22-28 mm longis puberulis, lobis inferis 15-17 mm longis lanceolatis subulatis, corollis 30 mm longis glabris, loba infera 12 mm diametro suborbiculari. Typus: Maui I., Hanaula, H. St. John 26,883.

Cyrtandra ternaria sp. nov. Ramulae glabrae sunt, foliis 3-verticillatis sessilibus, laminis 12-20 \times 2.7-4.4 cm oblanceolatis basi auriculata infra nervis pilosulis, cymis 1-floriferis, pedunculo 3 mm longo, pedicellis 5-7 mm longis puberulis, gemmis 22 mm longis fusiformibus rostro 4 mm longo, calycibus $\frac{1}{2}$ partitis lobis inferis 12 mm longis lanceolatis, corollis 38-40 mm longis glabris, loba infera 9 \times 10 mm subglobosa. Typus: Molokai I., Transect 1, F. R. Warshauer 2,423.

Cyrtandra trinalis sp. nov. Ramulae glabrae sunt, foliis 3-verticillatis, petiolis 12-20 mm longis, laminis 22-35 \times 7.5-9.2 cm oblanceolatis subacuminatis supra midnervo sericeo infra nervis sericeis, cymis 4-6 cm longis 3-7-floriferis pilosulo-sericeis, pedicellis 6-14 mm longis, gemmis fusiformibus, calycibus 30 mm longis sericeis, 5 lobis 13-17 mm longis lanceolatis, corollis 35 mm longis glabris. Typus: Maui I., Nahiku, H. St. John 17,897A.

Cyrtandra waiheensis sp. nov. Novellae tomentosae sunt, foliis 4-verticillatis, petiolis 2-4.5 cm longis tomentosis, laminis 11.5-16.5 \times 1.7-2.6 cm oblanceolatis acuminatis basi decurrenti infra nervis pilosis, cymis 4-5 cm longis 1-floriferis tomentosis, pedicellis 4 mm longis, gemmis fusiformibus rostro et corpore aequantibus, calycibus 43 mm longis ad medium fissis, corollis 28 mm longis glabris. Typus: Maui I., Waihee, J. F. Rock et al.

SECTION LOBICALYCES OF CYRTANDRA (GESNERIACEAE)

HAWAIIAN PLANT STUDIES 154

Harold St. John
Bishop Museum, Box 19000A, Honolulu, Hawaii, USA

Cyrtandra

Section Lobicalyces, sect. nov.

(Subgen. Brachycyathus)

Diagnosis Typi: Calycibus viridibus persistentibus, fere $\frac{3}{4}$ lobatis, lobis lanceolatis, corollis albis, inflorescentia cymosa, floribus paucis, foliis verticillatis.

Calyx green, persistent, campanulate, lobed about $\frac{3}{4}$ way into lanceolate lobes; corollas white; inflorescence cymose, flowers few; leaves verticillate.

Type species: *Cyrtandra curvata* St. John.

Discussion: A related section is *Verticillatae*, which also has verticillate leaves, but it differs by having the calyx fusiform in bud, and it is deciduous before the fruit ripens.

Section *Schizocalyces* is similar to the new section in calyx and corolla, but the leaves are opposite.

Other species in the new section are *C. biserrata* Hillebr., *C. Conradtii* Rock, *C. Fauriei* H. Levl., *C. Grayana* Hillebr. and 6 vars., *C. longifolia* Hillebr., var. *degenerans* (Wawra) C. B. Clarke, f. *cymosa* Rock, *C. macrocalyx* Hillebr., *C. montis-loa* Rock, and *C. procera* Hillebr.

Cyrtandra curvata sp. nov. Frutex est, ramulis badi-pilosis, foliis 4- (3-) verticillatis, petiolis 5-7 mm longis dense pilosis, laminis 10-14 X 2-2.6 cm plicatis et in aspectu ligulatis sed in veritate anguste oblanceolati-oblongis acutis basi 6-8 mm lata subcordata infra dense pilosulis, cymis 3-5 cm longis 1-3-floriferis pilosulis, pedicellis 7-15 mm longis, gemmis campanulatis lobis calycis adscendentibus, calycibus 16-17 mm longis pilosulis $\frac{3}{4}$ partitis 5 lobis subaequalibus 11-13 mm longis oblanceolatis, corollis 22-24 mm longis tubo 17-18 mm longo pilosulo, 2 lobis superis 6 X 7 mm suborbicularibus. 2 lobis lateralibus 6 mm diametro suborbicularibus. loba infera 7 X 6 mm suborbiculari.

Diagnosis of Holotype: Shrub 1.5 m tall; leafy shoot 4-6 mm in diameter, densely brown pilose; middle stem 6-7 mm in diameter, brown, smooth, somewhat fleshy and

on drying with longitudinal ridges, glabrate; internodes 1.5-4 mm long; nodes scarcely enlarged; leaf scars 4-5 mm high, shieldshaped, pale; bundle scars 3; leaves 4- (3-) verticillate; leafy branches with 11 whorls of leaves; leaves at first ascending, later divergent, but downcurved and revolute, and thus appearing 7-9 mm wide, subsessile, the petioles 5-7 mm long, 2.5-3 mm in diameter, concealed by the dense brown pilosity; blades 10-14 \times 2-2.6 cm, but all plicate and appearing ligulate and less than half that width, very narrowly oblanceolate oblong, the apex acute, the base 6-8 mm wide, subcordate, fleshy, the outer half with minute curved subulate teeth, the secondary veins numerous and evident, above dark green, glabrous, below densely brown ascending pilosulous; cymes 3-5 cm long, 1-3-flowered; peduncle 6-10 mm long, appressed brown pilosulous; pedicels 7-15 mm long, appressed brown pilosulous; bracts 8-12 mm long, lanceolate, appressed brown pilosulous; buds campanulate, the calyx lobes ascending; calyx in antheses when fresh 16-17 mm long, green, campanulate, but cuneate at base, ascending, appressed brown pilosulous without, glabrous within, cleft 3/4 way, the tube 4-5 mm long, the 5 lobes subequal 11-13 mm long, 6 mm wide, elliptic oblanceolate, acute, in fruit the lobes 14-15 mm long, 7 mm wide; corolla when fresh white, 22-24 mm long, the tube 17-18 mm long, 4 mm in diameter at base, 3 mm at the middle, 8 mm at the throat, gently downcurved at the middle, the enclosed part glabrous, the free part spreading pilosulous, within at the throat capitate glandular puberulous; the limb 2-lipped, 5-lobed, the 2 upper lobes 6 \times 7 mm, suborbicular; lower lip 3-lobed, the lateral lobes 6 mm in diameter, suborbicular; the lower lobe 7 \times 6 mm, suborbicular; (fruit not seen).

Expanded Description: Shrub 1-2 m tall; middle stem 4-7 mm in diameter; internodes 0.6-4 cm long; leafy branches with 8-11 whorls of leaves; petioles 3-7 mm long; blades 3-14 \times 0.7-2.6 cm, the base 3-8 mm wide, secondary veins 8-10 in each half; cymes 1-3-flowered; peduncle 3-10 mm long; pedicels 7-17 mm long; bracts 5-12 mm long; corolla when dried 21 mm long; berry when dried 17 \times 11 mm, broadly ovoid, acute, and including the 2-3 mm beak.

Holotypus: Hawaiian Islands, Molokai Island, Ditch Trail, Hanalilililo, head of Waikolu Valley, rain forest, 3,600 ft alt., Dec. 24, 1953, H. St. John 25,223. (BISH).

Specimens Examined: Hawaiian Islands, Molokai Island, Kipouki Flats, common on moist shaded hillside, 3,400 ft elev., 3 July 1964, M. R. Crosby et al. 1,640; Nualele Valley Dark Gulch, March 18, 1952, O. Degener & A. Tam 22,211; head of Waikolu Valley, Hanalilililo, 3,750 ft

alt., Dec. 21, 1932, H. St. John et al. 12,407; Puu O Kaeha, Kawela, swampy forest, 3,900 ft alt., Dec. 23, 1932, St. John et al. 12,495; ridge between Manlilolilo and Pepeopae, Waikolu Valley, Kawela, swampy rain forest, 4,000 at alt., Dec. 25, 1932, St. John et al. 12,588; s. w. slope of Puu Alii, Kawela, rain forest, 4,200 ft alt., Dec. 31, 1938, St. John et al. 19,931.

Discussion: *C. curvata* is the type species of the new section *Curvata*. Its closest relative seems to be *C. Grayana* Hillebr., of west Maui, a species with the cymes 6-7 cm long, 5-7-flowered, corolla 18-20 mm long; leaves 4-6-verticillate, flat, 18-37 mm wide, cuneate at base, above sparsely pilosulous, and the petioles 2.5-9 cm long. *C. curvata* has the cymes 3-5 cm long, 1-3-flowered; corolla 22-24 mm long; leaves 4- (3-) verticillate, folded and arcuate decurved, subcordate at base, 20-26 mm wide, above glabrous; and the petioles 5-7 mm long. The new types are in the Bishop Museum, Hon.

The new epithet is the Latin adjective *curvata*, curved, and it applies to the curved blades.

C. anise sp. nov. Frutex est, ramulis pilosis, foliis 4-verticillatis, petiolis 16-28 mm longis pilosulis, laminis 6-9 X 1.8-2 cm coriaceis elliptico-lanceolatis subacutis basi cuneata decurrenti, supra hirsutis infra pilosis, cymis 2-4 cm longis 5-7-floriferis pilosulis, pedicellis 5-16 mm longis, calycibus 13-14 mm longis pilosulis 4/5 fissis lobis superis 10-11 mm longis illis inferis 11-12 mm longis elliptico-oblongis subobtusis. Typus: Maui I., Ukumehame Gulch, H. St. John et al. 25,737.

C. calvicalycis sp. nov. Frutex ramosus est, novellis sericeis, foliis 4-verticillatis, petiolis 2-3.5 cm longis sericeis, laminis 7-10 X 1.4-2.4 cm coriaceis oblanceolatis basi cuneata decurrenti, supra hirsutis infra sericeis, cymis 4-6 cm longis 3-floriferis sericeis, pedicellis 10-18 mm longis, calycibus 15-16 mm longis lobis 12-14 mm longis ellipticis acutis, corollis 27 mm longis. Typus: Maui I., Puu Kukui, F. R. Fosberg 10,003.

C. framea sp. nov. Ramulis hirsutis, foliis ternatis, petiolis 6-10 mm longis hirsutis, laminis 5-10 X 1.3-3.1 cm subcoriaceis oblanceolatis basi cuneata decurrenti infra pilosulis, cymis 3 cm longis 1-floriferis puberulis, pedicellis 13-17 mm longis, calycibus 19-21 mm longis puberulis lobis inferis 17 mm longis ellipticis subacutis, corollis 27 mm longis pilosulis. Typus: Molokai I., F. R. Warshauer 2,421.

C. fulva sp. nov. Novellae pilosae sunt, foliis ternatis, petiolis 14-20 mm longis ellipticis acutis basi cuneata decurrenti, cymis 3-7 cm longis 1-3-floriferis pilosulis, pedicellis 4-22 mm longis, calycibus 26 mm longis pilosulis $\frac{1}{2}$ lobatis lobis inferis 12 mm longis ovato-lanceolatis, corollis 20 mm longis pilosulis. Typus: Molokai I., Kawela Gulch, L. E. Bishop 036903.

C. furfurosa sp. nov. Arbor 2-2.6 m alta est, novellis pilosulis, foliis ternatis, petiolis 15-45 mm longis pilosulis, laminis 12.5-15 \times 3.7-5.5 cm oblanceolatis basi cuneata decurrenti supra hirsutulis infra pilosulis, cymis 5 cm longis 7-floriferis pilosulis caulifloribus, pedicellis 7-13 mm longis pilosulis, calycibus 12-13 mm longis pilosulis lobis 11-12 mm longis spathulato-oblanceolatis, corollis 22 mm longis pilosulis. Typus: Molokai I., Waikolu Valley, M. R. Crosby & Anderson 1,685.

C. Grayana Hillebr., var. caudata var. nov. A var. *lanaiensis* Rock differt in calycibus 23-25 mm longis lobis 21-23 mm longis caudatis. Typus: Lanai I., Puu Aalii, F. R. Fosberg 12,474.

C. Grayana Hillebr., var. *Fosbergii* var. nov. A var. *lanaiensis* differt in lobis calycis 20-22 mm longis caudatis, laminis infra moderatim adpresse sericeis. Typus: Lanai I., Puu Aalii, F. R. Fosberg 12,474.

C. hematos sp. nov. Ramulae glabrae sunt, foliis ternatis, petiolis 4-5.5 cm longis pilosulis, laminis 7-10.5 \times 2.6-4 cm subcoriaceis oblanceolatis basi cuneata supra pilosulis infra puberulis sed nervis pilosulis, cymis 3-4 cm longis 1-floriferis hirsutulis, pedicellis 12-17 mm longis, calycibus 15-17 mm longis puberulis lobis 2.5-3 mm longis ellipticis, corollis 22 mm longis glabris loba infera 9 \times 10 mm suborbiculari. Typus: Molokai I., Transect 21, F. R. Warshauer 2,935.

C. Higashinoi sp. nov. Novellae villosae sunt, foliis 4-verticillatis, petiolis 15-33 mm longis villosis, laminis 7-12.2 \times 2.3-3.8 cm subcoriaceis lanceolatis acuminatis supra hirsutulis infra pilosulis midnervo piloso, cymis 2.5-5 cm longis 3-floriferis villosis, pedicellis 12-17 mm longis, calycibus 14-17 mm longis pilosis lobis 13-15 mm longis lanceolatis, corollis 28-30 mm longis pilosis loba infera 6 mm diametro suborbiculari. Typus: Maui I., Kahikinui, P. K. Higashino 9,226.

C. inaequalis sp. nov. Novellae pilosae sunt, foliis ternatis, petiolis 10-30 mm longis glabris, laminis 9-16 \times 3.5-5 cm oblanceolatis basi cuneata decurrenti supra nervis hirsutulis infra nervis hirsutulis, cymis 5.5 cm longis 3-floriferis glabris, pedicellis 5-6 mm longis, calycibus 16-19 mm longis glabris lobis inferis

8-11 mm longis lanceolatis, corollis 34 mm longis glabris. Typus: Molokai I., Transect 1, F. R. Warshauer 2,426.

C. kalaensis sp. nov. Arbor est, novellis puberulis, foliis ternatis, petiolis 4-32 mm longis pilosulis, laminis 2.2-9.8 X 1-3.4 cm ellipticis acuminatis basi cuneata supra hirsutulis infra puberulis sed nervis pilosulis, cymis 2.5-4.5 cm longis 1-floriferis pilosulis, pedicellis 6-16 mm longis, calycibus 9-10.5 mm longis pilosulis 4/5 lobatis lobis 8-9 mm longis oblanceolatis, corollis 13-15 mm longis pilosulis. Typus: Molokai I., Kalae, J. F. Rock 14.047.

C. kamokuensis sp. nov. Novellae pilosae sunt, foliis ternatis, petiolis 12-22 mm longis pilosulis, laminis 4.3-14 X 1.5-4 cm oblanceolatis acuminatis basi cuneata decurrenti supra hirsutulis infra pilosulis sed nervis villosis, cymis 5-7.5 cm longis 1-floriferis pilosulis, pedicellis 14-30 mm longis, calycibus 23-26 mm longis pilosulis lobis inferis 5-9 mm longis lanceolatis, corollis 27 mm longis pilosulis loba infera 6 X 5 mm suborbiculari. Typus: Molokai I., Kamoku Camp, J. F. Rock 6,118.

C. kirrhe sp. nov. Novellae pilosulae sunt, foliis ternatis, petiolis 2.5-3 cm longis pilosulis, laminis 9-13 X 2.1-2.8 cm ellipticis acuminatis basi cuneata decurrenti supra hirsutulis infra nervis pilosulis, cymis 5-7 cm longis 1-3-floriferis pilosulis, pedicellis 6-22 mm longis, calycibus 13-15 mm longis pilosulis 6/7 lobatis lobis 11-13 mm longis lanceolatis, corollis 26-27 mm longis pilosulis. Typus: Maui I., Puu Kukui, L. M. Cranwell et al. 2,653.

C. leiocalyx sp. nov. Novellae pilosulae sunt, foliis 4-verticillatis, petiolis 2-4.2 cm longis pilosulis, laminis 5.5-8.7 X 2-3.2 cm supra hirsutulis infra nervis hirsutulis, cymis 2.5-3 cm longis 1-floriferis glabris, pedicellis 8-9 mm longis, calycibus 11 mm longis lobis 8-9 mm longis oblanceolatis, corollis 24 mm longis glabris. Typus: Molokai I., Kaluaaha Valley C. N. Forbes 450.Mo.

C. monanthe sp. nov. Ramulae pilosulae sunt, foliis ternatis, petiolis 1.5-5.3 cm longis, laminis 6-9.7 X 2-3.2 cm ellipticis subacuminatis basi cuneata supra hirsutis infra pilosulis, cymis 5-8 cm longis 1-floriferis hirsutulis, pedicellis 18-27 mm longis, calycibus 16-18 mm longis hirsutulis lobis 14-16 mm longis lanceolatis, corollis 21-22 mm longis hirsutulis, loba infera 6 mm longa ovata. Typus: Molokai I., Transect 2, F. R. Warshauer 2,363.

C. olaensis sp. nov. Novellae villosae sunt, foliis ternatis, petiolis 2-5.5 cm longis villosis, laminis 6.5-16.5 X 2.3-6.1 cm ellipticis acuminatis basi cuneata

decurrenti supra midnervo hirsutulo, infra nervis pilosis, cymis 2.5-5 cm longis 3-5-floriferis pilosis, pedicellis 15-22 mm longis, calycibus 20 mm longis pilosis 2/3 lobatis lobis 15-17 mm longis lanceolatis, corollis 18-19 mm longis. Typus: Oloa, Kulani Trail, H. St. John 24,974.

C. olokuiensis sp. nov. Novellae pilosulae sunt, foliis ternatis, petiolis 2-3.3 cm longis pilosulis, laminis 5.2-10.7 \times 2.5-4 cm subcoriaceis oblanceolatis subacuminatis basi cuneata decurrenti supra hirsutis infra nervis hirsutis, cymis 5 cm longis 2-floriferis pilosulis, pedicellis 15-20 mm longis, calycibus 9 mm longis pilosulis lobis 7-8.5 mm longis lanceolatis, corollis 22 mm longis pilosulis. Typus: Molokai I., Olokui, P. K. Higashino 9,400.

C. pepeopaeensis sp. nov. Novellae hirsutae sunt, foliis 4-verticillatis, petiolis 1.5-3 mm longis, laminis 5-8.5 \times 0.9-1.5 cm oblanceolatis falcatis supra glabris infra pilosulis, cymis 3-4 cm longis 1-floriferis hirsutulis, pedicellis 13-17 mm longis, calycibus 12-13 mm longis hirsutulis 11/12 lobatis lobis 9-12 mm longis lanceolatis, corollis 20-22 mm longis hirsutulis. Typus: Molokai I., Pepeopae Bog, J. Davis & P. Kores 59.

C. prasina sp. nov. Novellae pilosae sunt, foliis ternatis, petiolis 2-4.5 cm longis pilosis, laminis 7.5-13.5 \times 2.5-4 cm oblanceolatis subacuminatis basi cuneata supra pilosulis infra pilosulis sed nervis pilosis, cymis 1-3-floriferis pilosis, pedicellis 6-14 mm longis, calycibus 15-19 mm longis puberulis 7/8 lobatis lobis 13-16 mm longis spathulatis. Typus: Hawaii I., Mountain View, W. Gagne 659.

C. puuensis sp. nov. Novellae pilosulo-tomentosae sunt, foliis 6-verticillatis, petiolis 12-20 mm longis pilosulis, laminis 5.7-9.5 \times 1.1-2.1 cm coriaceis ellipticis acutis basi cuneata supra pilosis infra pilosulo-tomentosis, cymis caulifloribus 3.5-4.5 cm longis 3-7-floriferis pilosulis, pedicellis 6-9 mm longis, calycibus 10-11 mm longis 4/5 lobatis pilosulis lobis 7-9 mm longis ellipticis, corollis 20-21 mm longis pilosis. Typus: Maui I., Puu Kukui, M. R. Crosby & W. R. Anderson 1,847.

C. stenohede sp. nov. Novellae pilosulae sunt, foliis ternatis, petiolis 1-2 cm longis pilosulis, laminis 14-22 \times 4.6-8.6 cm ellipticis acuminatis tertia basali anguste cuneata supra hirsutulis infra nervis hirsutulis, cymis 5-6.5 cm longis 3-floriferis pilosulis, pedicellis 10-27 mm longis, calycibus 16-20 mm longis pilosulis lobis inferis 11 mm longis lanceo-subulatis, corollis 22-25 mm longis pilosulis. Typus: Hawaii I., Holokaiea, J. F. Rock 4,075.

C. subaequalis sp. nov. Novellae pilosae sunt, foliis ternatis, petiolis 2-4.5 cm longis pilosis, laminis 7.5-13.5 \times 2.5-4 cm oblanceolatis subacuminatis basi cuneata supra pilosulis infra pilosis, cymis 1-3-floriferis pilosis, pedicellis 6-14 mm longis, calycibus 13-15 mm longis puberulis. Typus: Hawaii I., Keaau, W. C. Gagne 659.

C. subcalva sp. nov. Novellae pilosulae sunt, foliis 4-verticillatis, petiolis 1.5-3 cm longis pilosulis, laminis 7-14.5 \times 1.8-3.2 cm oblanceolatis acuminatis basi cuneata et decurrenti supra midnervo puberulo infra nervis pilosulis, cymis 3.5-4 cm longis 1-floriferis pilosulis, pedicellis 4-8 mm longis, calycibus 25-26 mm longis pilosulis 2/5 lobatis lobis 12-17 mm longis lanceolatis, corollis 25 mm longis glabris. Typus: Molokai I., Wailau, H. St. John et al. 13,257B.

C. subtilis sp. nov. Novellae hirsutulae sunt, foliis ternatis inaequalibus, petiolis 1.5-3.5 cm longis, laminis 6-10.5 \times 2.4-4.5 cm ellipticis subacuminatis basi cuneata, cymis 4-10 cm longis 2-3-floriferis hirsutulis, pedicellis 13-27 mm longis, calycibus 16-18 mm longis hirsutulis lobis 13-14 mm longis lanceolatis, corollis 19 mm longis hirsutulis. Typus: Hawaii I., Transect 67, F. R. Warshauer 2,014.

C. subviridis sp. nov. Novellae pilosae sunt, foliis 3-4-verticillatis, petiolis 1.4-4.8 cm longis pilosis, laminis 6.5-11 cm longis subcoriaceis fusiformibus acuminatis basi cuneata decurrenti supra hirsutulis infra tomentosis, cymis caulifloribus 3-6 cm longis 9-13-floriferis pilosulis, pedicellis 8-13 mm longis, calycibus 15 mm longis pilosulis 5/6 lobatis lobis 12-13 mm longis ellipticis acutis, corollis 25 mm longis hirsutis. Typus: Maui I., Hanaula, K. Nagata 1,925.

C. tenuis sp. nov. Novellae pilosulae sunt, foliis ternatis, petiolis 5-7 cm longis pilosulis, laminis 14-17 \times 3.3-4.3 cm coriaceis oblanceolatis subacuminatis basi cuneata decurrenti supra hirsutulis infra tomentosis, cymis 5 cm longis 7-floriferis pilosulis, pedicellis 12-17 mm longis, calycibus 15-17 mm longis pilosulis, lobis 10-15 mm longis ellipticis, corollis 21-22 mm longis pilosulis. Typus: Molokai I., Puu Kolekole, C. N. Forbes 147a.Mo.

C. tetraphylla sp. nov. Novellae pilosulae sunt, foliis 4-verticillatis, petiolis 1.2-2.2 cm longis pilosulis, laminis 5-9 \times 1.7-2.6 cm coriaceis oblanceolatis basi cuneata supra hirsutulis infra pilosis, cymis 3-5 cm longis 3-5-floriferis pilosulis, pedicellis 8-15 mm longis, calycibus 14 mm longis pilosulis lobis inferis 8-10 mm longis ovatis acutis, corollis 26-30

mm long. Typus, Maui I., Puu Kukui, F. R. Warshauer 3,044.

C. triados sp. nov. Novellae pilosulae sunt, foliis ternatis, petiolis 5-9 cm longis pilosulis, laminis 16-20 \times 5.1-7 cm subcoriaceis ellipticis acutis basi cuneata decurrenti supra hirsutulis infra pilosulis, cymis 6-9 cm longis 3-floriferis pilosulis, pedicellis 7-25 mm longis, calycibus 17-20 mm longis pilosulis lobis 14-18 mm longis ellipticis, corollis 35 mm longis pilosulis. Typus: Molokai I., Transect 9, L. Stemmermann 3,862.

C. trifida sp. nov. Novellae hirsutae sunt, foliis ternatis, petiolis 8-25 mm longis hirsutis, laminis 4.5-10.5 \times 1.5-4 cm ellipticis subacuminatis basi cuneata supra hirsutis infra nervis hirsutis, cymis 4.5-7 cm longis 3-5-floriferis hirsutis, calycibus 13-15 mm longis hirsutis 4/5 lobatis lobis 10-12 mm longis lanceolatis, corollis 15-16 mm longis. Typus: Hawaii I., Puu Hualalai, H. St. John 11,377.

C. triplex sp. nov. Novellae puberulae sunt, foliis ternatis, petiolis 4-20 mm longis puberulis, laminis 3.2-9.7 \times 1.1-3.3 cm ellipticis acuminatis basi cuneata supra hirsutulis infra puberulis, cymis 3.5-5 cm longis 1-floriferis puberulis, pedicellis 15-25 mm longis, calycibus 14-15 mm longis puberulis lobis 12-13 mm longis oblanceolatis, corollis 17-18 mm longis pilosis. Typus: Molokai I., Kalae, C. N. Forbes 30.Mo.

C. ustulata sp. nov. Novellae pilosae sunt, foliis ternatis, petiolis 1.5-3.5 cm longis pilosis, laminis 8-13 \times 2.5-4 cm fusiformibus subacuminatis basi cuneata supra pilosis infra pilosulis, cymis 5 cm longis 2-floriferis pilosis, pedicellis 10-15 mm longis, calycibus 12-13 mm longis pilosulis lobis 8-9 mm longis lanceo-ovatis. Typus: Maui I., Wailaulau Gulch, A. C. Medeiros 234.

C. vestigii sp. nov. Novellae pilosae sunt, foliis 3-4-verticillatis, petiolis 2-3 cm longis pilosis, laminis 5-9 \times 1.2-3.5 cm ellipticis subacuminatis basi cuneata supra hirsutulis infra pilosulis nervis pilosis, cymis 2.5-3 cm longis 3-5-floriferis pilosis, pedicellis 2-8 mm longis, calycibus 11-12 mm longis 4/5 lobatis pilosulis lobis 9-10 mm longis oblanceolatis, corollis pilosulis. Typus: Molokai I., Mapulehu, H. St. John & F. R. Fosberg 12,903.

C. vulsa sp. nov. Novellae pilosae sunt, foliis ternatis, petiolis 3-6.5 cm longis pilosis, laminis 13-16 \times 4-8 cm coriaceis ellipticis subacuminatis basi cuneata supra midnervo pilosulo infra pilosulis, cymis 4-4.5 cm longis 3-5-floriferis pilosis, pedicellis 10-17 mm longis, calycibus 15-17 mm longis pilosis lobis 11-14 mm longis lanceolatis. Typus: Hawaii I., Palakea Forest, C. N. Forbes 996.H.

ADDENDUM

C. hanaulaensis sp. nov. Ramulae pilosulae sunt, foliis 3-4-verticillatis inaequalibus, petiolis 2.5-5 cm longis pilosulis, laminis 7-13.5 \times 1.9-3.5 cm oblanceolatis acutis basi cuneata decurrenti supra hirsutulis infra pilosis, cymis 5-7 cm longis 7-10-floriferis pilosulis, pedicellis 6-12 mm longis, calycibus 14-16 mm longis pilosulis lobis 10-12 mm longis ellipticis subacutis, corollis 23-25 mm longis pilosulis loba infera 10-11 \times 8-9 mm elliptica. Typus: Maui I., Hanaula, H. St. John 26,880.

DIAGNOSES OF CYRTANDRA SPECIES (GESNERIACEAE) SECTION
MICROCALYCES

HAWAIIAN PLANT STUDIES 155

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Section Microcalyces of Cyrtandra is a small one, containing 4 species and 1 variety on Oahu, and 1 species and 1 variety on Hawaii. To these eight species are here added.

The types of the following species are in the Bishop Museum, Honolulu, unless otherwise indicated.

Cyrtandra ataute sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 4-8 cm longis pilosis, laminis $7.5=11 \times 5-7$ cm coriaceis ellipticis basi cuneata et breve decurrenti apice acuminato supra intervallis pilosis et midnervo et nervis principalibus dense pilosis, cymis 1-floriferis pilosis, pedicellis 12-15 mm longis, calycibus 15 mm longis pilosis tubo 7 mm longo lobis lanceolatis subobtusis pilosis 2 lobis superis 7 mm longis 3 lobis inferis 8 mm longis, corollis 14 mm longis. Typus: Hawaii I., Stainback Hwy., Mary A. B. Lee 1.

Cyrtandra deltoidea sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 2.5-3.5 cm longis hirsutis, laminis $10.5-12.3 \times 4-5$ cm ellipticis apice acuminato basi cuneata infra nervis pilosulis, cymis 5 cm longis (1-) 5-floriferis pilosulis, pedicellis 7-17 mm longis, calycibus 14 mm longis pilosulis tubo 8-10 mm longo 5 lobis 5-6.5 mm longis subaequalibus deltoideis, corollis 30 mm longis. Typus: Hawaii I. Park Jct., M. R Crosby & W. R. Anderson 1,964.

Cyrtandra exilis sp. nov. Novellae pilosae sunt, foliis oppositis inaequalibus, petiolis 4-9 cm longis pilosis, laminis $8.5-13 \times 4-6.4$ cm ellipticis apice acuminato basi cuneata et breve decurrenti supra hirsutis infra hirsutulis nervis hirsutis, cymis 2-2.5 cm longis 1-floriferis pilosis, pedicellis 11 mm longis, calycibus 12-13 mm longis $\frac{1}{2}$ lobatis 5 lobis 5-6 mm longis lanceolatis subobtusis, corollis 16 mm longis puberulis tubo 12 mm longo 2 lobis superis 4 mm longis suborbicularibus, loba infera 5 mm longa semiorbiculari. Typus: Hawaii I., Kulani, H. St. John 25,337.

Cyrtandra hesperia sp. nov. Novellae hirsutae sunt, foliis oppositis inaequalibus, petiolis 2-5.5 cm longis hirsutulis, laminis $7-11 \times 2.5-4.6$ cm fusiformi-ellipticis varie oblanceolatis acuminatis basi cuneata hirsutulis infra hirsutulis, cymis 4-5 cm longis 2-3-floriferis

puberulis, pedicellis 10-14 mm longis, calycibus 15-18 mm longis puberulis, tubo 7-8 mm longo lobis lineari-lanceolatis eis superis 10-11 mm longis, corollis 19-21 mm longis puberulis. Typus: Hawaii I., Hookena, F. R. Warshauer 1,932,

Cyrtandra lalaensis sp. nov. Novellae villosae sunt, foliis oppositis, petiolis 2-11.5 cm longis villosis, laminis 7.5-26 X 4-15 cm ellipticis acuminatis basi cuneata supra hirsutis infra hirsutulis nervis hirsutis, cymis 6-8 cm longis 5-floriferis villosis, pedicellis 10-28 mm longis, calycibus 9-10 mm longis pilosulis. lobis 2.5-6.5 mm longis deltoideis ad lanceolatis, corollis 23 mm longis pilosulis. Typus: Hawaii I., Puu Lala, H. St. John et al. 22,503.

Cyrtandra simulata sp. nov. Novellae pilosae sunt, foliis oppositis inaequalibus, petiolis 5-9 cm longis, laminis 8-10.5 X 4.5-7 cm ellipticis acuminatis basi cuneata supra hirsutulis infra pilosis, cymis 3-floriferis hirsutulis, pedicellis 5-8 mm longis, calycibus 9-10 mm longis hirsutulis tubo 5 mm longo lobis 5 mm longis lanceolatis hirsutulis, corollis 12 mm longis hirsutulis. Typus: Hawaii I., Stainback Hwy., Mary A. B. Lee.

Cyrtandra triangularis sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 3-4 cm longis pilosis, laminis 9-11 X 7-7.3 cm subcoriaceis ellipticis acuminatis basi subcordata supra hirsutis infra pilosis, cymis 6 cm longis 3-floriferis pilosis, pedicellis 20 mm longis, calycibus 9 mm longis pilosis lobis 4 mm longis deltoid-eis subobtusis. Typus: Hawaii I., Laupahoehoe, W. Wong (HAW).

Cyrtandra waipioensis sp. nov. Novellae villosae sunt, foliis oppositis, petiolis 3-7 cm longis villosis, laminis 5-17 X 3.5-9.8 cm ellipticis acuminatis basi cuneata supra hirsutis infra pilosulis, cymis 5-8 cm longis 2-5-floriferis villosis, pedicellis 12-25 mm longis, calycibus 11-14 mm longis villosis lobis 4-5 mm longis lanceo-ovatis, corollis 13-16 mm longis villosis. Typus: Hawaii I., Waipio, Upper Hamakua Ditch Trail, H. St. John et al. 11,453.

DIAGNOSES OF CYRTANDRA SPECIES (GESNERIACEAE) SECTION
CROTONOCALYCES

HAWAIIAN PLANT STUDIES 156

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As recently known *Cyrtandra*, section *Crotonocalyces*, had 6 species on Kauai, 5 species and 7 varieties on Maui, 1 species on Lanai and 3 species and 5 varieties on Hawaii. To these there are here added 12 species each on Kauai, Maui, and Hawaii.

The types are in the Bishop Museum, Honolulu.

Cyrtandra acmule sp. nov. Folia opposita sunt, petiolis 2-4.5 cm longis pilosulis, laminis 8-12 \times 4-5.2 cm ellipticis subacuminatis basi cuneata supra pilosulis infra pilosulis, cymis 3.4-4.5 cm longis 3-floriferis pilosulis, pedicellis 4-17 mm longis, calycibus 7.5-8 mm longis pilosulis $\frac{3}{4}$ lobatis lobis 4.7-5 mm longis ovatis acutis. Typus: Maui I., W. H. Hatheway 457A.

Cyrtandra capitata sp. nov. Novellae sericeo-pilosae sunt, foliis oppositis inaequalibus, petiolis 10-22 mm longis sericeo-pilosulis, laminis 9.4-20.4 \times 4-7.2 cm ellipticis acuminatis parte $\frac{1}{6}$ basali anguste cuneata supra hirsutulis, cymis 4-4.5 cm longis 1-2-floriferis pilosulis, pedicellis 6-9 mm longis, calycibus 21-25 mm longis pilosulis lobis inferis 16 mm longis ovatis, corollis 33 mm longis pilosulis. Typus: Maui I., Transect 4, F. R. Warshauer 2,832.

Cyrtandra alaustri sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 1-4 mm longis pilosis, laminis 8-16 \times 4.8-8 cm ellipticis acuminatis basi subrotundata cuneata decurrenti supra hirsutulis, infra pilosulis, cymis 2.5-3 cm longis 1-floriferis pilosis, pedicellis 2 mm longis, calycibus 17-18 mm longis pilosis tubo 7-8 mm longo lobis 9-11 mm longis lanceolatis. Typus: Kauai I., Wainiha, B. C. Stone 1,489.

Cyrtandra conferta sp. nov. Novellae pilosulae sunt, foliis subcoriaceis inaequalibus, petiolis 15-30 mm longis pilosulis, laminis 4.3-11 \times 1.6-4.6 cm ellipticis subacuminatis basi cuneata infra nervis pilosulis, cymis 4-5 cm longis 4-5-floriferis pilosulis, pedicellis 8-14 mm longis, calycibus 11-12 mm longis pilosulis tubo 6-7 mm longo lobis lanceolatis eis inferis 7 mm longis, corollis 20-21 mm longis pilosulis loba infera 7 mm longa oblate elliptica. Typus: Hawaii I., Kiolaka'a, J. Davis 495.

Cyrtandra cordata sp. nov. Novellae villosae sunt, foliis oppositis, petiolis 3-9 cm longis villosis, laminis 6-11 X 5.5-9 cm subcoriaceis cordate suborbicularibus subacuminatis villosis, cymis 3-4.5 cm longis 3-7-floriferis villosis, pedicellis 5-10 mm longis, calycibus 8.5-12 mm longis villosis lobis 4.5-5 mm longis ovatis acutis, corollis 15 mm longis. Typus: Maui I., Puu Pani, C. N. Forbes 1,885.M.

Cyrtandra crinalis sp. nov. Novellae villosae sunt, petiolis 4-6 cm longis villosis, laminis 10-13 X 8-9.5 cm suborbicularibus acuminatis basi rotundata supra hirsutis infra pilosis nervis villosis, cymis 1.5-2.5 cm longis 5-floriferis villosis, pedicellis 1-2 mm longis, calycibus 13-15 mm longis pilosis tubo 5-6 mm longo lobis inferis 8-9 mm longis lanceolatis, corollis pilosulis. Typus: Maui I., Puu Kukui, P. K. Higashino 9,477.

Cyrtandra glabriflora sp. nov. Novellae pilosulae sunt, foliis oppositis inaequalibus, petiolis 1-2 cm longis pilosulis, laminis 12-17 X 4-6 cm ellipticis acuminatis basi cuneata decurrenti supra pilosis infra pilosulis, cymis 3.5-4 cm longis 1-3-floriferis pilosulis, pedicellis 11-12 mm longis, Calycibus 24-25 mm longis pilosulis tubo 11 mm longo lobis 12-13 mm longis ovate lanceolatis sed apice subulato, corollis 27 mm longis glabris. Typus: Kauai I., Hanakapiai, S. Perlman 475.

Cyrtandra glenwoodensis sp. nov. Novellae hirsutae sunt, foliis oppositis, petiolis 1.5-6.5 cm longis hirsutis, laminis 4-14 X 1.5-5.3 cm ellipticis acuminatis basi cuneata supra hirsutis infra hirsutulis, cymis 4-7 cm longis 3-5-floriferis hirsutulis, petiolis 1-2.5 cm longis, calycibus 12-13 mm longis hirsutis tubo 5 mm longo lobis 7-8 mm longis lanceolatis. Typus: Hawaii I., Kalanilehua, W. M. Giffard (Rock) 13,094.

Cyrtandra henanthe sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 2-7 cm longis pilosulis, laminis 6-17 X 4-11 cm ellipticis vel ovatis acuminatis basi cuneata et decurrenti supra hirsutis infra pilosulis, cymis 2-2.4 cm longis 1-floriferis pilosis, pedicellis 2 cm longis, calycibus 22 mm longis pilosis lobis 7 mm longis lanceolatis, corollis 22 mm longis. Typus: Kauai I., Wainiha, H. St. John & F. R. Fosberg 13,977.

Cyrtandra hiloensis sp. nov. Novellae hirsutae sunt, foliis oppositis, petiolis 6-8 mm longis hirsutis, laminis 12.7-18 X 7-10 cm membranaceis ellipticis acuminatis basi cuneata supra hirsutulis infra hirsutis, cymis 3-4 cm longis 3-5-floriferis hirsutis, pedicellis 7-12 mm longis, calycibus 13-14 mm longis hirsutis lobis 6-7 mm longis lanceolatis, corollis 16 mm longis pilosulis. Typus: Hawaii I., Hilo, L. H. MacDaniels 237.

Cyrtandra humifusa sp. nov. Novellae pilosae sunt, foliis oppositis inaequalibus, petiolis 10-32 mm longis pilosis, laminis 5-10 \times 2.8-5.6 cm ellipticis acutis basi cuneata supra hirsutulis infra pilosis sed nervis hirsutulis, cymis 2.5 cm longis 1-floriferis pilosis, pedicellis 7 mm longis, calycibus 13-15 mm longis pilosis $\frac{1}{2}$ lobatis lobis ovatis subacutis eis superis 6 mm longis illis inferis 8-9 mm longis, corollis 23-24 mm longis pilosis, loba infera 7 \times 9 mm oblate semiorbicularis. Typus: Maui I., Ukumehame, H. St. John et al. 25,741.

Cyrtandra imparifolia sp. nov. Novellae villosae sunt, foliis oppositis, petiolis 10-27 mm longis villosis, laminis 10.5-20.5 \times 4-6.6 cm oblanceolatis acuminatis basi cuneata et decurrenti supra pilosis infra pilosis sed nervis villosis, cymis 4-6 cm longis 2-3-floriferis villosis, pedicellis 16-22 mm longis, calycibus 12 mm longis villosis $\frac{2}{5}$ lobatis lobis 5-6 mm longis semiorbicularibus acutis, corollis 20-22 mm longis villosis loba infera 7 mm longa suborbiculari. Typus: Kauai I., Wainiha, C. & H. Christensen 263.

Cyrtandra imparis sp. nov. Novellae villosae sunt, foliis oppositis inaequalibus, petiolis 6-12 cm longis villosis, laminis 12-25 \times 8-15 cm ellipticis acuminatis basi cuneata supra villosis infra pilosis sed nervis villosis, cymis 6.5-8 cm longis 3-floriferis pilosis, pedicellis 20-23 mm longis, calycibus 7-7.5 mm longis $\frac{2}{3}$ lobatis pilosis, lobis 4.5-5 mm longis ovato-deltoides acuminatis. Typus: Maui I., Makamakaole Stream, W. H. Hatheway 457.

Cyrtandra ise sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 2-5.5 cm longis pilosulis, laminis 4.5-8 \times 2.8-5.9 cm ovatis acutis basi subcordata supra pilosulis infra glandulose pilosulis sed nervis pilosis, cymis 3-4 cm longis 5-floriferis pilosis, pedicellis 5-12 mm longis, calycibus 8-9 mm longis glandulose pilosis lobis 5 mm longis lanceolatis, corollis pilosulis. Typus: Maui I., Olowalu, C. M. Forbes 2,393.M.

Cyrtandra kaiholenaensis sp. nov. Novellae hirsutulae sunt, foliis oppositis subinaequalibus, petiolis 2.5-5.5 cm longis hirsutulis, laminis 8-13 \times 3.5-7.3 cm ellipticis acuminatis basi cuneata supra hirsutulis infra hirsutulis, cymis 5-6.5 cm longis 3-floriferis hirsutulis, pedicellis 18-20 mm longis, calycibus 9.5 mm longis hirsutulis lobis 4-5 mm longis lanceolatis, corollis 13 mm longis hirsutulis. Typus: Hawaii I., Kaiholena, J. D. Jacobi 684.

Cyrtandra limahuliensis sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 1.5-3.2 cm longis pilosis, laminis 10-13.5 \times 6.3-7.5 cm ellipticis vel ovatis acuminatis basi cuneata supra hirsutis infra pilosulis

nervis pilosis, cymis 2.5-3.2 cm longis 1-floriferis hirsutis, pedicellis 1 mm longis, calycibus 21-24 mm longis hirsutis lobis 7-12 mm longis lanceolatis, corollis 24-28 mm longis hirsutis, Typus: Kauai I., Limahuli, S. Perlman et al. 223.

Cyrtandra lumahaiensis sp. nov. Novellae piloulae sunt, foliis oppositis inaequalibus, petiolis 1.7-6 cm longis pilosulis, laminis $7.5-26 \times 5-14$ cm ellipticis acuminatis basi cuneata et decurrenti supra pilosulis infra puberulis, pedicellis 1-3 mm longis puberulis, calycibus 20 mm longis puberulis lobis 9 mm longis lanceolatis, corollis 26 mm longis puberulis. Typus: Kauai I, C. Christensen 204.

Cyrtandra makalehaensis sp. nov. Novellae villosae sunt, foliis oppositis inaequalibus, petiolis 22-28 mm longis villosis, laminis $14-23 \times 4.5-6.5$ cm subcoriaceis elliptici-lanceolatis acuminatis basi cuneata supra hirsutulis infra pilosis, cymis 2.5-4 cm longis 3-floriferis villosis, pedicellis 7-12 mm longis, calycibus 12-14 mm longis villosis lobis 5 mm longis semiorbicularibus, corollis 20 mm longis villosis. Typus: Kauai I., Makaleha, R. Hobdy 112.

Cyrtandra monadantha sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 15-30 mm longis pilosis, laminis $7-15 \times 5.3-6.8$ cm ellipticis acuminatis basi cuneata supra hirsutulis infra pilosulis sed nervis pilosis, cymis 22 mm longis 1-floriferis pilosis, pedicellis 3 mm longis, calycibus 16 mm longis pilosis $\frac{1}{2}$ lobatis lobis 9 mm longis oblanceolatis. Typus: Kauai I., Lumahai, C. Christensen 227.

Cyrtandra obmalaris sp. nov. Novellae pilosae sunt, foliis oppositis, laminis $28-32 \times 7.5-10.5$ cm subsessilibus oblanceolatis acuminatis basi subligulata supra pilosulis infra nervis pilosulis, cymis 6-7.5 cm longis 5-9-floriferis pilosulis, pedicellis 10-20 mm longis, calycibus 15-19 mm longis pilosulis $\frac{2}{3}$ lobatis lobis lanceolatis eis superis 6 mm longis illis inferis 10 mm longis, corollis 20 mm longis glabris. Typus: Maui I., in 1910, C. N. Forbes.

Cyrtandra ovatiloba sp. nov. Novellae villosae sunt, foliis oppositis, petiolis 5-8 cm longis villosis, laminis $11-11.5 \times 8-10$ cm ellipticis subacuminatis basi rotundata supra hirsutulis infra pilosis nervis villosis, cymis 9.5-11 cm longis 3-floriferis villosis, pedicellis 16-20 mm longis, calycibus 16-17 mm longis villosis lobis 6-7 mm longis ovatis, corollis 24 mm longis pilosulis. Typus: Maui I., Amalu, Haelaau, O. Selling & C. Skottsberg 2,730.

Cyrtandra paris sp. nov. Novellae hirsutae sunt, foliis oppositis, petiolis 3-4.5 cm longis hirsutis,

laminis 7.5-12.5 cm ellipticis acuminatis basi cuneata supra hirsutis infra nervis hirsutis, cymis 4-7 mm longis 3-5-floriferis hirsutis, pedicellis 17-23 mm longis, calycibus 16-19 mm longis hirsutis 5 lobis 7-9 mm longis lanceolatis. Typus: Hawaii I., Kapapala, C. N. Forbes 377, H.

Cyrtandra petila sp. nov. Novellae hirsutulae sunt, foliis oppositis inaequalibus, petiolis 4.5-11 cm longis hirsutulis, laminis 11-18 \times 7-10.5 cm ellipticis acuminatis basi cuneata supra hirsutulis infra pilosulis, cymis 6-7 cm longis 2-3-floriferis hirsutulis, pedicellis 17-27 mm longis, calycibus 17-18 mm longis pilosulis lobis 8-9 mm longis lanceolatis, corollis 19 mm longis pilosulis loba infera 4 \times 5.5 mm reniformi. Typus: Hawaii I., Transect 23, F. R. Warshauer 1,585.

Cyrtandra pilosula sp. nov. Novellae pilosulae sunt, foliis oppositis paulum inaequalibus, petiolis 1.2-3.5 cm longis pilosulis, laminis 5-9.7 \times 2.2-4.2 cm ellipticis suacuminatis basi cuneata supra midnervo pilosulo infra pilosulis, cymis 2-2.5 cm longis 3-floriferis pilosulis, pedicellis 8-12 mm longis, calycibus 11-12 mm longis pilosulis lobis 9 mm longis ovatis mucronatis, corollis 15 mm longis pilosulis. Typus: Hawaii I., Olaa Flume, C. N. Forbes 664, H.

Cyrtandra pluviola sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 6-10 cm longis pilosis, laminis 16.5-21 \times 10.5-15 cm ovatis acuminatis basi rotundata supra hirsutis infra pilosis, cymis 4-5 cm longis 1-4-floriferis pilosis, pedicellis 15-20 mm longis, calycibus 13 mm longis hirsutis lobis 8 mm longis lanceolatis, corollis 19 mm longis pilosis loba infera 6 \times 7 mm reniformi. Typus: Hawaii I., Transect 17, F. R. Warshauer 1,572.

Cyrtandra quiritis sp. nov. Novellae villosae sunt, foliis oppositis, petiolis 12-25 mm longis villosis, laminis 9.5-12 \times 2.2-3.2 cm coriaceis lanceolatis acutis basi cuneata supra hirsutis infra villosis, cymis 8-9 cm longis 2-floriferis villosis, pedicellis 25-35 mm longis, calycibus 12-13 mm longis villosis lobis 2-3 mm longis deltoideis. Typus: Kauai I., Wahiawa Mts., C. N. Forbes 223, K.

Cyrtandra runae sp. nov. Novellae pilosae sunt, foliis oppositis inaequalibus, petiolis 12-31 mm longis pilosis, laminis 7-12.5 \times 4-7 cm ellipticis acuminatis basi cuneata et decurrenti supra hirsutis infra pilosis, cymis 3 cm longis 1-floriferis pilosis, pedicellis 3 mm longis, calycibus 19 mm longis pilosis lobis 7-9 mm longis lanceolatis. Typus: Kauai I., Anahola, R. Hobdy 188.

Cyrtandra septemiflora sp. nov. Novellae pilosae sunt, foliis oppositis inaequalibus, petiolis 1.4-2.7 cm longis pilosis, laminis 11-30 \times 3.4-9 cm oblanceolatis acuminatis basi longe cuneata et decurrenti supra hirsutis infra pilosulis, cymis 7-8 cm longis 5-7-floriferis pilosis, pedicellis 2-3.5 cm longis, calycibus 13 mm longis pilosis lobis 4 mm longis deltoideo-ovatis, corollis 20 mm longis extra glabris. Typus: Kauai I., Kamilomilo, H. St. John et al. 23,128.

Cyrtandra spissa sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 1-5 cm longis pilosis, laminis 8-18.5 \times 5-9 cm ellipticis acuminatis basi cuneata et decurrenti supra hirsutis infra pilosulis, cymis 1.5-1.8 cm longis 1-floriferis pilosis, pedunculo et pedicello 1.5-4 mm longis, calycibus 25 mm longis hirsutis lobis 11-12 mm longis lanceolatis pilosis, corollis 22 mm longis glabris. Typus: Kauai I., C. Christensen 238.

Cyrtandra Stemmermannae sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 2.3-4 cm longis pilosulis, laminis 10.3-13 \times 4.4-6 cm subcoriaceis ellipticis acuminatis basi cuneatas supra pilosulis infra nervis pilosulis, cymis 3-7 cm longis 1-7-floriferis pilosulis, pedicellis 10-22 mm longis, calycibus 15-18 mm longis pilosulis, lobis inferis 7-8 mm longis lanceolatis, corollis 22-23 mm longis pilosulis loba infera 8 \times 7 mm ovata. Typus: Hawaii I., Transect 40, L. Stemmermann 3,804.

Cyrtandra subsolana sp. nov. Novellae subglabrae sunt, foliis oppositis inaequalibus, petiolis 1.5-4.5 cm longis in initio subhirsutulis, laminis 5.3-13.5 \times 2.3-6.1 cm ellipticis acuminatis basi cuneata supra midnervo hirsutulo infra nervis hirsutulis, cymis 4-4.5 cm longis 3-floriferis, pedicellis subhirsutulis, calycibus 15-20 mm longis hirsutulis lobis inferis 9-12 mm longis ovatis, corollis 24-25 mm longis hirsutis loba infera 7 mm diametro obbiculari. Typus: Maui I., Transect 6, F. R. Warshauer 2,611.

Cyrtandra sylvestris sp. nov. Novellae pilosae sunt, foliis oppositis inaequalibus, petiolis 1.5-6.5 cm longis pilosulis, laminis 3.5-17 \times 1.9-9.6 cm ellipticis acuminatis basi cuneata supra hirsutulis infra pilosulis, umbellis 6-7 cm longis, pedicellis 15-22 mm longis, calycibus 15-17 mm longis pilosulis lobis lanceolatis eis inferis 8-9 mm longis. Typus: Hawaii I., Wood Valley, F. R. Warshauer 1,781.

Cyrtandra trina sp. nov. Novellae pilosae sunt, foliis oppositis inaequalibus, petiolis 2.5-5 cm longis

pilosis, laminis 5.3-10.5 \times 2.5-4.7 cm ellipticis acuminatis basi cuneata supra et infra hirsutis, cymis 4-5 cm longis 3-floriferis hirsutis, pedicellis 8-13 mm longis, calycibus 10-11 mm longis hirsutis lobis 5-6 mm longis lanceolatis, corollis 15 mm longis hirsutulis. Typus: Hawaii I., Transect 67, F. R. Warshauer 2,023.

Cyrtandra ustulata sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 2.7-4 cm longis pilosis, laminis 8-9 \times 3.5-4.8 cm subcoriaceis ellipticis acuminatis basi subcordata supra et infra pilosulis, cymis 7 cm longis 5-floriferis pilosulis, pedicellis 13-17 mm longis, calycibus 19-20 mm longis pilosulis lobis inferis 9-10 mm longis ovato-deltoideis, corollis 27 mm longis pilosulis, Typus: Maui I., Transect 11, F. R. Warshauer 2,903.

Cyrtandra waiakeaensis sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 5-11.5 cm longis, laminis 7.5-14.5 \times 4.5-9 cm ellipticis acuminatis basi cuneata supra hirsutulis infra hirsutulis, cymis 3-6 cm longis 3-floriferis hirsutulis, pedicellis 17-22 mm longis, calycibus 11 mm longis hirsutulis lobis 5 mm longis lanceolatis, corollis 14 mm longis hirsutis. Typus: Hawaii I., Kulani, H. St. John 22,341,

Cyrtandra waiheae (Rock) comb. nov.

C. Pickeringii A. Gray, var. waiheae Rock, Am. Journ. Bot. 5: 276-277, 1918.

DIAGNOSES OF CYRTANDRA SPECIES (GESNERIACEAE)

SECTION SCHIZOCALYCES

HAWAIIAN PLANT STUDIES 157

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Bishop Museum, Box 19000A. Honolulu, Hawaii 96817, USA

As previously known the section Schizocalyces of Cyrtandra contained 5 species on Kauai, 33 species and 3 varieties on Oahu, 2 species and 1 variety on Molokai, 3 species and 5 varieties on Hawaii. To these are here added 41 species and 1 variety. The types are in the Bishop Museum, Honolulu, unless otherwise indicated.

C. ahome sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 3-9 cm longis pilosulis, laminis $9-18 \times 4.5-7$ cm ellipticis acuminatis basi cuneata supra hirsutulis infra nervis pilosulis, cymis 7.5-8 cm longis 3-floriferis pilosulis, pedicellis 20-30 mm longis, calycibus 16-17 mm longis pilosulis lobis 13-14 mm longis lanceolatis, corollis 20 mm longis pilosulis. Typus: Hawaii I., Transect 69, F. R. Warshauer 2,015.

C. albula sp. nov. Novellae puberulae sunt, foliis oppositis inaequalibus, petiolis 7-15 mm longis pilosis, laminis $3.2-10.5 \times 1.1-3.5$ cm ellipticis subacuminatis basi cuneata supra puberulis infra puberulis, cymis 3-5.5 cm longis 1-floriferis puberulis, pedicellis 15-20 mm longis, calycibus 20-22 mm longis 8/9 partitis lobis 15-20 mm longis lanceolatis obtusis puberulis, corollis 20 mm longis $\frac{1}{2}$ partitis loba infera 8×7 mm elliptica. Typus: Maui I, Honokohau Stream, H. St. John 21,358.

C. anxie sp. nov. Novellae puberulae sunt, foliis oppositis inaequalibus, petiolis 1-2.5 cm longis puberulis, laminis $4.5-10.5 \times 1.6-3.9$ cm fusiformibus acuminatis basi cuneata supra hirsutulis infra nervis puberulis, cymis 5-6 cm longis 2-floriferis puberulis, pedicellis 7-23 mm longis, calycibus 7-8 mm longis puberulis lobis ligulato-lanceolatis eis superis 5.5-6 mm longis, corollis 10 mm longis puberulis. Typus: Hawaii I., Puu Makaala, K. Nagata 1,884.

C. austrohiloensis sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 2-5 cm longis pilosis, laminis $5.7-10.1 \times 2.8-7$ cm ellipticis basi cuneata supra hirsutis infra pilosulis nervis pilosis, cymis 3-4 cm longis 3-floriferis pilosis, pedicellis 10-17 mm longis, calycibus 20 mm longis pilosis 4/5 partitis lobis 16 mm longis lanceolatis, corollis 20 mm longis pilosulis loba infera 6×5 mm suborbiculari. Typus: Hawaii I.,

Waiakea, Saddle Road, H. St. John et al. 22,396.

C. badia sp. nov. Novellae hirsutae sunt, foliis oppositis, petiolis 2.8-7 cm longis hirsutis, laminis 8-16 \times 3.5-6.2 cm ellipticis acuminatis basi cuneata supra hirsutulis infra hirsutulis, cymis 4.5 cm longis 1-floriferis hirsutis, pedicellis 14 mm longis, calycibus 16 mm longis lobis 13-14 mm longis ligulate oblanceolatis, corollis 15 mm longis pilosis. Typus: Hawaii I., Hawaii Natl. Park, G. O. Fagerlund & Mitchell 580.

C. biserrata sp. nov. Novellae hirsutae sunt, foliis oppositis, petiolis 15-43 mm longis hirsutis, laminis 7-15 \times 3-7.5 cm fusiformi-ellipticis acutis basi cuneata supra hirsutis infra pilosulis sed nervis pilosis, cymis 5-6 cm longis 1-2-floriferis pilosulis, pedicellis 18-20 mm longis, calycibus 18-21 mm longis lobis 15-18 mm longis lanceolatis, corollis 24 mm longis pilosulis loba infera 9 \times 12 mm reniformi. Typus: Molokai I., F. R. Warshauer 2,442.

C. brunnea sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 18-30 mm longis pilosulis, laminis 6.8-8.3 \times 2.7-5.9 cm oblanceolatis acuminatis basi cuneata supra subglabra infra pilosulis, cymis 4-6 cm longis 1-4-floriferis pilosulis, pedicellis 15-27 mm longis, calycibus 13-15 mm longis pilosulis lobis inferis 11 mm longis lanceolatis, corollis 18 mm longis puberulis. Typus: Hawaii I., Transect 29, F. R. Warshauer 1,660.

C. callaina sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 2-3.5 cm longis pilosulis, laminis 4.5-11 \times 1.6-4.5 cm ellipticis subacuminatis basi cuneata decurrenti supra hirsutulis infra pilosulis, cymis 3-4 cm longis 3-floriferis pilosulis, calycibus 12 mm longis pilosulis lobis 10-11 mm longis spatulatis, corollis 18 mm longis. Typus: Maui I., Kaea, C. N. Forbes 2,557 M.

C. carina sp. nov. Novellae pilosulae sunt, foliis oppositis inaequalibus, petiolis 20-42 mm longis pilosis, laminis 7.5-16.5 \times 4.5-7 cm ellipticis acuminatis basi cuneata supra hirtellis infra nervis pilosulis, cymis 5-7 cm longis 3-9-floriferis pilosis, pedicellis 18-30 mm longis, calycibus 12-14 mm longis pilosis lobis 7-8 mm longis lanceolatis, corollis 23 mm longis pilosulis loba infera 7 \times 8 mm suborbiculari. Typus: Hawaii I., Glenwood, E. Funk 201.

C. catenulata sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 2.5-4 cm longis pilosis, laminis 11-11.5 \times 3.2-3.6 cm subcoriaceis fusiformibus acuminatis basi cuneata infra pilosulis nervis pilosis, cymis 4-4.5 cm longis 1-3-floriferis pilosis, pedicellis 18-25 mm longis, calycibus 20-25 mm longis pilosis

lobis 15-18 mm longis lanceolatis, corollis 21 mm longis pilosulis. Typus: Hawaii I., Kulani, F. R. Warshauer 1,359.

C. chartacea sp. nov. Novellae pilosae sunt, foliis oppositis inaequalibus, petiolis 1-4 cm longis pilosis, laminis 6-12.5 \times 3-5.2 cm oblanceolatis acuminatis basi cuneata decurrenti supra hirsutulis infra pilosulis, cymis 3-4 cm longis 1-floriferis pilosis, pedicellis 7-14 mm longis, calycibus 15 mm longis pilosulis lobis 7 mm longis lanceolatis, corollis 21 mm longis pilosulis, loba infera 8 \times 7 mm elliptica. Typus: Kauai I., Wainiha, C. Christensen 264.

C. commensurata sp. nov. Novellae puberulae sunt, foliis oppositis, petiolis 8-18 mm longis puberulis, laminis 4-10.3 \times 1.6-3.8 cm subcoriaceis ellipticis acuminatis basi cuneata decurrenti supra hirsutulis infra puberulis, cymis 4-5 cm longis 3-floriferis puberulis, pedicellis 16-25 mm longis, calycibus 7 mm longis puberulis 6/7 partitis lobis 5-6 mm longis obcuneatis. Typus: Hawaii I., Laupahoehoe, W. Wong.

C. comosa sp. nov. Novellae pilosulae sunt, foliis oppositis inaequalibus, petiolis 2-6 cm longis pilosulis, laminis 12.5-19 \times 4.4-6.9 cm fusiformibus acuminatis basi cuneata hirsutulis, cymis 5 cm longis 3-floriferis hirsutulis, pedicellis 7-9 mm longis, calycibus 10 mm longis hirsutulis lobis 6 mm longis lineari-lanceolatis, corollis 14 mm longis hirsutulis. Typus: Hawaii I., Clarke 554.

C. crassichartacea sp. nov. Novellae villosae sunt, foliis oppositis, petiolis 5-8 cm longis villosis, laminis 8-10 \times 4.5-7.5 cm ellipticis acuminatis basi rotundata supra hirsutis infra pilosis sed nervis villosis, umbellis 9-9.5 cm longis 5-7-floriferis villosis, pedicellis 14-25 mm longis, calycibus 13-14 mm longis villosis 7/8 lobatis lobis 10-12 mm longis lanceolatis, corollis 12-14 mm longis pilosis. Typus: Hawaii I., Glenwood, O. Degener.

C. crebra sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 9-20 mm longis pilosulis, laminis 3-6 \times 1.5-3.2 cm ellipticis acuminatis basi cuneata supra hirsutis infra pilosis, cymis 2-2.5 cm longis 1-floriferis hirsutis, pedicellis 5-6 mm longis, calycibus 7 mm longis hirsutis lobis 3.5-4 mm longis lineari-lanceolatis, corollis 13 mm longis hirsutis. Hawaii I., 22 Mile Road, Olaa H. St. John et al. 18,489.

C. crispa sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 1.5-2.5 cm longis pilosulis, laminis 10-17 \times 5.5-7.3 cm ellipticis acuminatis basi cuneata decurrenti supra hirsutulis infra pilosulis nervis pilosis, cymis 5-6 cm longis 7-floriferis pilosulis, pedicellis 6-20 mm longis, calycibus 13 mm longis pilosulis 5/6 partitis lobis inferis 7-8 mm longis obcuneatis, corollis 20 mm longis puberulis. Typus: Hawaii I., Kohala Mts., Puu Laalaau, W. J. Hoe 1905.O. (HAW).

C. duploserrata sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 2.5-6.5 cm longis pilosis, laminis 13-14 \times 7-7.3 cm ellipticis acuminatis basi cuneata supra pilosis infra pilosis, cymis 5-6.5 cm longis 1-3-floriferis pilosis, pedicellis 14-30 mm longis, calycibus 17 mm longis pilosis lobis 15-17 mm longis oblanceolatis corollis 20 mm longis pilosulis loba infera 7 mm diametro suborbiculari. Typus: Hawaii I., Transect 28, F. R. Warshauer 1,641.

C. dytike sp. nov. Novellae puberulae sunt, foliis oppositis inaequalibus, petiolis 1.8-2.5 cm longis puberulis, laminis 5-15 \times 1.8-5.3 cm ellipticis acuminatis basi cuneata supra hirsutulis infra puberulis, cymis 5-7 cm longis 5-7-floriferis puberulis, pedicellis 7-16 mm longis, calycibus 14 mm longis puberulis lobis 12.5 mm longis lanceolatis, corollis 16 mm longis puberulis. Typus: Maui I., Makamaole Valley, K. Kepler 50.

C. echyros sp. nov. Ramulae hirsutae sunt, foliis oppositis inaequalibus, petiolis 5-7 cm longis hirsutis, laminis 18-21 \times 10-12 cm ellipticis acuminatis basi cuneata decurrenti infra pilosulis nervis pilosis, cymis 7-floriferis pilosis, pedicellis 5-27 mm longis, calycibus 22-32 mm longis pilosulis 6/7 partitis lobis inferis 13 mm longis lanceolatis, corollis 20 mm longis. Typus: Hawaii I., Hawaii Volcanoes Natl. Park, F. R. Warshauer 32.

C. elliptica sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 9.5-11 cm longis pilosis, laminis 14.5-17.5 \times 9.4-10 cm ellipticis subacuminatis basi cuneata supra pilosis infra pilosulis, sed nervis pilosis, cymis 9-11 cm longis 3-5-floriferis pilosis, pedicellis 14-20 mm longis, calycibus 18-20 mm longis pilosis lobis 15-17 mm longis lanceolatis, corollis 22 mm longis pilosis. Typus: Hawaii I., Mauna Loa, Transect 29, F. R. Warshauer 1,650.

C. epiphytica sp. nov. Novellae hirsutae sunt, foliis oppositis, petiolis 2-5.5 cm longis hirsutis, laminis 6-11 \times 3.3-6 cm ellipticis acuminatis basi cuneata supra hirsutulis infra pilosulis nervis hirsutulis, cymis 3-4.5 cm longis 1-2-floriferis hirsutis, pedicellis 10-20 mm longis, calycibus 17 mm longis hirsutis lobis lanceolatis eis superis 11 mm longis, corollis 21 mm longis pilosulis. Typus: Hawaii I., Transect 26, F. R. Warshauer 1,613.

C. ferripilosa sp. nov. Novellae pilosulae sunt, foliis oppositis inaequalibus, petiolis 1.5-4 cm longis pilosulis, laminis 6.8-19.7 \times 1.7-7.7 cm subcoriaceis elliptico-oblanceolatis subacuminatis basi cuneata hirsutulis, cymis 3-9 cm longis 1-6-floriferis pilosulis, pedicellis 13-25 mm longis,

calycibus 21-22 mm longis pilosulis, lobis 15-16 mm longis lanceolatis, corollis 25 mm longis pilosis. Typus: Maui I., Transect 18, F. R. Warshauer 3,100.

C. fissa sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 2-4 mm longis pilosis, laminis 10-13.5 \times 5.5-7 cm subcoriaceis oblanceolatis ad ellipticis acuminatis basi cuneata decurrenti supra hirsutis infra pilosulis, cymis 4-4.5 cm longis 1-3-floriferis pilosis, pedicellis 10-14 mm longis, calycibus 16-18 mm longis pilosis 5/6 lobatis lobis 12-15 mm longis ellipticis. Typus: Kauai I., Kalalau, H. St. John 26,043.

C. fruticosa sp. nov. Novellae pilosulae sunt, foliis oppositis inaequalibus, petiolis 3.5-10 cm longis pilosulis, laminis 6-16.5 \times 2.5-8 cm. ellipticis acuminatis basi cuneata supra hirsutulis infra hirsutulis, cymis 3-4 cm longis 3-floriferis pilosulis, pedicellis 12-14 mm longis, calycibus 12-13 mm longis pilosulis lobis lineari-lanceolatis eis inferis 9 mm longis, corollis 18 mm longis pilosulis loba infera 6 \times 7 mm suborbiculari. Typus: Hawaii I., Malama-Ki Forest Res.

G. Clarke 561.

C. Heinrichii sp. nov.

C. oenobarba H. Mann, var. *obovata* Wawra, Flora 55: 563, 1872, non *C. obovata* Gillett (1973).

C. confertiflora (Wawra) C. B. Clarke, var. *obovata* (Wawra) C. B. Clarke in DC., Monogr. Phanerog. 5: 236, 1883.

C. iaoensis sp. nov. Ramulae pilosulae sunt, foliis oppositis inaequalibus, petiolis 8-32 mm longis pilosulis, laminis 3.5-8.3 \times 1.5-3.2 cm ellipticis subacuminatis basi cuneata supra hirsutulis infra puberulis, cymis 8-9 cm longis 3-floriferis puberulis, pedicellis 13-25 mm longis, calycibus 17-18 mm longis lobis 16-17 mm longis ellipticis subacuminatis, corollis 23 mm longis pilosulis loba infera 9 \times 9 mm orbiculari. Typus: Maui I., Iao, R. Hobdy 912.

C. infraglabra sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 2.5-5.5 cm longis pilosulis, laminis 7-17 \times 3-7 cm ellipticis acuminatis basi cuneata supra et infra pilosulis, cymis 2.5-4.5 cm longis 3-floriferis pilosulis, pedicellis 11-15 mm longis, calycibus 12 mm longis pilosulis 3/4 lobatis lobis 9-10 mm longis deltoideis, corollis 16-18 mm longis pilosulis loba infera 5 mm diametro suborbiculari. Typus: Hawaii I., Waiakea, H. St. John et al. 22,358.

C. keanaeensis sp. nov. Novellae puberulae sunt, foliis oppositis inaequalibus, petiolis 7-23 mm longis puberulis, laminis 3-9.5 \times 2-3.8 cm coriaceis ellipticis subacuminatis basi cuneata supra hirsutulis infra pilosulis, cymis 4 cm longis 3-5-floriferis puberulis, pedicellis

7-13 mm longis, calycibus 10-12 mm longis pilosulis labia supera 9-10 mm longa lobis ellipticis, corollis pilosulis. Typus: Maui I., P. K. Higashino 9,114.

C. kukuensis sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 3-4 cm longis pilosis, laminis $14.5-15.5 \times 4.6-6$ cm ellipticis acuminatis basi cuneata decurrenti pilosulis, cymis 4-5 cm longis 1-3-floriferis pilosis, pedicellis 10 mm longis, calycibus 18-20 mm longis pilosis 7/8 partitis lobis 16-18 mm longis lanceolatis obtusis, corollis 28 mm longis pilosis. Typus: Maui I., Mauna Kukui, J. F. Rock 8,172.

C. kamooolaensis sp. nov. Ramulae pilosulae sunt, foliis oppositis, petiolis 1-4.5 cm longis pilosulis, laminis $9-15 \times 4-8$ cm ellipticis acuminatis basi cuneata supra et infra puberulis, cymis 4-5 cm longis 1-floriferis pilosulis, pedicellis 8-15 mm longis, calycibus 23-28 mm longis pilosulis lobis 21-25 mm longis oblanceolatis, corollis 25-27 mm longis pilosulis. Typus: Kauai I., Kamooola Stream, C. Christensen 70.

C. lysiosepapa (A. Gray) C. B. Clarke, var. *Ewartii* var. nov. Novellae puberulae sunt, foliis oppositis, petiolis 5-17 mm longis, laminis $2.4-8.5 \times 1.2-3.8$ cm ellipticis subacuminatis supra pilosulis infra puberulis nervis pilosulis, cymis 4-6.5 cm longis 1-floriferis puberulis, pedicellis 20-25 mm longis, calycibus 15-16 mm longis 7/8 partitis puberulis lobis 13-14 mm longis lanceolatis. Typus: Maui I., Haelaau, G. R. Ewart III & G. C. Munro 39.

C. macilenta sp. nov. Novellae pilosulae sunt, foliis oppositis inaequalibus, petiolis 2-4.5 cm longis pilosulis, laminis $5.5-18 \times 2.2-8$ cm lanceolatis acuminatis basi cuneata decurrenti pilosulis, cymis 2.7-4.5 cm longis 1-floriferis pilosulis, pedicellis 7-22 mm longis, calycibus 15-16 mm longis pilosulis lobis 14-22 mm longis, corollis 24 mm longis pilosulis loba infera 9×7 mm ovata. Typus: Kauai I., Hanakoa, H. St. John et al. 23,199.

C. malina sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 2-5 cm longis pilosulis, laminis $10-11 \times 4-6$ cm lanceolatis acuminatis basi cuneata, cymis 5-7 cm longis 3-7-floriferis pilosulis, pedicellis 9-20 mm longis, calycibus 11-12 mm longis pilosulis 7/8 lobatis lobis 9-10 mm longis spathulatis, corollis 15-16 mm longis. Typus: Maui I., Kaupo Gap, W. Gagne & S. Montgomery 604.

C. molokaiensis sp. nov. Novellae pilosulae sunt, foliis oppositis inaequalibus, petiolis 2-6 cm longis pilosulis, laminis $6-17.5 \times 3.5-7.2$ cm ellipticis

acuminatis basi cuneata decurrenti supra pilosulis infra puberulis nervis pilosulis, cymis 4-5 cm longis pilosulis, pedicellis 0.5-2 mm longis, calycibus 18-22 mm longis puberulis lobis 16-20 mm longis lanceolatis, corollis 19 mm longis puberulis. Typus: Molokai I., Lelemako Gulch, S. Perlman 503.

C. nanawaleensis sp. nov. Novellae hirsutulae sunt, foliis oppositis, petiolis 2-5 mm longis hirsutulis, laminis 4-15 X 2-5.2 cm ellipticis acutis basi cuneata hirsutulis, cymis 2 cm longis 3-floriferis hirsutulis, pedicellis 5-8 mm longis, calycibus 7 mm longis hirsutulis lobis 4-5 mm longis lanceolatis subobtusis, corollis 13 mm longis hirsutulis. Typus: Hawaii I., Nanawale Forest Res., L. K. Cuddihy 790053.

C. nuda sp. nov. Frutex ramosus est, petiolis 18 mm longis pilosulis, laminis 19.5-20 X 6.4-7.8 cm ellipticis acuminatis quarto basali deminuenti et cuneata supra midnervo hirsutulo infra nervis pilosulis, cymis 4 cm longis 3-floriferis pilosulis, pedicellis 4-10 mm longis, calycibus 23-25 mm longis pilosulis lobis 16 mm longis lanceolatis, corollis pilosulis. Typus: Maui I., Transect 4, F. R. Warshauer 2,836.

C. obliqua sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 3-7 cm longis pilosis, laminis 14-17.5 X 6.5-8.5 cm ellipticis acuminatis basi cuneata supra hirsutis infra pilosulis nervis hirsutulis, cymis 7-9 cm longis 3-floriferis pilosis, pedicellis 13-30 mm longis, calycibus 16-18 mm longis pilosis lobis 12-16 mm longis lanceolatis, corollis 15 mm longis pilosis. Typus: Maui I., Puu Kukui, G. R. Ewart III 136.

C. occidentis sp. nov. Novellae pilosulae sunt, foliis oppositis inaequalibus, petiolis 2-3 cm longis pilosulis, laminis 3.5-7.5 X 1.2-3 cm ellipticis acutis basi cuneata supra pilosulis infra pilosulis, cymis 6-7 cm longis 3-floriferis pilosulis, pedicellis 15-20 mm longis, calycibus 11-13.5 mm longis pilosulis 11/12 lobatis lobis 8.5-13 mm longis ellipticis acutis, corollis 15 mm longis pilosulis. Typus: Maui I., Waihee, H. Wawra 1,820a (W).

C. oblonga sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 1-2.2 cm longis pilosulis, laminis 7-16 X 3.8-7.6 cm ellipticis acuminatis basi cuneata supra hirsutulis infra pilosis, cymis 4-5 cm longis 3-5-floriferis pilosulis, pedicellis 12-20 mm longis, calycibus 11-13 mm longis pilosulis lobis 9-11 mm longis ellipticis subacutis, corollis 17 mm longis pilosis. Typus: Maui I., Makawao, W. Hillebrand & J. M. Lydgate (specimine ad dextram).

C. olowaluensis sp. nov. Novellae puberulae sunt, foliis oppositis inaequalibus, petiolis 7-25 mm

longis puberulis, laminis 8-13 \times 3-3.8 cm ellipticis acuminatis basi cuneata decurrenti supra hirsutulis infra puberulis, cymis 5.5-6 cm longis 3-floriferis puberulis, pedicellis 15-18 mm longis, calycibus 12-13 mm longis puberulis lobis 11-12 mm longis spathulatis, corollis 15 mm longis pilosulis. Typus: Maui I., Olowalu, C. N. Forbes 2,432.M.

C. pololuensis sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 2.5-4 cm longis pilosulis, laminis 11-16 \times 3.5-9 cm ellipticis acuminatis basi cuneata supra hirsutulis infra pilosis, cymis 2-3 cm longis 1-floriferis pilosulis, pedicellis 7-10 mm longis, calycibus 10-11 mm longis pilosulis 5/6 partitis lobis 8-9 mm longis lanceolatis, corollis 10 mm longis pilosulis. Typus: Hawaii I., Pololu, O. Degener & A. Greenwell 21,895.

C. prasina sp. nov. Novellae hirsutulae sunt, foliis oppositis, petiolis 1.5-6.5 cm longis hirsutis, laminis 4-14 \times 1.5-5.3 cm ellipticis acuminatis basi cuneata supra hirsutis infra hirsutulis, cymis 4-7 cm longis 3-5-floriferis hirsutulis, pedicellis 10-25 mm longis, calycibus 12-13 mm longis hirsutis lobis 7-8 mm longis lanceolatis. Typus: Hawaii I., Giffard 13,094.

C. pustulata sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 15-17 mm longis pilosulis, laminis 8-11.5 \times 3.5-6 cm ellipticis acutis basi cuneata supra hirsutis infra pilosis, cymis 4 cm longis 1-floriferis pilosulis, pedicellis 12-18 mm longis, calycibus 12-13 mm longis pilosulis lobis 8-9 mm longis lanceolatis corollis 22 mm longis pilosulis. Typus: Molokai I. P. K. Higashino 9,400.

C. ralla sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 6-7.5 cm longis pilosulis, laminis 15-18 \times 6-7.8 cm coriaceis ellipticis subacuminatis basi cuneata supra pilosulis infra pilosulis, calycibus 18-19 mm longis pilosulis lobis inferis 13-14 mm longis lanceolatis, corollis 28 mm longis pilosulis loba infera 7.5 mm diametro suborbiculari. Typus: Hawaii I., Transect 30, F. R. Warshauer 1,236.

C. recurrens sp. nov. novellae villosae sunt, foliis oppositis, petiolis 4-8 cm longis villosis, laminis 11.5-16 \times 6.5-8.4 cm ellipticis acuminatis basi cuneata decurrenti supra hirsutulis infra pilosulis nervis villosis, cymis 5-6 cm longis 3-5-floriferis villosis, pedicellis 10-15 mm longis, calycibus 16-19 mm longis villosis lobis 9-12 mm longis lanceolatis, corollis 15 mm longis villosis. Typus: Hawaii I., Kalanilehua, Olaa, W. M. Giffard.

C. rudiculata sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 1.5-2.5 cm longis pilosis, laminis 15-18 X 4.2-5.7 cm oblanceolatis sed quarto basali cuneato midnervo infra piloso, cymis 3.5 cm longis 3-floriferis pilosis, pedicellis 8 mm longis, calycibus 16 mm longis pilosis lobis 13-14 mm longis lanceolatis, corollis 13 mm longis pilosulis. Typus: Hawaii I., Kohala Forest Res., O. Degener 30,369.

C. subcoriacea sp. nov. Novellae pilosae sunt, foliis oppositis, petiolis 4.5-5 cm longis pilosis, laminis 8-13.5 X 5.5-8 cm subcoriaceis ellipticis acuminatis basi cuneata decurrenti supra hirsutis infra pilosis nervis villosis, cymis 6-9 cm longis 3-floriferis pilosis, pedicellis 12-25 mm longis, calycibus 13-15 mm longis pilosis lobis 8-9 mm longis ovatis acutis, corollis 22 mm longis pilosis. Typus: Maui I., Kapilau Ridge, L. E. Bishop et al. 047117 (HAW).

C. trite sp. nov. Novellae puberulae sunt, foliis oppositis, petiolis 2.5-5 cm longis puberulis, laminis 12-16 X 4.5-7 cm ellipticis acuminatis basi cuneata supra hirsutulis infra glaucis hirsutulis, cymis 8-10 cm longis 3-5-floriferis puberulis, pedicellis 20-25 mm longis, calycibus 10-11 mm longis puberulis lobis superis 7-8 mm longis lanceolatis, corollis 14-14.5 mm longis puberulis loba infera 3.5 X 4 mm semiorbiculari. Typus: Hawaii I. Laupahoehoe, L. W. Cuddihy 742.

C. umbelliflora sp. nov. Novellae villosae sunt, foliis oppositis, petiolis 3-4 cm longis villosis, laminis 10.5-13 X 5.5-6.5 cm ellipticis acuminatis basi cuneata supra hirsutis infra villosis, umbellis 7-floriferis, pedunculo 5.8 cm longo, pedicellis 22 mm longis, calycibus 13-15 mm longis hirsutulis lobis inferis 11-13 mm longis ligulatis. Typus: Maui I., Makawao, W. Hillebrand & J. M. Lydgate, (specimene ad sinistram).

C. vespertalis sp. nov.

C. triflora Gaud., β forma robusta Wawra, Flora 55: 563, 1872 (p. 17 in reprint), non *C. robusta* Kraenzl. (1927).

Expanded diagnosis: Branchlets pilosulous; leaves opposite; petioles 3-5 cm long, pilosulous; blades 8-17 X 3.2-6.5 cm, elliptic, acuminate, cuneate at base, above catenulate hirsutulous, below puberulous, but the veins hirsutulous; cymes 8-15 cm long, 3-11-flowered, pilosulous; pedicels 25-40 mm long; calyx 11-13 mm long, pilosulous, the lobes 5-11 mm long, elliptic; Holotype: Maui I., Waihee, H. Wawra 1,820b (W).

ADDENDUM (sect. Chaetocalyces).

C. anatolike sp. nov. Novellae pilosulae sunt, foliis oppositis, petiolis 1-3 cm longis pilosulis, laminis 4-8.5 X 2-3.5 cm ellipticis acuminatis supra hirsutulis infra pilosulis, cymis 2.5-4 cm longis 1-floriferis pilosulis, pedicellis 12-20 mm longi, calycibus 17 mm longis pilosulis lobis 11-14 mm longis ligulatis subacutis, corollis 17-18 mm longis pilosulis. Typus: Maui I., USFWS Base Camp Ridge, F. R. Warshauer 2,536.

BOOK REVIEWS

Alma L. Moldenke

"A FUNCTIONAL BIOLOGY OF CROP PLANTS" by Vincent P. Gutschick, x + 230 pp., 26 black/white figures and 3 tables. Timber Press, Portland 97225. 1987. \$39.95.

This functional biological approach "generates with scientific rigor many fruitful and testable hypotheses of wide import that are not readily developed by approaches lacking a systems orientation". The text is planned for upper level or advanced agriculture students and is organized under the following topics: 1. functional biology and plant strategies with routes to crop improvement; 2. mineral nutrition and agricultural consequences; 3. photosynthesis and the costs and benefits of adaptive responses; 4. water relations and costs and benefits of adaptations; and 5. integrative processes for long-term coordination of all resource uses. This study will surely prove to be important and therefore needed.

"IKEBANA SOGETSU" by Harold Teshigahara, 40 pp., 20 colored plates + 1 black/white photo and 40 black/white drawings. Charles E. Tuttle Co., Rutland, Vermont 05701-0410. 1986. \$5.95 paper.

The color plates are so well printed that they add to the quality and beauty of the ikebana presented. This Sogetsu school is a modern style one, emphasizing "that ikebana can be practiced at any time, in any place, by anybody and with whatever material available...To create this beauty which does not exist in a natural state is ikebana." The descriptions of and arrangement suggestions for these impressive color plates are given in both English and Japanese. They are printed on the backs of the arrangements. It would have saved much distracting page flipping if they were printed on the left and adjacent page.

"THE HISTORY OF IKEBANA" by Kudo Masanobu, 64 pp., 58 color photo. Charles E. Tuttle Company, Rutland, Vermont 05701-0410. 1986. \$14.95 paperbound.

This is a delightful book just to look at. This is an interesting book to read about the story of the development of this art form which reaches "back into that universal animism of primitive beliefs" and why only in Japan "it evolved into this sophisticated national art". The many color photographs are printed beautifully and are "designed so that evolution of ikebana styles can be clearly followed pictorially". As a summary, there is appended a 3-page "Chronological Table of History of Ikebana". This publication was made with the desire that through it, "those many people from foreign countries who love ikebana can come to understand it better".

"DINOSAURS PAST AND PRESENT Volume I" edited by Sylvia J. Czerkas and Everett C. Olson, xvii + 63 pp., 55 color full and double plates, 60 black/white illustrations and 6 figures. University of Washington Press, P. O. Box 50096, Seattle, Washington 98145-5096. 1987. \$35.00.

This fascinatingly different interpretation of dinosaur life styles as interpreted by today's paleontologists in this text and in its new beautifully printed murals comes from an exhibition and symposium organized by the Natural History Museum of Los Angeles County. There are six papers on such topics as the dancing dinosaurs, the tiny dinosaurs, the importance of reconstruction of dinosaur trackways and the scientific approach to considering dinosaurs as living, active creatures. Volume II is to appear in the coming spring with more papers and reconstruction art from the same symposium.

"THE PHAREAE AND STREPTOGYNEAE (POACEAE) OF SRI LANKA: A Morphological-Anatomical Study" by Thomas R. Soderstrom, Roger P. Ellis & Emmet J. Judziewicz, Smithsonian Contributions to Botany no. 65, iv + 27 pp., 8 black/white figures with 3 plates + 5 multi-tissue photos, Smithsonian Institution Press, Washington, D. C. 20560. 1987.

The senior author, recently deceased, had the fortunate opportunity to have worked with the wonderful personage and agrostologist, Agnes Chase, and had throughout his professional life produced much valuable research. In this study with two confreres these herbaceous bamboos are carefully diagnosed and effectively illustrated. They occupy the easternmost limit of their range. They are animal-dispersed rain forest grasses often found together.

A KEY TO ARBOREAL SPIDERS OF DOUGLAS-FIR AND TRUE FIR FORESTS OF THE PACIFIC NORTHWEST" by Andrew R. Moldenke, Becky L. Fichter, William P. Stephen and Charles E. Griswold. ii + 48 pp., 96 color photos, 24 black/white figures + 1 table. U.S. Department of Agriculture, Pacific Northwest Research Station, P. O. Box 3890, Portland, OR 97208. 1987. paperbound.

"This illustrated key for identifying spiders inhabiting true fir and Douglas-fir is based on extensive collections from throughout the three North American Pacific Coast States." It "is written for people unfamiliar as well as familiar with spider taxonomy; a glossary of all technical terms is included." It is interesting to note that these arboreal spiders, devourers of the larval Douglas-fir tussock moth, *Orgyia pseudotsugata*, are among some 30 most abundant and widespread species in the crowns of *Pseudotsuga menziesii* and *Abies* spp. Botanists doing ecological and forestry studies in the Pacific Northwest, ecologists and the insect and arachnid people will surely appreciate having colored photographs, descriptions and accesible keys to these creatures.

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