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A NEW SPECIES OF, AND OBSERVATIONS ON, THE GENUS SMALLANTHUS (ASTERACEAE - HELIANTHEAE)

B.L. TURNER

Department of Botany, Univ. of Texas, Austin, TX 78713, U.S.A.

The well-known genus Polymnia L. was treated by Wells (1965) as comprised of 19 species, most of which were confined to Mexico, Central and South America. Robinson (1978), following the suggestions of earlier workers, redefined the genus, restricting Polymnia to but 2 species endemic to the eastern U.S.A. and adjacent Canada; the remainder of the species were positioned in Smallanthus Mackenzie. Indeed, Robinson (1981) was so certain of the phyletic distance between the two taxa that he erected the monotypic subtribe Polymniinae to house Polymnia, positioning Smallanthus in the subtribe Melampodiinae. While I cannot subscribe to his subtribal views, careful examination of the characters emphasized by Robinson, and comparison of these with yet other characters of related genera, strongly suggests that 2 genera are envolved. At least they are as distinct from each other as are the genera Trigonospermum (base chromosome number, x = 15) and Sigesbeckea (x = 15), and it might be that Polymnia stands as close to the latter two genera as it does to Smallanthus (x = 16 or 8?), the latter of which appears as close to Rumfordia (x = 24 or 8?) is it does to Polymnia.

In any case, we will treat Smallanthus as a good genus in our forthcoming treatment of the Asteraceae of Mexico (Turner & Nesom, in prep.). In the present study of Smallanthus I have had occasion to consider the relationship of S. uvedalius of the southeastern U.S.A. (Wells, 1965) to that of S. maculatus, which has heretofore been treated as a distinct species of Mexico and Central America. After examination of numerous specimens throughout the range of both taxa, I conclude that there are no characters, or combination of characters, that will adequately separate them. Wells used achene size to distinguish between these (achenes greater than 5 mm long and 4 mm wide in S. uvedalius, versus less that 5 mm long and 4 mm wide in S. maculatus). But achene size is a very inconstant character and varies throughout the range of the putative species. In fact, while both Blake (1917) and Wells (1965) recognized several varieties under these two species. I cannot recognize but a single variable species, as shown in Fig 1. This conclusion is nicely affirmed by Wells who comments upon the presence of 3 varieties of Smallanthus uvedalius on the island of Bermuda, all apparantly derived from a single introduction from the mainland sometimes between 1883-1905. He states, "Thus the presence of three varieties there probably must be explained by mutation or segregation in the island". Clearly the morphological expressions of this species are easily shifted, given novel conditions. In my opinion, the submergence of the names concerned is long overdue.

Among the specimens of Smallanthus annotated by Wells as Polymnia maculata, I have been able to segregrate a number of sheets from Chiapas, Mexico, which I think constitute an undescribed species of Smallanthus which I describe here.

SMALLANTHUS OBSCURUS B. Turner, sp. nov.

Smallanthus uvedalius (L.) Mackinzie simile sed foliis profunde trilobis, caulibus dense glanduloso-pubescentibus non maculosis, et involucri bracteis externis ovatis superficiebus abaxialibus grosse pubescentibus aliquando glandiferis differt.

Robust perennial herbs 1-2 m high; stems reddish or brownish, densely glandular-pubescent, a few longer non-glandular trichomes often interspersed; leaves mostly 12-20 cm long, 8-16 cm wide; petioles 4-10 cm long, winged throughout, auriculate at the base; blades deeply 3-lobed, the venation palmate, usually coarsely reticulate-beneath and moderately to densely pubescent, rarely not, the surface atomiferous glandular; heads radiate, 2-10, in loose terminal cymules; involucres mostly 10-14 mm high, the outer bracts ovate, either roughly hispid-pubescent or with glandular-trichomes, or both, on the abaxially faces, the inner bracts somewhat smaller but pubescent like the outer; ray florets mostly 8-11, the ligules yellow, 8-12 mm long; disk florets numerous, the corollas yellow with pubescent lobes; achenes broadly obovate in outline, 4-5 mm high, 3-4 mm wide.

TYPE: MEXICO. OAXACA: Mcpio. San Cristobal Las Casas, along road to Chanal, 16-20 km E of Chilil, 2380 m, 10 Nov 1976, D.F. Breedlove 42387 (holotype TEX; isotype CAS).

ADDITIONAL SPECIMENS EXAMINED: OAXACA. Mcpio. Amatenango del Valle: "grassy floor at Amatenango del Valle", 5800 ft, 7 Jul 1966, Breedlove 14427 (LL, NY); "in the sitios of Amatenango del Valle", 5900 ft, 27 Jul 1966, Breedlove 14658 (NY); S of center of Amatenango del Valle, 5900 ft, 5 Sep 1966, Ton 1072; Amatenago del Valle, 5800 ft, 26 Sep 1966, Ton 1232. San Cristobal Las Casas: SW slope of Muk'ta vits, 2480 m, 7 Nov 1976, Breedlove 41298 (LL); NE edge of San Cristobal Las Casas, 2250 m, 20 Sep 1981, Breedlove 52950 (NY, TEX); 4-7 W of San Cristobal, 2100 m, 16 Oct 1980, Breedlove & Strother 46340, 46353. Mcpio. Huistan: "steep slope with Pinus and Quercus below Huistan, 2133 m, 30 Aug 1981, Breedlove 52464. Mcpio. Ixtapa: along the trail from Zinacantan Center to Ixtapa, 4000 ft, 17 Jun 1966, Laughlin 1099 (NY). Mcpio. Pueblo Nuevo Solistahuacan: 3 km NW of Pueblo Nuevo Solistahuacan, 5800 ft, 5 Aug 1970, Mill 259 (TEX). Mcpio. San Andres Larrainzar: near summit of Chuchil Ton, NE of Bochil, 2700 m, 17 Oct 1972, Breedlove 29299 (TEX). Mcpio. Teopisca: S edge of Teopisca, 5900 ft, 13 Oct 1965, Breedlove & Raven 13091 (LL, NY); 5 km SW of Teopisca, 1750 m, 27 Nov 1976, Breedlove 41859 (LL).

This taxon is distinguished by its deeply 3-lobed leaves, glandular-pubescent stems, ovate outer involucral bracts which are glandular-pubescent or coarsely hispidulous, or both, on the abaxial surfaces, and 8-11 ray florets with yellow ligules. It seemingly combines features of both Smallanthus oaxacanus and S. uvedalius and is perhaps an ancestral hybrid derivitive of these two species. I do not believe these to be, in situ, newly spawned hybrids since S. obscurus has not been collected at any one site with any of their putative parents, nor does there appear to be anything but fertile achenes on S. obscurus. As shown in Fig. 1, however, the latter taxon is known to occur in a region where both S. oaxacanus and S. uvedalius occurs and it is possible that what I have described here as new is, in fact, a remarkable series of rather uniform hybrids between these, neither parent of which was collected at the site concerned by the collectors cited. Indeed, one of the collections cited above (Breedlove 29299) appears to approach S. uvedalius in characters of the involucre and this might prove to be a hybrid derivitive of S. uvedalius x S. obscurus. This might also be true for Breedlove & Strother 46353, which appears to approach S. uvedalius in characters of the involucre but this is only an approach; Breedlove & Strother 46340, collected at the same site, is typical S. obscurus. Apparantly S. maculatus was not colleted at this locality by the collectors concerned.

ACKNOWLEDGEMENTS

I am grateful to the following herbaria for the loan of specimens: (F, GH, MO, NY, LL, TEX). The Latin diagnosis was rendered by Guy Nesom.

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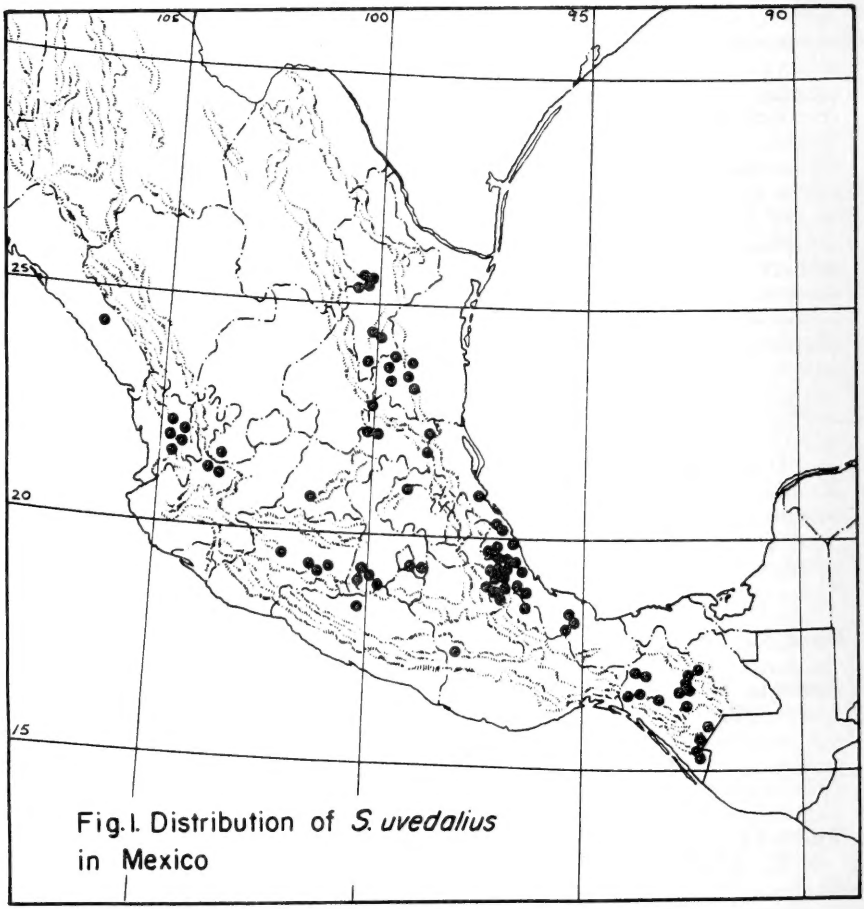

Fig. 1. Distribution of *S. uvedalius* in Mexico

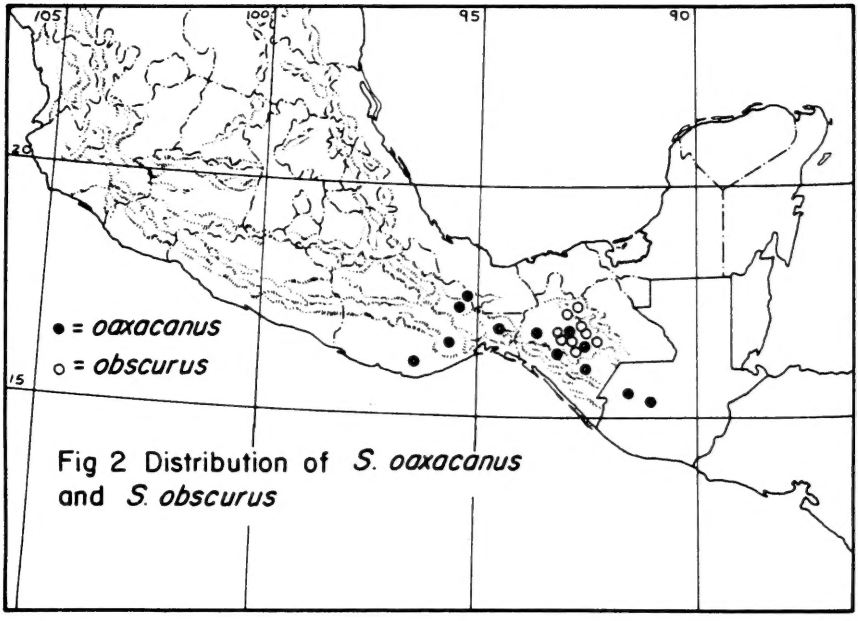

Fig 2 Distribution of *S. oaxacanus* and *S. obscurus*

TAXONOMIC STUDY OF CHRYSANTHELLUM (ASTERACEAE, COREOPSIDEAE)

B. L. Turner

Department of Botany, University of Texas, Austin, TX, 78713, U.S.A.

ABSTRACT

An inclusive systematic study of Chrysanthellum is rendered. Eleven species are recognized: C. indicum, a highly variable, pantropical, weed with 3 continental varieties (var. indicum, Asia; var. afroamericanum, South America and Africa; var. mexicanum, North America) and var. madagascarense from Madagascar; C. americanum, largely restricted to the Caribbean Islands; C. pusillum, endemic to the Galapagos Islands; and 8, mostly localized, species confined to the mainland of tropical and subtropical North America. The species are all characterized by their herbaceous habit, alternate leaves, Kranz syndrome and linear, persistent, pales. Chrysanthellum is believed to be most closely related to Eryngiophyllum, a genus of only 2 closely related species endemic to Mexico. Several species are illustrated, diagrams showing relationships are presented, distribution maps for each taxon are portrayed and a new species, C. keilii, is proposed. Relationships of both Chrysanthellum and Eryngiophyllum to the Malasian genus, Neuractis are discussed.

Chrysanthellum is a genus belonging to the tribe Coreopsideae of the Asteraceae. It relates to a group of genera with alternate leaves which show the Kranz syndrome (Smith and Turner, 1975), and does not appear especially close to the large genera Bidens and Coreopsis with which it is often associated.

The type species of the genus, C. americanum, was described by Linnaeus in 1753 in his Species Plantarum from material obtained in the Caribbean Islands, but he placed this in the genus Anthemis. This species was subsequently (1807) positioned by Richards, along with C. procumbens, in its own genus, Chrysanthellum. The latter species, in time, proved synonymous with C. americanum and, until recently, only a few additional species were added, most of these relating to the widespread weedy species, C. indicum, which was first described by De Candolle in 1836. Indeed, in spite of the fact that 10 of the 11 species recognized in the present treatment occur in North America (the one exception, C. pusillum from the Galapagos Islands), Alexander (1955), in his

treatment for the North American Flora, recognized, or was familiar with, but two of these, C. americanum and C. indicum.

Mexico is especially rich in Chrysanthellum taxa, 10 of the 11 species are known to occur there. Steetz (1853) described the first mainland species for North America, C. integrifolium; this was followed by Greenman (1903) who added C. mexicanum (reduced to a variety of C. indicum by Turner); P.G. Wilson (1962) added C. involutum; McVaugh (1972) added C. filiforme; Strother (1976) added C. pilzii; and I have added the remainder of those recognized in the present paper.

At the present time I recognize 11 species in the genus: 1) a widespread pantropical weed, C. indicum, with 4 regional varieties; 2) C. americanum, itself a highly variable weedy taxon, largely confined to the Caribbean Islands, and much-confused with C. indicum; 3) C. pusillum, an endemic of the Galapagos Islands; the remaining 8 species are native to the mainland of North America, mostly narrow endemics of the Pacific slopes of Mexico.

CHROMOSOME COUNTS

Chromosome counts are available for only 6 of the 11 species of Chrysanthellum as follows

Species	Count (n)	Reference or Voucher
C. indicum var. afroamericanum	8	Olorode (1974; reported as C. americanum)
"	8	Turner et al. (1979)
"	8	Renard et al. (1983)
C. indicum var. mexicanum	8	De Jong & Longpre (1963);
	8	Powell & Turner (1963);
"	8	Keil & Stuessy (1975)
C. keilii	8	Keil 15222 (TEX)
C. michoacanum	ca 9,9	Keil 15327 (TEX)
C. pilzii	12	Strother 1094 (type)
C. pusillum	8	(Turner, unpubl.)

C. tamaulipense	8	Strother (1972); reported as C. involutum.

With the exceptions noted below, chromosome numbers have been obtained mostly from meiotic material with clear counts of n=8 pairs (which is the same as 2^n=8 pairs of authors). Chrysanthellum michoacanum has been reported to have n=9 pairs, but the camera lucida drawings documenting this number (attached to the voucher, TEX!) do not appear unequivical and it is possible that the number is n=8 pairs, with univalents (or chromosomal fragments). Counts of n=12 pairs for C. pilzii appear to be unequivical, this representing a fertile triploid on a base of x=8 or perhaps a tetraploid on a base of x=4.

GENERIC RELATIONSHIPS

Eryngiophyllum, a poorly known genus of only 2 species from the Pacific slopes of Mexico, is the closest relative of Chrysanthellum. Both have alternate leaves and show the Kranz syndrome and are distinguished largely by habital features: Chrysanthellum is a tap-rooted annual or short-lived perennial with mostly cauline leaves whilst Eryngiophyllum is a rosette-forming, strongly perennial, herb with a woody, corm-like, tap root. Indeed, the 2 genera are so alike as to vegetative and floral features that I am inclined to combine the two, but have retained them pending chromosomal and chemical studies.

Past Eryngiophyllum one must look to South American genera (e.g., Isostigma, a largely Brazilian genus with alternate leaves and the Kranz syndrome) or perhaps to Neuractis, a small Malasian genus which Backer (1913) transferred to Chrysanthellum, and which was retained by Backer (1965) in his treatment of the Asteraceae of Java, a view rejected in the present paper, but one that speaks to the remote relationships of both Chrysanthellum and Eryngiophyllum.

SPECIES RELATIONSHIPS

Relationships among the 11 species recognized in the present paper are believed to be close. Three of these, C. americanum, C. indicum and C. pusillum, are especially close and can be recognized by their 2-nerved small ray ligules; the remaining 8 possess 4-8 nerved ligules and are more diverse. I have shown their hypothetical relationships in three diagrams: Fig. 1A., a "seat-of-the-pants" construct based on my intuitive "feel" of the

TABLE 1. Character states used in cladogram.

Characters	primitive (0)	advanced (1)
Gynecium		
1. Disk achenes	fertile	sterile
2. Ray achenes	straight	circinate
3. Ray achenes	unornamented	ornamented
4. Disk achenes	w/o wings	winged
5. Style branches of disk florets	unfused	fused
6. Achenes	monomorphic	dimorphic
7. Achene body	w/o neck	w neck
8. Pappus	present	absent
Androecium		
9. Anther appendages	well-developed	reduced
Corolla		
10. Ligules of ray	4-8 nerved	2-3 nerved
11. Disk color	all yellow	not so
12. Disk lobes	5-lobed	4-lobed
13. Ray ligules	yellow	cyanogenic
14. Ray ligules	3-lobed	entire or bifid
Involucre		
15. Bracts	present	absent
Leaves		
16. Shape	simple	dissected
17. Spinulose	not	yes
Habit		
18. Stems	erect	prostrate
19. Duration	perennial	annual
Other		
20. Chaff	well-developed	poorly dev.
21. Roots	tap-rooted	woody-crown
22. Phyllotaxy	alternate	subopposite
23. Ray floret no.	5-32	2-4
24. Achenes curled	adaxilly	abaxilly

Table 2. Character States used in Cladistic Analysis.

Species	Character States (from table 1)																							Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Chrysanthellum																									
indicum ind.	0	0	0	1	1	1	0	1	0	1	0	1	0	1	0	1	0	0	1	0	0	0	0	0	8
indicum mex.	0	0	0	1	1	1	0	1	0	1	0	1	0	1	0	1	0	0	1	0	0	0	0	0	8
indicum aft.	0	0	1	1	1	1	0	1	0	1	0	1	0	1	0	1	0	0	1	0	0	0	0	0	10
pusillum	0	0	1	0	1	1	0	1	0	1	0	1	0	1	0	1	0	1	1	0	0	0	0	0	10
americanum	0	0	0	0	1	1	0	1	0	1	0	0	0	1	0	1	0	1	1	0	0	0	0	0	8
perennans	1	?	?	?	1	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	?	7
tamaulipense	0	1	0	1	1	1	0	1	0	0	0	0	0	1	0	1	0	1	1	0	0	0	0	0	8
keilii	0	1	0	1	1	1	0	1	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	8
involutum	1	1	1	-	1	-	0	1	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	8
pilzii	1	1	1	-	1	-	0	1	0	0	0	0	0	1	0	1	0	1	1	0	0	1	0	1	11
integrifolium	1	0	0	-	1	-	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0	0	0	8
michoacanum	1	0	0	-	1	-	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0	0	0	8
filiforme	1	0	0	-	1	-	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	7
Eryngiophyllum																									
pinnatisectum	1	0	0	-	0	-	0	1	0	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	6
rosei	0	0	0	0	0	1	-	0	1	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	5
Neuractis																									
leschenaultii	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	1	1	0	0	1	0	0	0	0	7
smithii	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	1	1	1	0	1	0	0	1	0	8

?= character state unknown (immature)
-= character absent

0= primitive
1= advanced

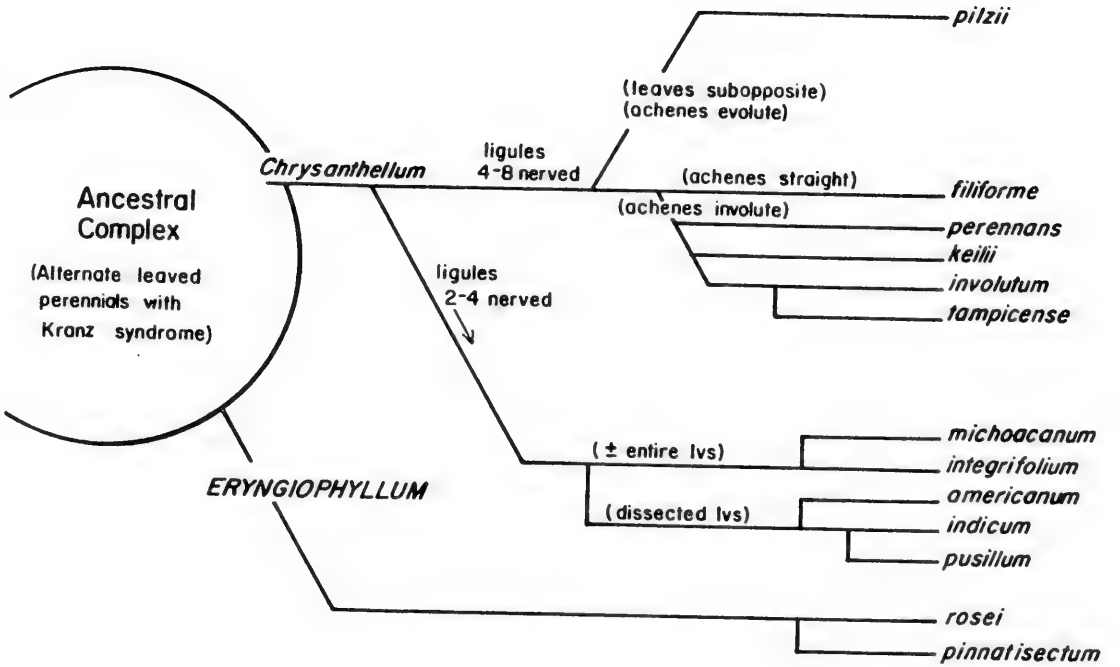

Fig. 1A. Hypothetical relationships of *Chrysanthellum spp.* (seat-of-the-pants-method)

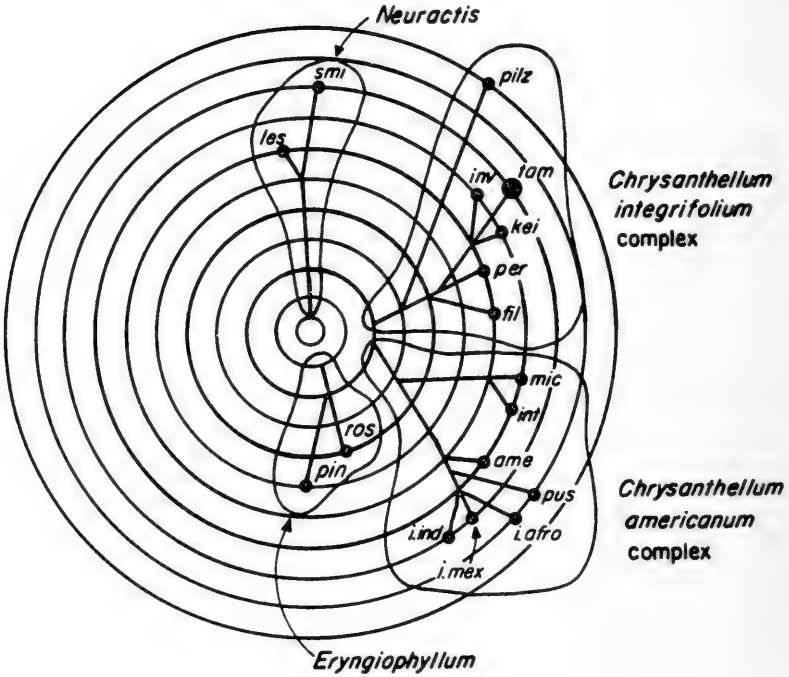

Fig. I.B. Hypothetical Relationships of *Chrysanthellum spp.* arranged in a Wagner-type diagram.

group based on my 40 or more years familiarity with character variability and species-relationships in the Asteraceae. Fig. 1B., a Wagner-type diagram based upon the characters shown in Table 1, the species arranged subjectively in concentric circles according to their additive positions; and 1c, a more formal cladistic analysis using the character states shown in Table 1.

Figures 1A and 1B suggest that within Chrysanthellum two phyletic lines exist, a group having ray ligules mostly reduced with 2-3 nerves centering about C. americanum, and a group having well-developed ligules with 4-8 nerves centering around C. perennans. The latter taxon, in particular, is believed to have retained characters which approach Eryngiophyllum, namely a perennial, rosulate habit, while C. pilzii with its subopposite leaves, evolute, ornate, disk achenes, and prostrate habit is believed to be the most advanced.

A parsimony analysis (PAUP, David Swofford, 198x) of the data presented in Table 2 resulted in 137 equal-length trees of 40 steps each. Figure 1C represents a strict consensus tree derived from 100 of these. Chrysanthellum is united as a monophyletic lineage by synapomorphies in characters 11 (1->0), 14 (0->1), and 15 (1->0). Neuractis smithii and N. leschenaultii are linked as sister taxa by synapomorphies in characters 8 (1->0), 9 (0->1), and 21 (1->0). The two species Eryngiophyllum lack a character in this data set to unite them as sister taxa.

ACKNOWLEDGEMENTS

This study is based upon the examination of approximately 840 sheets from the following herbaria (number of specimens shown in parenthesis): F (63), GH (96), GOT (1), K (127), LL (60), LP (42), MICH (44), MO (97), NY (106), TEX (66), UC (37), UNAM (15), US (84). I am grateful to the Directors for loan of materials. Linda Vorobik provided the illustrations and K. Nixon and G. Nesom helped with the cladistic analysis. Dr. J. Mears collected buds for the chromosome count of C. pusillum.

CHRYSANTHELLUM Rich. ex Persoon

Annual or rarely perennial prostrate to erect mostly glabrous herbs. Leaves predominantly alternate (superficially opposite in C. pilzii), simple to bipinnatisect. Heads terminal or axillary, heterogamous, radiate. Involucre 2-seriate, bracteate. Receptacle plane to convex, with membranous, persistent linear

florets fertile or functionally staminate throughout. Ray corollas pistillate, fertile, mostly yellow, 2-8 nervate. Disk corollas 4-5 lobate with well-marked tube and limb; often of 2 types, an outer, mostly yellow, series ca 1/2 the size of the inner florets, the latter usually with brown or reddish-brown, corollas. Anthers small, the appendages well-developed and acute. Style branches of ray florets filiform, acute, those of the disk well-developed with penicillate appendages 2-3 times the lengths of the stigmatic lines when fertile, or fused and merely bifid when sterile. Achenes dimorphic, those of the ray mostly clavate, epappose, unwinged, straight or variously recurved or coiled; disk achenes, when present, flattened, prominently winged, epappose or very rarely with 2 deciduous awns. Base chromosome number, x=8 or possibly x=4.

Type species. Chrysanthellum americanum (L.) Vatke

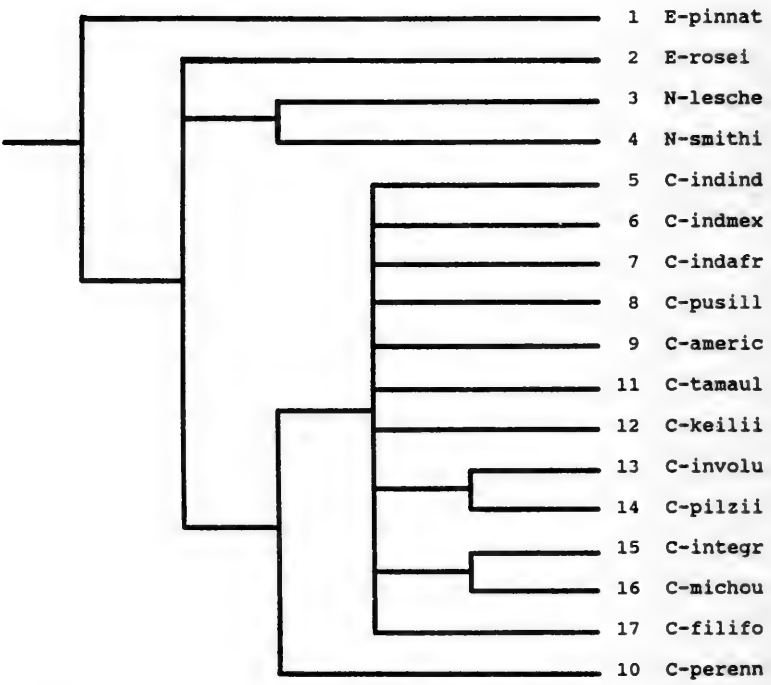

Fig. 1C. Cladistic analysis of Chrysanthellum, as discussed in text.

KEY TO SPECIES

A. Ligule of ray florets with 2(3) well-developed veins (B)
A. Ligule of ray floret with 4-8 rather equally well-developed veins (F)

B. Ligules of the ray quite pronounced, 6-15 mm long; leaves simple, ovate to oblanceolate, toothed or rarely tri-lobed, but never pinnatisect with narrow divisions (C)
B. Ligules of the ray short, inconspicuous, 1-5(6) mm long; leaves pinnately or ternately dissected, the divisions linear, 0.5-8.0 mm wide (D)

C. Disk corollas brownish-black..... 1. C. michoacanum
C. Disk corollas yellow.....2. C. integrifolium

D. Involucres 2.0-3.0 mm long; plants of Galapagos Islands.. ..... 3. C. pusillum
D. Involucres (2.5)3.0-6.0 mm long; plants elsewhere (E)

E. Leaves simple to variously lobed or dissected, the divisions broad, 2-8 mm wide; stems prostrate; ligules (3)4-5(6) mm long..... 4. C. americanum
E. Leaves bi- or tripinnately dissected, the divisions narrow, mostly 1-2 mm wide; stems mostly erect (rarely prostrate); ligules 1-3 mm long..... 5. C. indicum

F. Ray achenes straight or nearly so; disk florets "sterile" .....6. C. filiforme
F. Ray achenes circinate, incurved, outcurved, or coiled; disk florets fertile or "sterile" (G)

G. Perennials; leaves tripartite with only occasional lobing; head single on an elongate peduncle from a basal rosette ..... 8. C. perennans
G. Annuals; leaves variously bipinnatifid; heads several, not borne singly from a basal rosette (H)

H. Leaves, especially the petioles, conspicuously pubescent with long, multicellular hairs; achenes outcurved at maturity, the inner surface markedly spiny-tuberculate..... 9. C. pilzii
H. Leaves glabrous or nearly so; achenes incurved at maturity, the inner (adaxial) surface smooth or nearly so (I)

I. Disk florets completely "sterile"; lower-most leaves tri-pinnatisect (parsley-like)..... 10. C. involutum
I. Disk florets mostly fertile; lower-most leaves bipinnatisect (J)

J. Achenes of the ray florets merely recurved ; disk florets brown or brownish-red..... 7. C. keilii
J. Achenes of the ray florets circinate; disk florets yellow. ..... 11. C. tamaulipense

1. CHRYSANTHELLUM MICHOACANUM B. Turner, Phytologia 51: 292. 1982. Fig. 2.
TYPE: MEXICO. Michoacan: 11-13 km WSW of Apatzingan, along the road to Dos Aguas and Aguililla, ca. 300 m, 5-9 Sep 1972, J. V. A. Dieterle 4246 (holotype TEX!; isotype MICH!).

Annual, glabrous, prostrate, succulent herbs with stems up to 40 cm long. Leaves finely denticulate to coarsely toothed, rarely trilobed or lyrate, up to 15 cm long (basal leaves); blades of rosette leaves, when simple, narrowly oval, broadest at the middle; mid-stem leaves usually with ovate blades (rarely obovate), broadest below the middle. Peduncles 8-14 cm long at maturity, swollen just below the head. Heads 10-20 mm across, ca. 10 mm high, subtended by 5 acuminate bracts, 3-5 mm long; involucre as in C. integrifolium except for the more narrowly ovate bracts, 5-7 mm long, 2-3 mm wide. Receptacle convex, the pales lanceolate, ca. 1/2 as long as the disk florets. Ray florets ca. 32, "orange-yellow"; ligules bidentate, (6)8-10 mm long, 1.0-1.5 mm wide, 2-nerved. Disk florets 2-34, "sterile", the smaller, outer-florets, yellowish-brown, with corollas 3-4 mm long, the larger, inner florets "brownish-red" or "dark brown", 3-8 in number at anthesis and nearly twice the size of the outer florets. Ray achenes clavate, 3-4 mm long, prominently 8-10 grooved or markedly 8-ridged at maturity.
Chromosome number, $2n = 9II$ (Keil 15237).

DISTRIBUTION (Fig. 6): Only a few collection sites are known, all near Apatzingan (Hinton et al. 12058, GH, NY, US; Keil 15237, ASU, ENCB, MEXU, TEX; McVaugh 17907, MICH). The plants reportedly occur in thorn forest, in open areas, and along roadsides. Flowering, Aug-Sep.

The Keil collections, cited above, are noteworthy for their smaller heads and ray florets, approaching those of C. integrifolium. But in other characters they are typical of C. michoacanum.

Chrysanthellum michoacanum can be readily distinguished from C. integrifolium by its leaves, larger heads with longer ray florets, shorter pales and, most notably, by the brownish-red disk florets, some of these (3-8) becoming much darker and nearly twice the size of the outer disk florets, which are presumably at the same or later stage of development. Florets of the latter type were not observed in the dry heads of C. integrifolium and its expression must reflect adaptation to particular pollinators since both floret-types seem to be functionally staminate or "sterile".

2. CHRYSANTHELLUM INTEGRIFOLIUM Steetz, in Seem., Bot. Voy. Herald 160. 1853. TYPE: PANAMA: In savannas about Panama. w/o date, Steetz 601. (holotype BM!).

Chrysanthellum americanum var. integrifolium (Steetz) Alexander, N. Amer. Fl. II 2: 148. 1955.

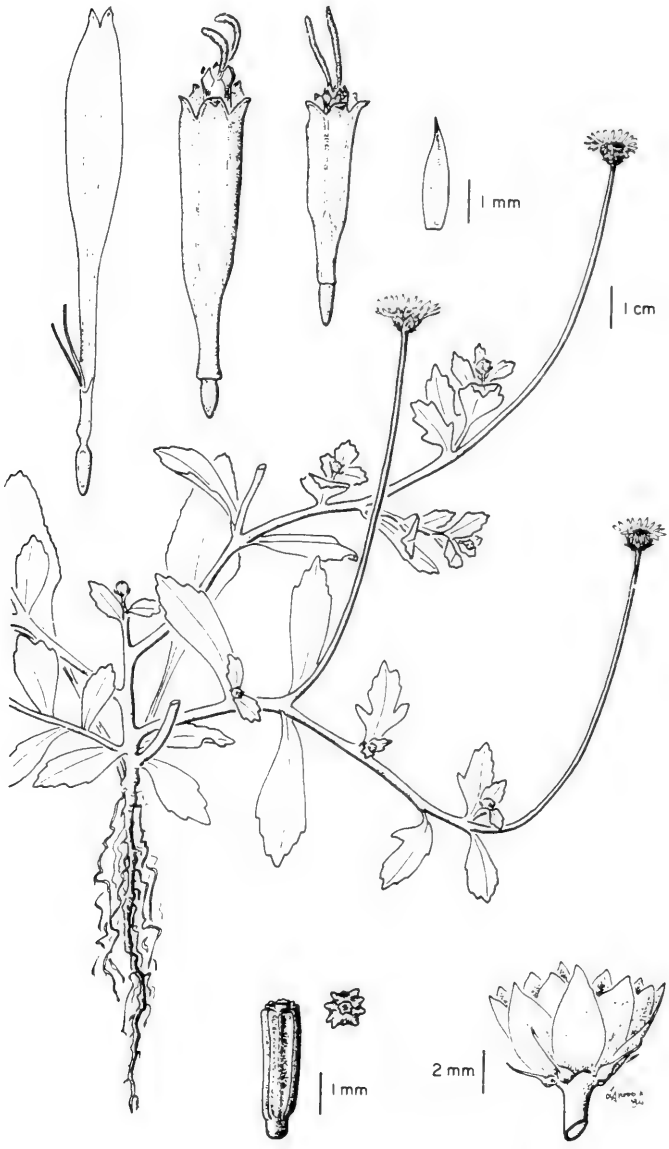

Fig. 2 *Chrysonthellum michooconum*, from holotype.

Annual, glabrous, often succulent herbs, 5-30 cm tall, at first rosulate but soon forming prostrate branches. Leaves simple, oblanceolate, finely to coarsely toothed from above the middle. Peduncles 5-15 cm long at maturity, swollen just below the head. Heads 8-12 mm across, 5-8 mm high, subtended by 4 or subulate bracts, 3-4 mm long; involucre double, an outer series of ca. 5 elliptic to ovate, scarious-margined phyllaries, 5-6 mm long, 2-3 mm wide, these alternating with a similar inner series. Receptacle convex, the pales linear, ca. 2/3 as long as the disk florets. Ray florets yellow, usually ca. 34 but often up to 55, the ligules bidentate, 5-6(7) mm long, 1.0-1.5 mm wide, 2-nerved. Disk florets ca. 35, yellow, (4-)5-lobed, "sterile", the tube ca. 1.5 mm long, the limb 3-4 mm long. Ray achenes clavate, 3-4 mm long, prominently 8-10 grooved, or markedly 8-ridged, at maturity.

Chromosome number undetermined.

DISTRIBUTION (Fig. 5): States of Veracruz, Oaxaca and Chiapas in Mexico; Honduras, El Salvador, Costa Rica and Panama. Reportedly common locally in full sun on wet clay soils at lower elevations (from sea level to 200 m). Flowering, Jul-Nov.

In spite of its locally weedy nature, the species is apparently relatively rare, to judge from the sparcity of collections in herbaria. Only one or two collection sites are known for each of the following: Veracruz (GH, NY), Chiapas (MICH), Oaxaca (ASU, MICH, TEX), El Salvador (F, MICH) and Honduras (F). While Guatemalan collections were not seen in the present study, it must surely occur in that country and perhaps other Central American Republics, for it appears to be quite common in Panama.

Alexander inexplicably treated this as a variety of Chrysanthellum americanum. The two taxa are distinguished by a number of vegetative and floral features, occupy different habitat types, are largely allopatric, and do not intergrade. The relationship of C. integrifolium is almost certainly with C. michoacanum and recent collections of the former from Oaxaca by Professor Keil seemingly reveal intergrades, (15555, ASU, ENCB, TEX) and additional study might justify treatment of C. michoacanum as a localized variety of C. integrifolium.

3. CHRYSANTHELLUM PUSILLUM Hook. f., Trans. Linn. Soc. London 20: 214. 1851. TYPE: ECUADOR: Galapagos Islands: Isabela (Albemarle), C. Darwin s.n. (holotype K!).

Chrysanthellum erectum Andersson, Kongl. Svensk. Vetenskapsakad. Hanl. 188. 1854. TYPE: ECUADOR Galapagos Islands: Santa Cruz, 1853, Andersson 176 (holotype S!).

Chrysanthellum fagerlindii Eliasson, Svensk Bot. Tidskr. 61: 91. 1967. TYPE: EUCADOR: Galapagos Islands: San Salvador, 28 Apr - 2 May 1953, Fagerlind & Wilson 3426 (holotype S!).

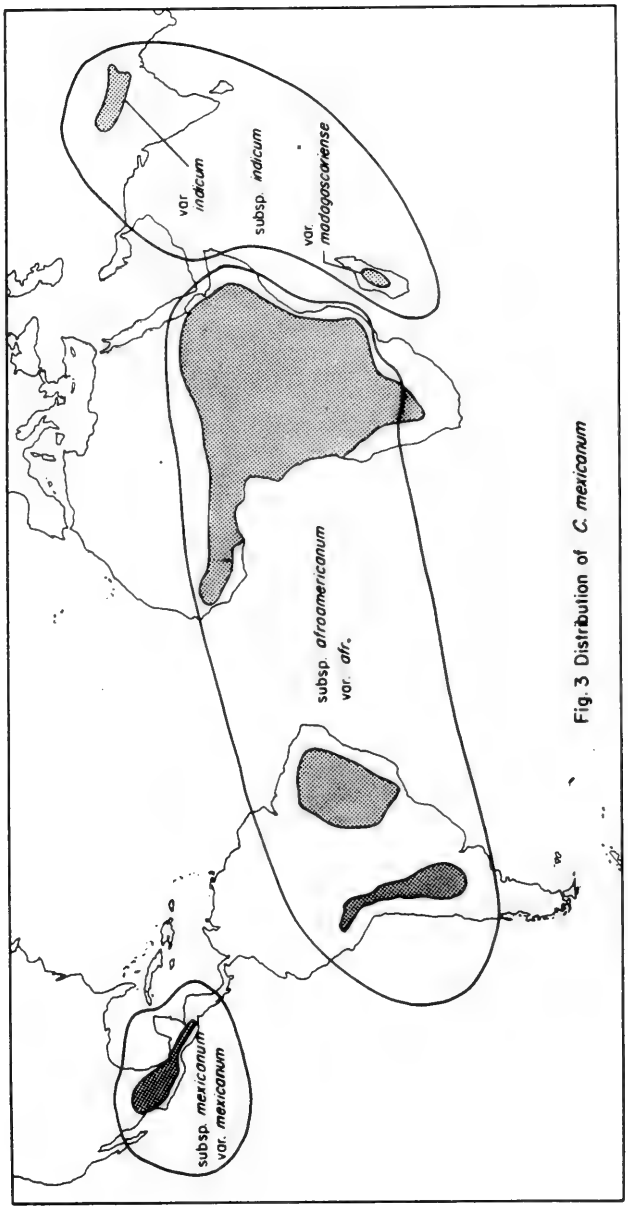

Fig. 3 Distribution of *C. mexicanum*

Annual, 5-30 cm high, at first rosulate, the peduncles elongate and arising from the center; primary stems erect, the secondary branches decumbent or ascending and richly floriferous. Leaves triternately dissected, the divisions usually broad, but occasionally quite linear. Peduncles 1-11 cm long. Involucres 2.5-3.0 mm long, the involucral bracts ovate to ovate-lanceolate. Ray florets 5-23 (rarely more); ligules yellow, 2-3 mm long, 2-nerved and cleft at the apex. Disk florets yellow, mostly "sterile" but often fertile; corolla ca. 2 mm long, 4-lobed. Achenes of the ray florets clavate, 1.0-1.3 mm long, usually tuberculate at maturity (sometimes conspicuously so) or less often smooth; disk achenes slender, somewhat flattened with smooth, rounded, shoulders.

Chromosome number, 2n = 8 II (Turner, unpubl.)

DISTRIBUTION. Known only from the Galapagos Islands where it occurs in an array of sites, mostly disturbed. Collections have been seen from the following islands: Fernandina, Isabela, Rabida, San Cristobal, San Salvador, Santa Cruz, Santa Fe, and Santa Maria. Flowering, Jan-Apr.

I agree with Eliasson (1967) and Cronquist (1971) in relegating C. erectum to synonymy under this species. In spite of the variability in branching habit and achene sculpture, both between and within populations of this taxon, there appears to be but a single species. Perhaps the most striking variability is seen in the leaf segments, which are often quite linear (especially on San Cristobal Island), and in the tuberculate ray achenes, this latter feature also varying among populations.

The two collections of Chrysanthellum fagerlindii (Fagerlind & Wilson 3426; 3440, S), both from Santiago Island, are enigmatic. The plants appear to be teratological forms of C. pusillum, the collectors apparently having obtained plants typical of the latter (F. & W. 3441, S) next to or near their collection 3440. What does seem clear is that the few plants known, while quite mature to judge from their much-branched habits, do not seem to produce fruiting material and their florets appear to be strangely reduced and irregular with 3-5 lobings, etc. Such anomalies are found nowhere else in the genus and extend to the involucre which is comprised of linear-lanceolate several-seriate bracts suggesting an atavistic reversion to some primordial developmental state. I have observed, very rarely, similar individuals among Texas populations of Gutierrezia (Asteraceae), the plants nearly always being small-headed, depauperate and sterile. Cronquist (1971) also does not accept C. fagerlindii as a "good" taxon, referring to it as "a minor form with very short rays and deeply cleft disk corolla, which will probably fail to persist...with the typical C. pusillum. The latter will probably swamp the incipient species in a few generations." Future field worker on Santiago Island should look for such forms to see if the present impressions are borne out, for Eliasson (1972)

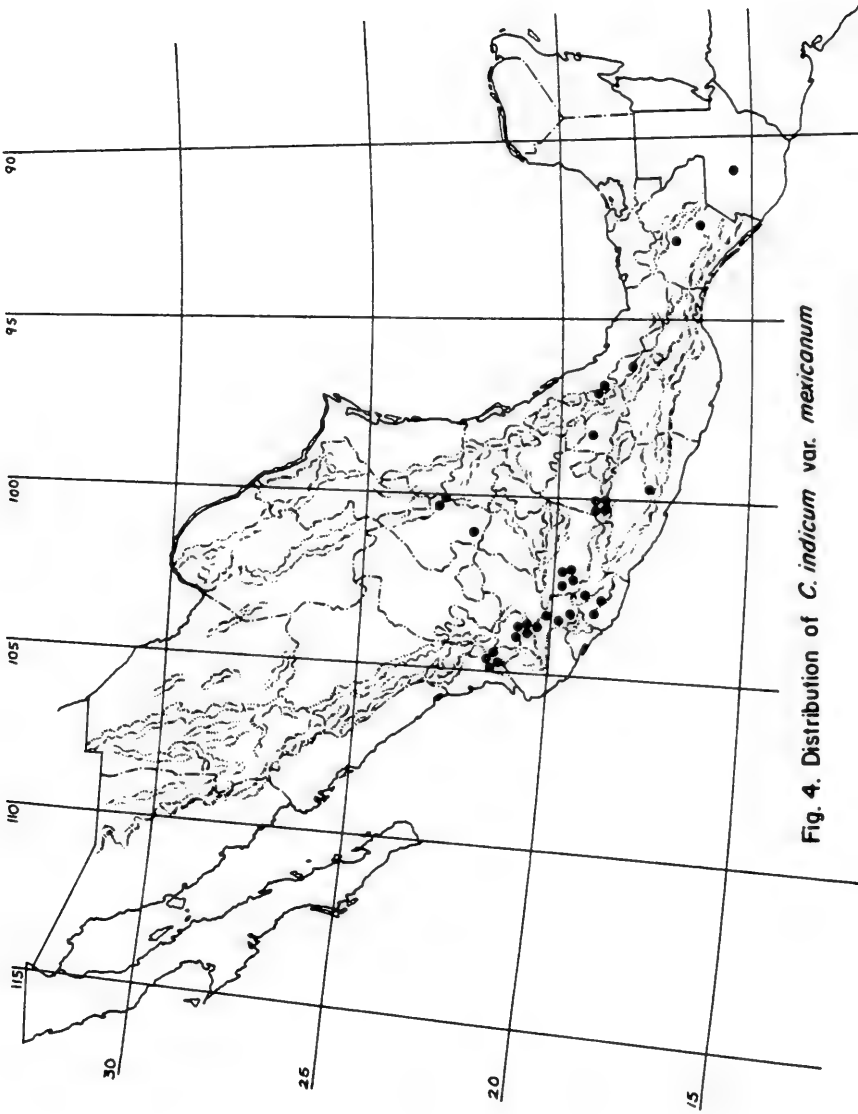

Fig. 4. Distribution of *C. indicum* var. *mexicanum*

seems quite convinced that the collections represent a good species. It would be quite helpful if achenes from such "forms" could be procured and germinated so as to see if the resultant plants breed true.

As to the origin of Chrysanthellum pusillum, I favor a relatively old introduction from some extinct populational source not too unlike C. indicum var. mexicanum. It has the chromosome number ($2n = 8$ II), reduced habit, and small, narrowly winged achenes of that taxon. In addition, highly "sterile" disk florets and tuberculate achenes are found in related taxa from the region where C. indicum occurs, suggesting that southwestern Mexico was the ancestral area from whence it dispersed.

4. CHRYSANTHELLUM AMERICANUM (L.) Vatke, Abh. Naturwiss Vereine Bermen 9: 122. 1885.

Anthemis americana L., Sp. Pl. 895. 1753. TYPE: JAMAICA. Sloane s.n. (holotype BM!).

Bidens apifolia L., Syst. ed. 10: 1203. 1760. TYPE: w/o locality or collector (holotype LINN!).

Verbesina mutica L., Sp. Pl., ed. 2. 1273. 1763. TYPE: w/o locality or collector (holotype LINN!).

Chrysanthellum procumbens Rich. ex Per., Syn. Pl. 2: 471. 1807. nom. superfl., illegit., TYPE: based on Verbesina mutica L.

Chrysanthellina fasciculata Cass., Dict. Sci. Nat. 25: 392. 1822. TYPE: Described from cultivated material, no specimens cited and place of origin unclear. The description fits C. americanum.

Chrysanthellina gracilis Cass., Dict. Sci. Nat. 25: 392. 1822. TYPE: As in the above. The description fits C. americanum.

Sebastiana heterophylla Bertol., Lucubr. 37. 1822. nom. superfl., illegit., TYPE: based on Anthemis americana L.

Collaea procumbens (Rich. ex Pers.) Spreng., Syst. 3: 622. 1826.

Chrysanthellum swartzii Cass. ex DC., Prodr. 5: 631. 1836. TYPE: JAMAICA. Swartz s.n. (holotype P; isotype S!).

Prostrate or recumbent, glabrous, annual herbs. Leaves simple below to variously lobed or dissected, not decidedly pinnatisect. Peduncles, 3-6(7) cm long. Fruiting heads 6-9 mm across, 4-5(6) mm high, subtended by 4-6 linear bracts, 1-2 mm long. Involucre double, an outer series of 5 ovate phyllaries, 4-5 mm long, 3-4 mm wide, the margins scarious; inner series 5, similar to the outer but somewhat narrower. Ray florets 13-34, yellow, the ligules usually bidentate,

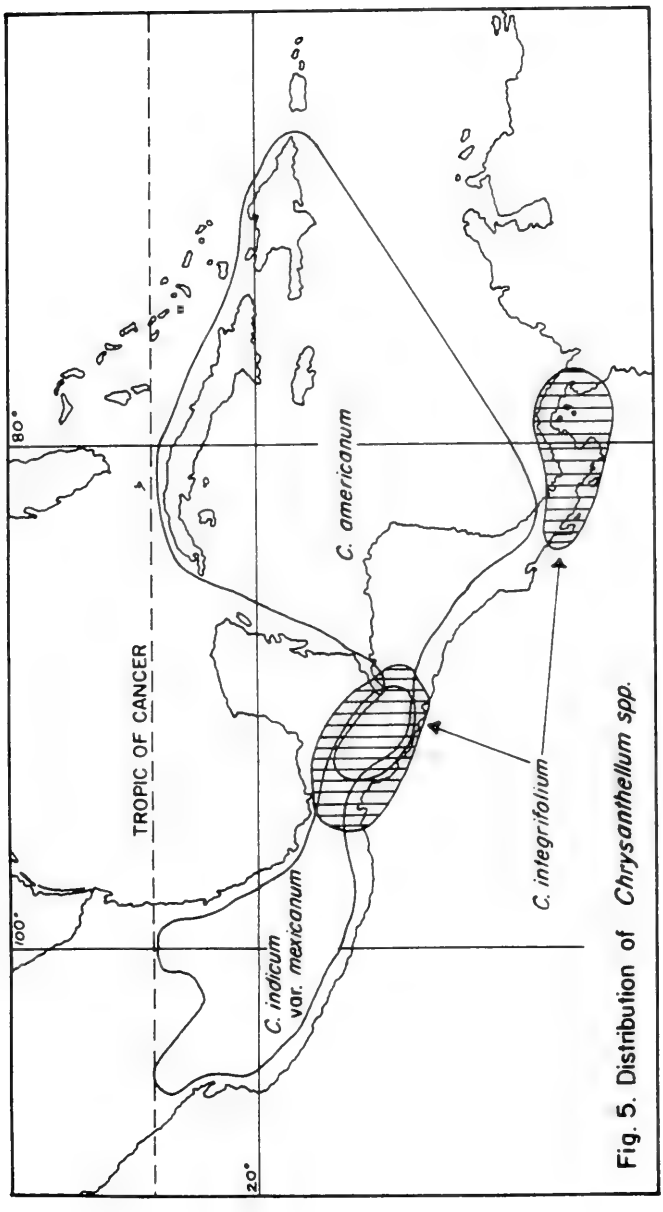

Fig. 5. Distribution of *Chrysanthellum* spp.

2-4(5) mm long, ca. 1 mm wide, with 2, or rarely 3, conspicuous nerves. Disk florets (4)5-lobed, most of them fertile, corolla orange-yellow to yellow (rarely white), ca. 1 mm long, the tube ca. 0.2 mm long; limb ca. 0.8 mm long, lobes acute, ca. 0.2 mm long. Ray achenes 2-3 mm long, columnar-clavate, with 3, or less often 2 sulci on the ad- and abaxial surfaces. Disk achenes linear-oblong, 2-3 mm long, ca. 1 mm wide, the faces bordered by a prominent, often rugose, cartilaginous, ciliate margin.

Chromosome number undetermined.

DISTRIBUTION (Fig. 5). Cuba, Hispaniola (Dominican Republic and Haiti) and Jamaica Islands; also Costa Rica, Guatemala, Honduras and southernmost Mexico (Chiapas) in continental North America. Mostly a weed in grassy fields and waste places at various elevations in the island areas but usually in pine and oak-pine woodlands and meadows of the lower montane regions (300-2000 m) on the mainland. Flowering, all seasons, according to rains.

This species, though quite distinct and fairly restricted in distributions, has long been confused with C. indicum. The latter is nearly pantropic but its range does not overlap that of C. americanum.

The island populations of Chrysanthellum were probably derived from relatively recent introductions from Central America, to judge from their morphological similarities, but it was presumably already established on Jamaica and Cuba at the time of European ventures into the region, for abundant, widespread, collections were obtained on these two islands by early collectors.

5. CHRYSANTHELLUM INDICUM DC.

Erect to prostrate, glabrous or nearly so, annual herbs up to 30 cm tall. Leaves bi-or tripinnatisect, 1-8 cm long. Peduncles 0.5-6.0 cm long, smooth or bearing scattered tuberculae. Heads 3-6 mm across, 2-6 mm high, subtended by 1 or 2 (rarely more) linear bracts. Involucre double, an outer series of 5(8) linear-ovate, phyllaries 2-5 mm long, 1-2 mm wide, the inner series similar but somewhat smaller. Ray florets 5-34 (modes at 5, 8, 13, 21 and 34), yellow or orange-yellow, the ligules usually bidentate, 1.0-2.5 mm long, 0.2-0.5 mm wide, 2-nerved. Disk florets fertile, 4- or rarely 5-lobed; corollas yellow, 0.8-1.3 mm long, the tube 0.2-0.3 mm long, limb 0.6-1.0 mm long. Ray achenes 2-4(5) mm long, compressed to columnar-clavate to cuboid, often corky-winged at maturity, smooth to ribbed on all faces, less often tuberculate. Disk achenes flattened, linear-oblong to oval, 2.3-5.0(6.0) mm long, 1-2 mm wide, the faces bordered with a narrow to broad callous margin (rarely absent), this being variously ciliate, tuberculate, erose or corky.

Chromosome number, $2n = 8$ II; $2n = 16$ (var. afroamericanum and var. mexicanum.

Four varieties in three subspecies are recognized and these are treated separately below.

Key to infraspecific taxa

A. Fruiting involucres 2-4 mm long; disk achenes bordered by a narrow catilaginous margin (seemingly absent in var. madagascarense), 0.1-0.2 mm wide; ray florets 5-13; plants of Asia, Madagascar, Mexico, and Central America (B).

B. Involucral bracts 2.0-3.0 mm long; cartilaginous margin of disk achene either well developed (ca. 0.2 mm wide) or seemingly absent; plants of Asia or Madagascar ..... subsp. indicum

C. Disk achenes with well-developed cartilaginous margins ca. 0.2 mm wide; plants erect (rarely prostrate); leaves much-dissected, mostly 2 cm long or more; India, Himalayan regions..... .....5a. subsp. indicum var. indicum

C. Disk achenes with margins absent or poorly developed; plants prostrate; leaves not much dissected and mostly less than 2 cm long; Madagascar..... 5b. subsp. indicum var. madagascarense

B. Involucral bracts (2.5)3.0-4.0 mm long; cartilaginous margin of disk achene narrow, ca. 0.1 mm wide; plants of Mexico or Central America..... 5d. subsp. mexicanum

A. Fruiting involucres 4-5(6) mm long; disk achenes (at maturity) bordered by a well-developed, cartilaginous or corky wing 0.2-0.4 mm wide; ray florets (8)13-34; plants of Africa and South America..... 5c. subsp. afroamericanum

SUBSP. INDICUM

5a. CHRYSANTHELLUM INDICUM DC. var. INDICUM, PROD. 5: 631. 1836. TYPE: INDIA. Near Gojpur and Dukanaghur, Wallich 401 (also cited in Wallich's catalogue as no. 3291; not 3231 as given by DC) (holotype G-DC; isotype K!).

Erect to semi-erect glabrous annual herbs up to 25 cm tall. Leaves bi- or tripinnatisect, 1-6 cm long. Peduncles, at maturity, 0.5-2.5(3.0) cm long, bearing scattered tuberculae. Heads 4-5 mm across, 2.5-3.0 mm high, subtended by 1, or rarely 2, linear bracts, 2-3 mm long; involucre double, an outer series of 5, linear-ovate, phyllaries, 2.5-3.0 mm long, ca. 1.0 mm wide, the inner series of 5 similar but somewhat smaller phyllaries. Ray florets usually 8, yellow, the ligules bidentate, ca. 1.5 mm long, ca. 1.2 mm long, the tube ca. 0.3 mm long, limb ca. 0.9 mm long. Ray achenes ca. 2.5 mm long, columnar-clavate, the abaxial faces with two sulci. Disk achenes linear-oblong, 2.5-2.8 mm long, ca. 1.0 mm wide, the faces brownish, bordered with an irregularly undulate or erose, cartilaginous, eciliate (or nearly so) margin ca. 0.2 mm wide.

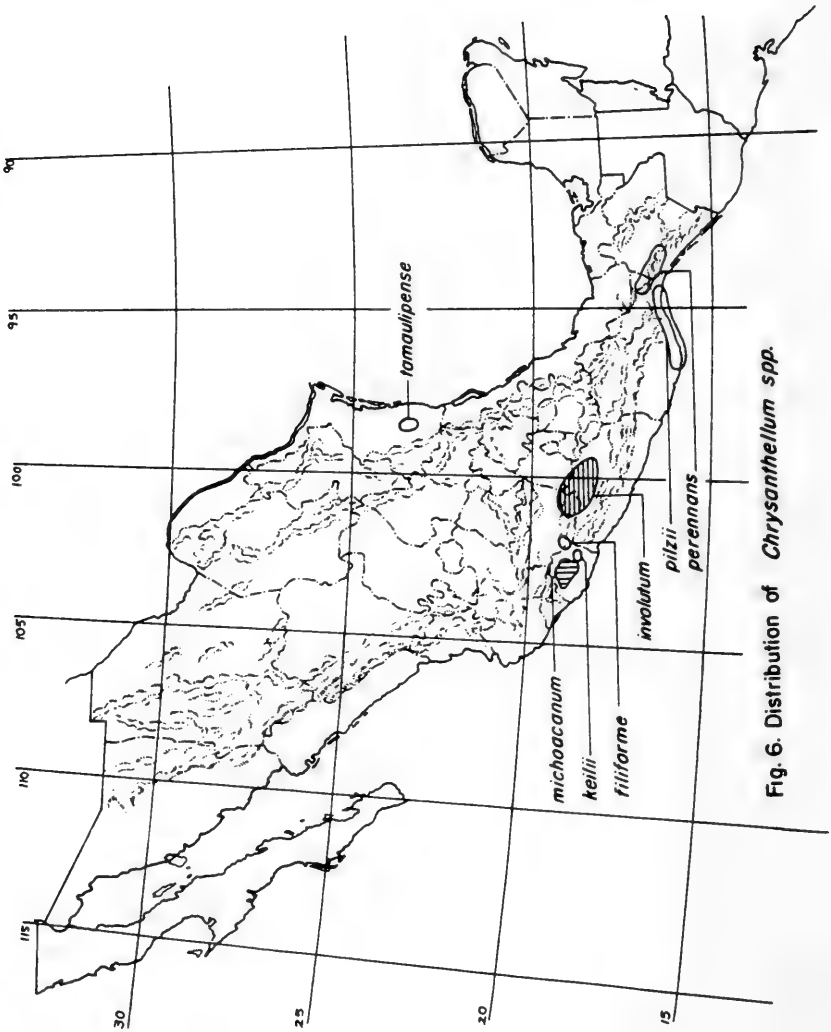

Fig. 6. Distribution of *Chrysanthellum* spp.

Chromosome number, unknown.

DISTRIBUTION (Fig. 3). Known only from India and adjacent Nepal, where it occurs in grassy places from 250 to 3500 m. Flowering, Aug-Oct.

With its small heads and relatively few ray florets, this variety much resembles var. mexicanum but it can be distinguished from the latter by its narrow-winged, nearly eciliate, disk achenes and generally shorter peduncles. Because of this resemblance it might have been reasonable to include var. mexicanum in the same subspecies with indicum but because of the distance separating their respective locales and the fact that the North American populations appear to have had a relatively more remote origin, perhaps relictual in the sense that it occupies the center of diversity of the genus, it seems more reasonable to assume that the Asian and Madagascar populations are convergent in the morphological characters that relate them to the Mexican populations. In short, phylogenetic reasoning suggests that propagules from montane North American populations, ancestral but similar to var. mexicanum, by long distance dispersal to the Andean regions, gave rise to var. afroamericanum; populations of the latter were presumably dispersed to Africa, India and Madagascar in relatively recent times, the latter two regions developing smaller-headed, less-winged fruits than is typical of the quite variable populations of var. afroamericanum on the African continent itself.

Inclusion of var. indicum and var. madagascarense in the same subspecies largely reflects emphasis upon head size and it might be that they should be recognized as sufficiently distinct so as to be treated as different subspecies. Enough material from Madagascar was not available to judge the constancy of the characters used to distinguish between these, but from the material at hand var. madagascarense seemed more distant from subsp. afroamericanum than from var. indicum.

Finally, it should be noted that some workers will surely say that var. indicum (and possibly var. madagascarense), being weedy, as are all the varieties, was probably introduced into India from Africa or South America during the past several hundred years and hence hardly worthy of subspecific rank. Perhaps so, but as noted in part by Hooker (1882) and wholly by Greenman (1903), the Indian populations have a combination of characters that readily distinguish them from the African and American populations, hence their recognition as a distinct taxon. However, taken on a worldwide basis, C. indicum is much too similar to selected African (and, as already noted, Mexican) populations to be accorded specific rank; indeed, if by chance an unlabeled Indian plant were transported to South American I would be hard-pressed to recognize this as anything more than an anomalous, few-flowered, small-fruited, form of afroamericanum, so much alike are they in their basic morphology.

Occasional specimens of var. indicum (Polunin et al. 5812, BM; Clarke 24919, BM) occur which have heads as large as those of var. afroamericanum, but their achenes and "tuberculate" peduncles are of the indicum-type, suggesting that the suite of subtle characters used to distinguish among the several infraspecific cataegories are relatively well-fixed, genetically speaking.

5b. CHRYSANTHELLUM INDICUM var. MADAGASCARENSE B. L. Turner, var. nov.

Chrysanthellum indicum var. indicum accedens sed marginibus cartilaginis acheum debile evolutis, foliis parvioribus minus dissectis. TYPE: CENTRAL MADAGASCAR. "Bessileo: an Strotknen Stellen der, Flugel." Mar 1881, J. M. Hildebrandt 3943 (holotype US!; isotype K!).

Additional specimens examined: MADAGASCAR. Angavo, 19 Oct 1931, M. R. Decary 7285 (K, US); Ankatso, 2 Feb 1921, Decary 240 (K).

DISTRIBUTION (Fig. 3). Known only from a few, mostly poorly-preserved specimens from the highland regions of Central Madagascar where it reportedly grows prostrate, although one collection (Decary 240) shows the plant to be at least weakly ascending. Flowering, Feb-Mar.

As noted in the discussion of var. indicum, collections of var. madagascarense available to me appear quite distinct and additional material might show the taxon to be deserving of subspecific recognition.

Subsp. AFROAMERICANUM B. L. Turner, Phytologia 51: 291. 1982.

Similar to the subspecies indicum but differing in its larger fruiting involucres (4-6 mm long); disk achenes with more prominent, well-developed, cartilaginous wings or corky margins, 0.2-0.4 mm wide; and ray florets mostly 13-34 (very rarely 8).
Chromosome number, $2n = 16$ II.

The subspecies is comprised of but a single variety.

5c. CHRYSANTHELLUM INDICUM var. AFROAMERICANUM B. L. Turner, Phytologia 51: 291. 1982. TYPE: ARGENTINA. Prov. Cordoba., Dept. Colon; Rio Ceballos, 15 Mar 1944, C. A. O'Donnell & J. M. Rodrigues V. 501 (holotype A!; isotypes F! UC!).

Adenospermum tuberculatum H. & A., Hookers J. Bot. 3: 318. 1841. TYPE: ARGENTINA: Prov. Cordoba, Cordoba. "On hillsides and hard dry soils", w/o date, L. Tweedie 1107 (not 1109 as cited) (lectotype K!). In the original description a collection by Gillies from Cordoba was also cited; I choose to typify the name with the Tweedie collection.

Hinterhubera kotschyi Sch.-Bip. ex Hochst., Flora 24: 419. 1841. TYPE: ABYSSINIA; "Ad montem Cordofanum Arasch cool locis prinis humide", 14 Oct 1839, pl. exs. Kotschy 175 (isotypes BM!, MO!, NY!, K!, L!).

Plagiocheilus erectus Rusby, Mem. Torrey Bot. Club 4: 212. 1895. TYPE: BOLIVIA. Cochabamba, 1891, A. M. Bang 965 (holotype US!; isotype US!).

Chrysanthellum boliviense Sch.-Bip., Bull. Soc. Bot. France 12: 82. 1865. Nomen nudum.

Chrysanthellum weberbaueri Chung, Phytologia 14: 321. 1967. TYPE: PERU. Prov. Tayacaja: Valley of the Mantaro below Colcabamba, 1900-2000 m, Mar 1931, A. Weberbauer 6465 (holotype F!; isotypes GH!, S!, US!).

Chrysanthellum tuberculatum (H. & A.) Cabrera, Bol. Soc. Argent. Bot. 15: 117. 1973.

Chrysanthellum argentinum Ariza & Cerana, Bol. Soc. Argentina Bot. 22: 267. 1983 (holotype, as shown by the illustration provided with the original description!).

DISTRIBUTION (Fig. 3). Mostly montane or moderatly elevated regions of South America and Africa where it occurs as a weed along paths, in gardens and disturbed areas generally; possibly introduced into Africa from South American in relatively recent times. Flowering most all seasons, depending upon rain.

An exceedingly variable, weedy taxon, especially on the eastern side of the Andes in northern Argentina, Bolivia, and Peru where it is undoubtedly native. Chrysanthellum tuberculatum is a sporadic form of the variety possessing tuberculate ray (and often disk) achenes; such plants occur throughout the American region. Cabrera (1973) correctly noted the relationship of the South American material to be with C. indicum and C. mexicanum and not C. americanum where most workers positioned these plants.

The Peruvian C. weberbaueri is a form with squat, much-thickened, somewhat tuberculate ray achenes, but otherwise scarcely different from typical afroamericanum; individuals of the latter occur in the same region with the former suggesting that this character is quite polymorphic. Indeed a similar, but not so striking, variability is found in African populations in which the ray achenes may be smooth or tuberculate, etc. Also noteworthy in both African and South American plants is the occasional occurrence of poorly developed, but distinct, awns at the apex of the disk achenes, much in the manner of Bidens or Isostigma.

Ariza and Cerana recognized Chrysanthellum argentinum largely by

the presence of well-developed wings on the ray achenes. In northcentral Argentina populations occur in which individuals have both ray and disk achenes essentially monomorphic or heteromorphic (i.e., disk achenes winged and the ray achenes unwinged). Indeed, the development of wings on ray achenes should not require much of a genetic change and I suggest that the considerably polymorphic variation which I found during my own field work in this region is due to such variation. In any case additional work will be needed to show that C. argentatum is an isolated gene pool growing within the bounds of C. indicum var. afroamericanum. Personally, I suspect that the former are weakly differentiated populations in which only a few genes for wing expression on the ray achenes have become partially fixed. Experimental crosses and progeny studies will be needed to resolve the problem.

Brazilian populations are also quite variable, especially the disk achenes, which often possess very narrow, ciliate, cartilaginous margins similar to those found in var. mexicanum. Similar forms also occur rarely in African populations; expression of this character is apparently regulated by a relatively simple genetic system. The larger heads, more numerous flowers, and the occurrence of individuals within these same populations with winged achenes typical of var. afroamericanum, show that the origin or closest affinity of the Brazilian populations must lie with the South American-African taxon and not var. mexicanum. Considering its weedy nature and the paucity of material collected in the Brazilian area it seems likely that these populations were introduced into this region from Andean populations in relatively recent times.

Wild (1967) and Milne-Redhead (1948) treated the African specimens of Chrysanthellum indicum as C. americanum, as did workers before them. They report collections from the countries of Malawi, Mozambique, Rhodesia and Zambia. In December of 1975 I examined African specimens at BM and K and in December of 1982 from MO. The earliest year of collection is given in parenthesis for the following countries:

Angola (1857)	Kenya (1915)	Southwest Africa (1907)
Burundi (1972)	Malawi (1974)	Sudan (1929)
Cameroun (1964)	Mozambique (1944)	Tanzania (1932)
Eritrea (1902)	Nigeria (1899)	Uganda (1912)
Ethiopia (1838)	Rhodesia (1912)	Upper Volta (1972)
Guinea (1949)	Senegal (1938)	Yemen[Arabian Peninsula] (1977)
Ivory Coast (1967)	South Africa (1906)	Zaire (1950)

Thus, if introduced into Africa during historic times, Chrysanthellum indicum probably found first-footing in the Abyssinian highlands of East Africa, subsequently spreading to the more western and southern lower montane regions. Indeed, populations from Ethiopia are exceedingly variable and some of these with small heads and nearly wingless achenes could as readily be annotated as var. indicum.

Subsp. MEXICANUM (Greenm.) B. L. Turner, Phytologia 51: 291. 1982.

The subspecies is represented by a single taxon, var. mexicanum.

5d. CHRYSANTHELLUM INDICUM var. MEXICANUM (Greenm.) B. Turner, Phytologia 51: 291. 1982.

Chrysanthellum mexicanum Greenm., Proc. Amer. Acad. Arts 39: 114. 1903. TYPE: MEXICO. Jalisco: Banks of ravines near Guadalajara, 10 Sep 1890, C. G. Pringle 3259 (lectotype GH!; isolectotypes ENCB!, F!, K!, MICH!, MO!, NY!, S!, UC!).

Coreopsis diffusa M. E. Jones, Contr. Western Bot. 18:73. 1933. TYPE: MEXICO. Jalisco: La Barranca, Guadalajara, 7 Nov 1930, M. E. Jones 27720 (holotype POM). As noted by Morton (1945), Sherff was the first to relegate this to synonymy under this taxon.

Similar to, but differing from, the var. indicum in possessing longer peduncles and longer leaves but especially by the somewhat larger disk achenes with narrower, more ciliate, cartilaginous margins. As noted by Greenman in his original description, var. mexicanum bears a close resemblance to var. indicum; this was also recognized by Cabrera (1973). I agree with both these authors and after examining a broad suite of specimens from throughout the world find it most reasonable to treat the largely continental isolates as weak, but distinct, varieties, most of which are sufficiently differentiated so as to be accorded the rank of subspecies.

DISTRIBUTION (Fig. 4). Mostly montane or moderately elevated subtropical regions of Mexico and Guatemala where it occurs as a weed along paths and roadways, especially in shallow wet depressions. Flowering, Jul-Oct.

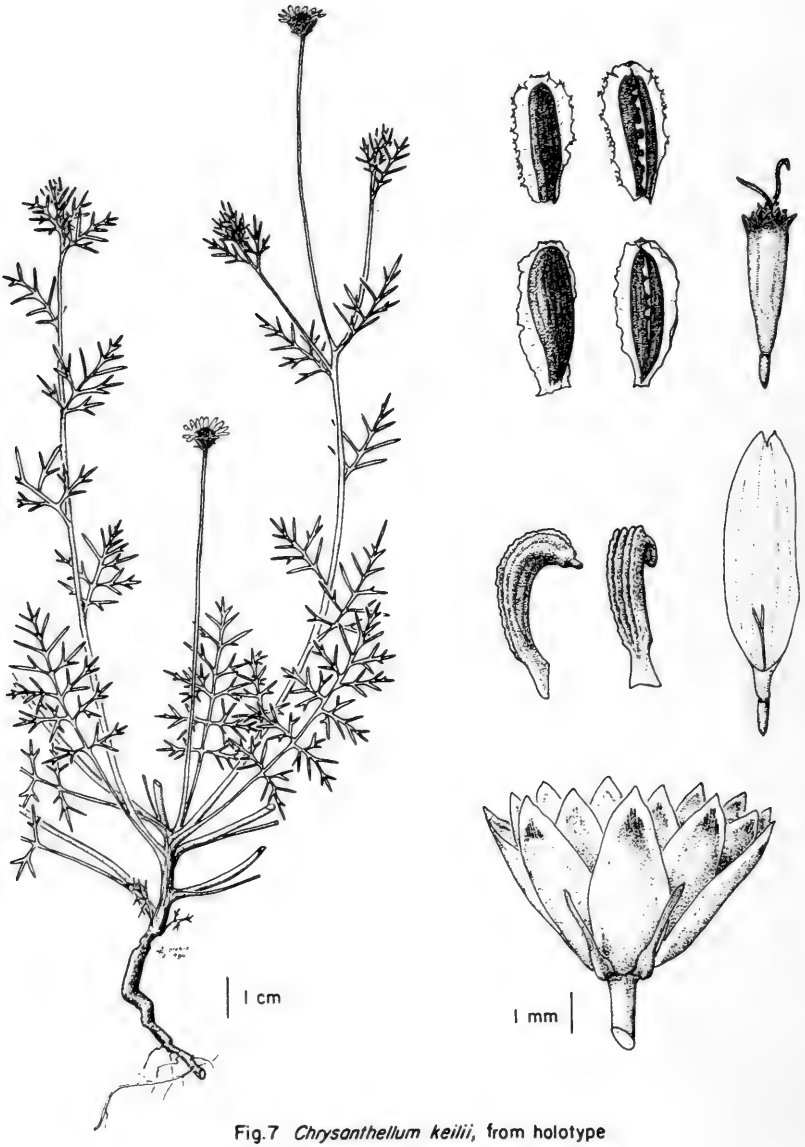

Fig.7 *Chrysanthellum keilii*, from holotype

6. CHRYSANTHELLUM FILIFORME McVaugh, Contr. Univ. Michigan Herb. 9: 412-413. 1972. TYPE: MEXICO. Michoacan: Summit of Canon el Marques, ca. 8 km N of Nueva Italia, ungrazed hillsides in Bouteloua grassland, 450-500 m, 19 Sep 1958, McVaugh 18030 (holotype MICH!; isotypes ENCB!, LL!, MICH!, NY!).

Slender, delicate, erect, glabrous annuals, 10-40 cm tall. Leaves, 2-9 cm long, pinnately dissected with narrowly linear divisions. Peduncles, at maturity, 7-12 cm long. Heads 1.2-1.8 cm across, 6-8 mm high, subtended by 3-4 bracts ca. 2 mm long; involucre double, an outer series of 5, scarious-margined, lanceolate phyllaries, 4-5 mm long, 1.5-2.0 mm wide, an inner series of 5(8) similar phyllaries. Ray florets 8-15, "orange", the ligules 5-7 mm long, ca. 2 mm wide, 4-5(6) nerved, obtuse or emarginate. Disk florets 20-30, brownish-red, "sterile", the tube 1.0-1.5 mm long, limb 3-4 mm long, 5(4) lobed. Ray achenes clavate, slightly incurved, 3.5-4.0 mm long, abaxially, 6-8 sulcate.

DISTRIBUTION. Known only from the type collection, cited above.

As noted by McVaugh in his original description, the species is quite distinct, being closer to Chrysanthellum americanum than to C. indicum. Actually, with the exception of C. keilii, C. filiforme, with its 4-5 nerved ligules, pinnately dissected leaves and somewhat incurved achenes, seems to stand closer to C. involutum than it does to C. michoacanum, its closest taxon among the C. americanum complex. The relationship of C. filiforme to C. keilii is discussed under the latter.

7. CHRYSANTHELLUM KEILII B. L. Turner, sp. nov. Fig. 7.

C. filiforme McVaugh accedens sed achaeniis florum radiatorum florumque aliorum fecundorum valde incurvis.

TYPE: MEXICO. Michoacan: 0.3 mi E of Antunez along highway 120; 8.7 mi W of Cuatro Caminos in areas of cultivation with thorn forest; "locally common in bottom of ditch", 1100 ft, 29 Aug 1981, D. Keil 15222 (holotype TEX!; isotypes ASU!, ENCB!, MEXU!).

Slender, erect, glabrous annual, 20-50 cm tall. Leaves, 3-15 cm long, pinnately dissected with narrowly linear divisions. Peduncles, at maturity, 7-18 cm long. Heads 1.0-1.5 cm across, 6-8 mm high, subtended by 3-5 bracts ca. 2 mm long; involucre double, an outer series of 5, scarious-margined, lanceolate phyllaries, 5-6 mm long, 1.5-2.5 mm wide, an inner series of 5(8) similar phyllaries. Ray florets 21-32, orange, the ligules 4.0-6.5 mm long, 2.0-3.0 mm wide, 4-nerved, obtuse or with a small notch. Disk florets 20-40, brown, mostly fertile, the tube 0.5-2.0 mm long, limb 2.0-4.5 mm long, 5-lobed. Ray achenes strongly incurved, 4-5 mm long, ca. 1 mm in diameter, rugose and 2-4 sulcate along the outer surface, the inner surface smooth; disk achenes somewhat spoon-shaped, 3.5-4.0 mm long, the body black, ca. 1 mm wide, smooth and glabrous on the outer

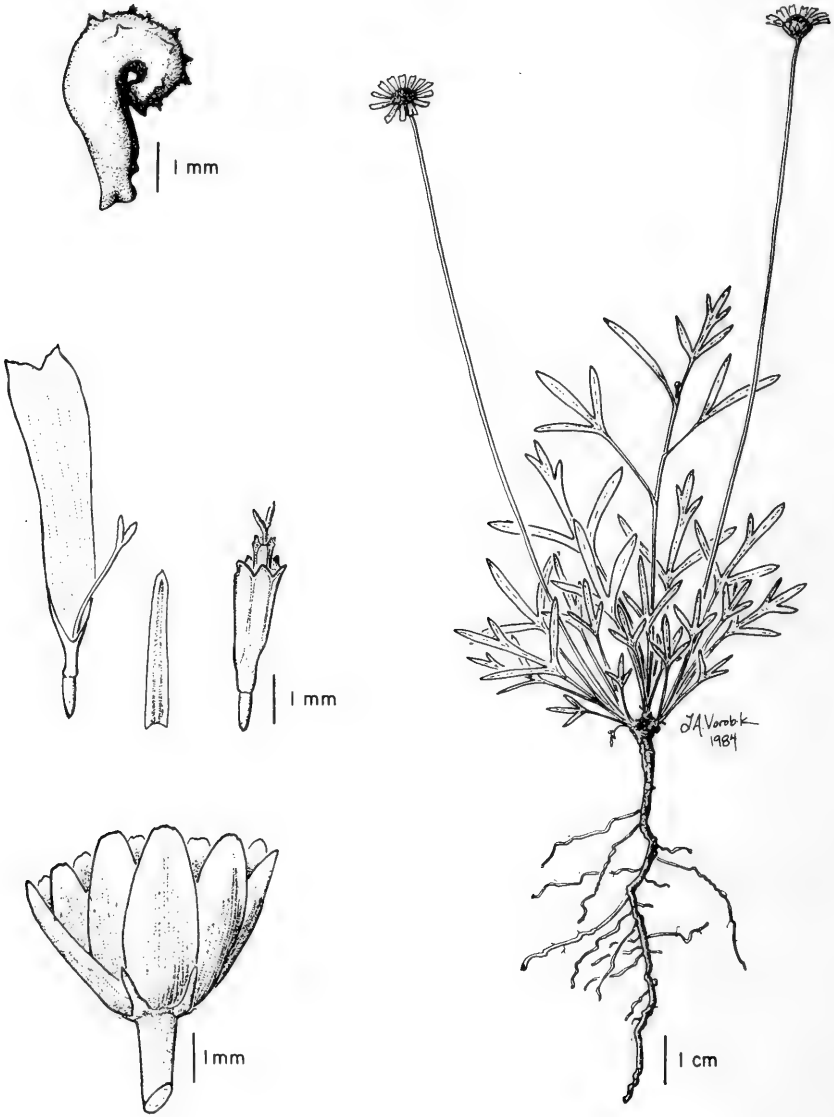

Fig.8 *Chrysanthellum perennans*, from holotype

surface but with a warty mid-vein on the inner surface, bordered on both sides by a white cartilaginous erose wing about 0.5 mm wide.

Chromosome number, 2n = 8 II (Keil 15222).

Additional collection. MICHOACAN: 8 mi S of Cuatro Caminos along highway 37; 2.4 mi N of El Capirio; thorn forest with short grass understory, "scattered in short grass, rocky area", 900 ft, 31 Aug 1981, D. Keil 15249 (ASU, TEX).

I propose this species with considerable hesitation since in habit, floral morphology and general geography it is like C. filiforme. However, the latter has fewer ray florets which produce nearly straight achenes and, as noted by McVaugh, it has completely "sterile" disk florets.

Such differences characterize species in other member-pairs of Chrysanthellum (e.g., C. americanum vs C. integrifolium; C. involutum vs C. tamaulipense; C. involutum vs C. indicum, etc.). Nevertheless, it is possible that relatively few genes regulate the sterility of what otherwise appear to be functional disk florets, including the remarkable transformation of ray florets. Thus McVaugh's disk-sterile, C. filiforme, with its nearly straight ray achenes, may be populational forms vicariously derived from what I have here described as C. keilii. Only additional field and experimental work can resolve the problem but it seems noteworthy that all of the 16 individuals from the two cited populations of C. keilii possessed fertile disk achenes and incurved ray achenes.

The taxon is named for Dr. David Keil, Professor at the University of California and avid scholar of the genus Pectis. Along with Dr. Melissa Luckow, he collected the fine set of specimens upon which the present species is based.

8. CHRYSANTHELLUM PERENNANS Turner, Phytologia 51: 293. 1982. Fig. 8. TYPE: MEXICO. Oaxaca: Along the Pan-American Highway, 22 km NW of Zanatepec, 100 m elevation or less; high dense vegetation, 10 Jul 1958, R. M. King 463 (holotype LL!; isotype MICH!).

Small, erect, glabrous perennial with well-developed, corky tap roots, with new growth producing from its crown up to four rosettes, each bearing but a single, elongate peduncle. Leaves merely tripartite with occasional secondary lobing, the lobes linear to lanceolate, 3-20 mm long, 1-3 mm wide. Peduncles at maturity, 15-20 cm long or longer. Heads ca. 15 mm across, ca. 6 mm high, subtended by 3-5 acuminate, prominently ciliate bracts, 1.0-1.5 mm long; involucre double, an outer series of 5, lanceolate, scarious-margined phyllaries, 5-6 mm long, 2-3 mm wide, an inner series of ca. 5 similar phyllaries. Ray florets ca. 13, "orange", the ligules ca. 8 mm long, 2 mm wide, 6-7 nerved and deeply cleft (ca. 2 mm). Disk florets presumably "sterile", "brown-orange", 5-lobed, the tube ca. 0.8 mm long, limb 2.0-2.2 mm long. Achenes immature.

DISTRIBUTION (Fig. 6). Known only the type locality where it is reportedly uncommon in sandy soil, and a single collection from Mcpio. Cintalapa, Oaxaca, in pine-oak woodlands. Flowering Jul-Sep.

Additional collection: OAXACA: Mcpio. Cintalapa, 23 km W of Las Cruces along road to La Mina Microwave Station, 870 m, 10 Sep 1981, Breedlove 52903 (CAS, TEX).

This is the only perennial taxon in the genus and is readily recognized by the elongate peduncles that arise singly from each rosette. Unfortunately, the collections available do not have mature heads so that the shape of the achene is unknown. These will probably prove to be circinate to some degree, to judge from the position of the corolla upon the somewhat oblique ovary, for it is positioned off-center towards the abaxial side.

9. CHRYSANTHELLUM PILZII Strother, Madrono 23: 358. 1976. TYPE: MEXICO. Oaxaca: ca. 1 km E of Salina Cruz, beach sand, 22 Jul 1971, J. Strother 1094 (holotype UC!; isotype TEX!).

Sparsely pubescent, annual herbs, 10-15 cm high; rosulate at first but soon forming prostrate stems. Leaves petiolate, arranged in nearly opposite pairs, the "pairs" separated by internodal lengths of 5-7 cm; blades tripartite, 2.0-3.0 cm long, 1.5-2.0 cm wide, the divisions variously lobed. Peduncles up to 9 cm or longer. Heads ca. 15 mm across, 8 mm high, subtended by 5, acuminate, prominently ciliate, bracts ca. 3 mm long; involucre double, an outer series of ca. 8, broadly lanceolate, scarious-margined, phyllaries, 5-6 mm long, 2-3 mm wide, an inner series of ca. 8 similar phyllaries. Ray florets ca. 13, yellow, the ligules ca. 6 mm long, 3-4 mm wide, 5-8 nerved, bidentate, the sinus shallow (0.5 mm or less). Disk florets brownish-yellow, functionally staminate, the tube ca. 0.8 mm long, limb 2.2-3.4 mm long. Ray achenes outcurved, the adaxial surface conspicuously echinate and marginally grooved, the abaxial surface depressed and smooth, ca. 6 mm long, 4 mm wide and 2 mm thick.
Chromosome number, $2n = 12$ II.

DISTRIBUTION (Fig. 6). Known only by a few collection from coastal dunes of eastern Oaxaca, 3-10 m. Flowering Mar-Jul.

Additional collections: OAXACA. Salina Cruz, 15 Jul 1946, Morley 680 (UC); Distr. Juguila, Trailer Park "Carrizalillo", Puerto Escondido, 10 m, 20 Mar 1983, Tenorio L. et al. 3578 (MEXU, TEX).

In spite of its restriction to what might appear to be relatively recently formed habitats (sand dunes), this is a remarkably distinct taxon. In habit it looks, at first glance, like a Bidens, especially in the superficially "paired" spacings of its alternate leaves, but it is best recognized by its large, prickly-tuberculate, evolute achenes. Its relationship is undoubtedly with the multinervate series, presumable near C. involutum or C. perennans.

10. CHRYSANTHELLUM INVOLUTUM P. G. Wilson, Hooker's Icon. Pl. 36: tab. 3587. 1962. TYPE: MEXICO. Mexico State, District Temascaltepec: on hill at Palmar, 9 Aug 1934, G. B. Hinton et al. 6977 (holotype K!; isotypes LL!, MICH!, NY!, UC!, US!).

Erect to ascending (rarely subrosulate) glabrous, annual herbs. Leaves bi-or tripinnatisect, up to 12 cm long. Peduncles, at maturity, 6-15 cm long. Heads 4-16 mm across, 6-7 mm high, subtended by 2-4 linear bracts, 2-4 mm long; involucre double, an outer series of ca. 8, elliptic to oval phyllaries, 4-6 mm long, 2-3 mm wide, an inner series of ca. 5, linear to oblong phyllaries, 4-5 mm long, 0.5-1.3 mm wide. Ray florets 18-21, yellow, the ligules 6-7 mm long, 2-3 mm wide, 4-5 nerved and bidentate. Disk florets yellow, "sterile", the tube 0.8-1.0 mm long, limb 2.8-3.1 mm long. Ray achenes circinate-involute, the outer surface rugose and nerved at maturity, the inner surface smooth, ca. 0.8 mm wide, 2-3 mm in diameter.

DISTRIBUTION (Fig. 6). Limestone hills in states of Mexico, Michoacan, and Guerrero. Flowering, Aug-Sep.

The species was originally known from only 7 Hinton collections cited by Wilson in his original description, duplicates of which are widely distributed. An excellent drawing accompanying this description depicts nicely the important features of the plant, except that of the functionally staminate florets, which is commented upon by Wilson as "peculiar for the subtribe Coreopsidinae as the disk florets are always sterile." Actually, completely sterile disk florets were recorded for Chrysanthellum integrifolium nearly a century earlier by Steetz (1856) in his original description of that species. It is also found in several additional species, some of which are quite closely related to species with fructiferous disk achenes (e.g., C. filiforme and C. keilii).

The only collections of C. involutum, besides those of Hinton mentioned above, are those of Keil 15368, 15371 (both from the vicinity of Arcelia, Guerrero, 6 Sep 1981, ASU).

Chrysanthellum involutum superficially resemble C. indicum var. mexicanum but its closest relationship is presumably with C. tamaulipense, which is vegetatively similar to C. involutum and possesses circinate ray achenes, but has at least some of the disk florets in each head quite fertile. This is not so for C. involutum, as determined by my examination of 100 or more heads from 50 or more plants.

11. CHRYSANTHELLUM TAMAULIPENSE Turner, Phytologia 51: 292. 1982. Fig. 9. TYPE: MEXICO. Tamaulipas: 6 mi. N of Aldama on the road to Soto la Marina, "Weedy growth in bottom of small arroyo through the basalt uplands.", 25 Sep 1960, J. Crutchfield & M. C. Johnston 5726 (holotype TEX!).

Fig. 9 *Chrysanthellum tamaulipense*, from holotype

Prostrate glabrous annual herbs. Leaves bipinnatisect, 2-6 cm long. Peduncles slender, at maturity 4-12 cm long. Heads 12-15 mm across, 5-6 mm high, subtended by 2-4 linear bracts, 2-4 mm long; involucre double, an outer series of 5, narrowly ovate, scarious-margined, phyllaries 4-5 mm long, 1.5-2.0 mm wide, the inner series similar but somewhat smaller. Ray florets ca. 21, yellow, the ligules ca. 6 mm long, 1.2-2.0 mm wide, 4-nerved, obtuse or indistinctly notched. Disk flowers yellow, at least some of them quite fertile, 5(4)-lobed, the tube ca. 1 mm long, limb ca. 2 mm long. Ray achenes circinate, the abaxial surfaces rugose at maturity, the inner surfaces smooth, ca. 0.8 mm wide, 1.8-2.0 mm in diameter. Disk achenes narrowly elliptic, ca. 4 mm long, 2 mm wide, bordered with conspicuous, erose, often ciliate, corky wings.

Chromosome number, $2n = 8$ II.

DISTRIBUTION (Fig. 6). Known only from the holotype and one additional collection (Tamaulipas: 2.4 mi N of Aldama, 16 Sep 1964, Strother 544, TEX).

The species is undoubtedly closely related to Chrysanthellum involutum but is readily distinguished by its smaller, less petiolate, mid-stem leaves, generally smaller floral parts and especially by its quite fertile disk florets. In all these characters C. tamaulipense approaches C. indicum but its circinate, marginal achenes and 4-nerved ligules place it nearer C. involutum.

EXCLUDED SPECIES

Chrysanthellum smithii Backer = Neuractis smithii (Backer) B. Turner, comb. nov.--based on Chrysanthellum smithii Backer, Bull. Jard. Bot. Buitenzorg 12:39. 1913.

Chrysanthellum leschenaultii (Cass.) Backer ex Koster = Neuractis leschenaultii Cass.

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A NEW SPECIES OF MELAMPODIUM (ASTERACEAE-HELIANTHEAE) FROM OAXACA, MEXICO

B. L. Turner

Department of Botany, Univ. of Texas, Austin, TX, U.S.A., 78713

Exploration of Cerro Espina, a site near Pachutla, Oaxaca, well-known for its concentration of endemic taxa, has revealed the following novelty in Melampodium. It is related to the delicate annual, M. tepicense, but amply distinct.

MELAMPODIUM NORTHINGTONII B. L. Turner, sp. nov., Fig. 2.

M. tepicensi B. L. Rob. simile sed foliis glabris, pedunculis 10-23 mm longis, et flosculis disci numerosioribus (10-14) differet.

Annual herb to 30 cm high. Stems erect, 1.0-1.5 mm diameter, puberulent to nearly glabrate. Leaves mostly 20-35 mm long, 10-20 mm wide; petioles 5-8 mm long; blades rhombic-ovate, broadly obtuse at the base, acute to obtuse at the apices, the upper surfaces sparsely strigose, the lower surfaces glabrous or nearly so, the margins obscurely crenate. Heads 2-3 mm high on peduncles 8-28 mm long. Involucre cupulate, 3.5-5.0 mm across; outer bracts 5, elliptical, somewhat connate at base, ca 2.5 mm long, 1.0-1.5 mm wide, rounded or obtuse at the apex. Fruits (body) ca 2 mm high, ca 1.5 mm across, the lateral surfaces with a vertical or oblique tuberculate ridge across an alveolate face; apices mostly without appendages (however, a few abaxial, flattened, appendages up to 2.5 mm long occur on a few fruits). Ray florets 5; corollas yellow, the ligules 1.5-2.0 mm long, 0.5-1.0 mm wide. Disc florets 10-12. Palea obovate, ca 1.5 mm long, 0.5 mm wide.

TYPE: MEXICO. OAXACA: southern lower slopes of Cerro Espina, ca 9 mi N of Pachutla. 23 Aug 1980, B. L. Turner 80A-26. (holotype TEX; isotype MEXU).

The species obviously belongs to the section Serratura of Melampodium and will key to M. tepicense B. L. Rob. in Stuessy's (1972) treatment of the genus. The latter species occurs along the Pacific Coast from Nayarit to Michoacan (Fig. 1). Melampodium northingtonii can be distinguished from M. tepicense by its much longer peduncles, nearly glabrous leaves and more numerous disc florets. It is also close to M. dicoelocarpum B. L. Rob. but the latter has longer, more acuminate, leaves, longer peduncles, larger heads, longer rays and fruits with different sculpturing, etc.

Melampodium northingtonii might, with some validity, be treated as a variety of either M. tepicense or M. dicoelocarpum but it appears as distinct from both of these as does M. sinaloense Stuessy. Indeed, it appears somewhat intermediate between these several taxa but, overall,

closer to M. tepicense.

It is a pleasure to name this species for Dr. David Northington, currently Director of the National Wildflower Center, Austin, Texas, who worked on the composite genus Pyrrhopappus for his doctoral thesis at the University of Texas, Austin. He also participated in the field work that led to the discovery of the present novelty.

ACKNOWLEDGEMENTS

I am grateful to Dr. Tod Stuessy for a critical appraisal of the manuscript; to Dr. Guy Nesom for the Latin diagnosis; and to Doris Tischler for the illustration.

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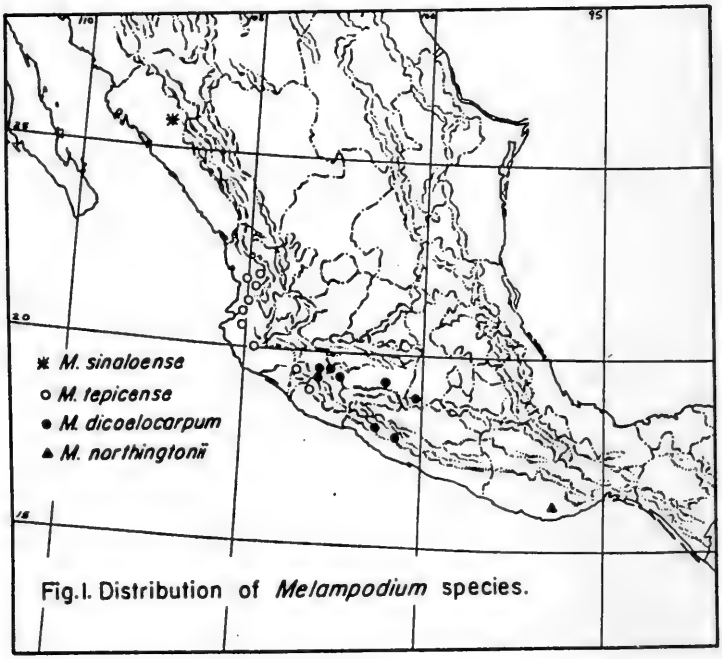

Fig. 1. Distribution of *Melampodium* species.

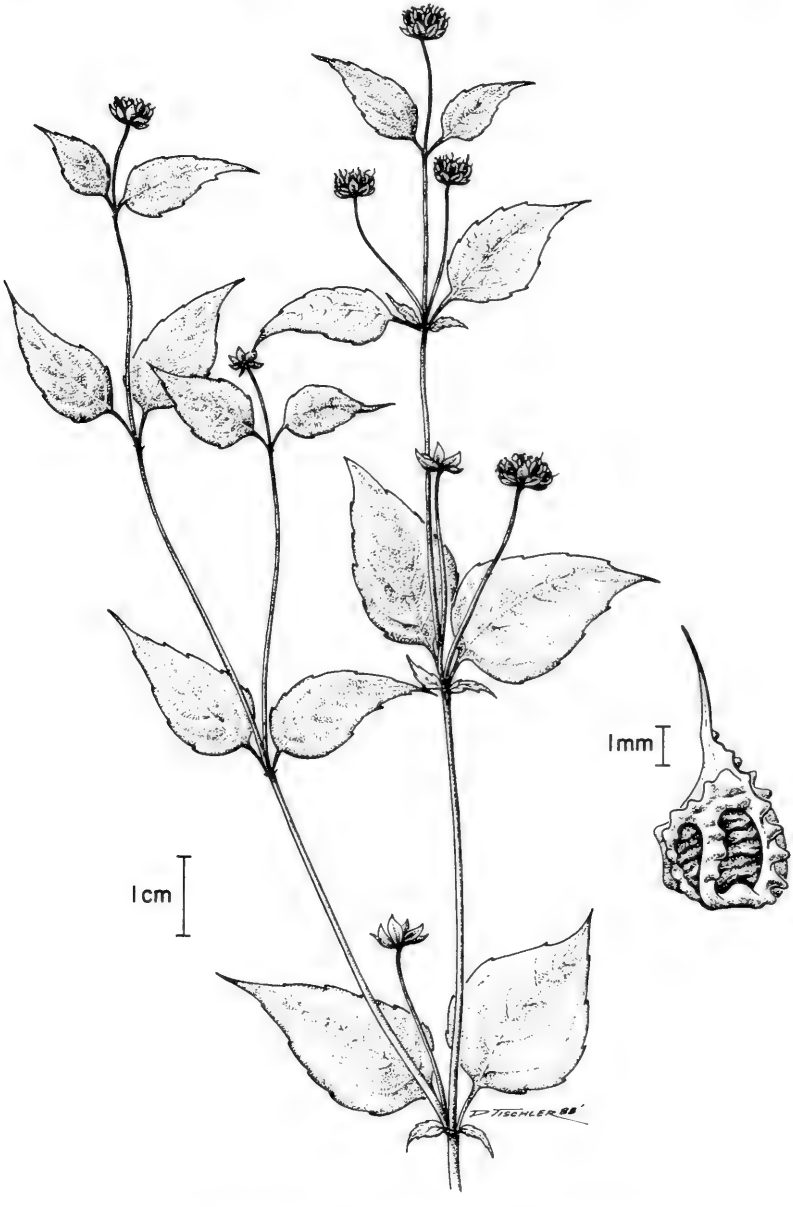

Fig. 2. *Melampodium northingtonii* (from holotype)

SYNOPSIS OF CHAETOPAPPA (COMPOSITAE-ASTEREAE) WITH A NEW SPECIES AND THE INCLUSION OF LEUCELENE

Guy L. Nesom

Department of Botany, University of Texas, Austin 78713

ABSTRACT

Chaetopappa includes species with a pappus ranging from one of strictly capillary bristles, a combination of bristles and scales, or a short crown, or in two species the pappus is essentially absent. Leucelene ericoides (Torrey) E. Greene, which has only bristles, is transferred to Chaetopappa. Chaetopappa asteroides var. imberbis A. Gray, an endemic of southeast Texas with only a coroniform pappus, is elevated in rank to species. Chaetopappa keerlioides Shinners is treated as a synonym of C. parryi A. Gray. A key emphasizing pappus characters is presented to distinguish the eleven species of the genus, and a brief summary of the distribution, habitat, and phenology is given for each species.

I. Merger of Leucelene with Chaetopappa

Chaetopappa as recognized by Shinners (1946a) included species with a pappus of a hyaline crown, hyaline scales, or a combination of an equal number (usually 5 each) of alternating scales and awn-like bristles, or with the pappus reduced to a minute crown or ring and appearing essentially absent. Soreng and Spellenberg (1984) recently described a new species with a pappus of numerous (13-19) bristles as well as an outer series of narrowly lanceolate scales. The description (Turner, 1977) of the distinctive C. plomoensis B. Turner added what appears to be only a small evolutionary step further in diversification of the pappus in Chaetopappa -- numerous (ca. 25) bristles without scales. Turner contrasted C. plomoensis with C. parryi A. Gray, which has a coroniform pappus without bristles, and I agree that the two species appear to be closely related.

The widespread and common Leucelene ericoiodes (Torrey) Greene has long been recognized as closely similar to Chaetopappa. Shinners (1946b) commented that "It hardly differs from Chaetopappa except in the entirely capillary pappus and characteristically creeping root and often partially underground stem." Since the pappus of C. plomoensis is identical to that of L. ericoides, and caudex-like, partially underground branches commonly occur in C. parryi and C. plomoensis, Leucelene cannot be justifiably maintained as a genus separate from Chaetopappa. I make the following combination to unite them:

Chaetopappa ericoides (Torrey) Nesom, comb. nov.

Inula? ericoides Torrey, Ann. Lyceum Nat. Hist. New York 2:212. 1828. TYPE: United States, probably Texas, "on the Canadian," summer, 1820, Dr. Edwin James s.n. (NY).

See below for further information about this species.

II. Elevation in rank of Chaetopappa asteroides var. imberbis

A study of the variation within Chaetopappa asteroides (Nutt.) DC. has convinced me that the following taxon is best regarded as a distinctive species.

Chaetopappa imberbis (A. Gray) Nesom, stat. et comb. nov.

Chaetopappa asteroides (Nutt.) DC. var. imberbis A. Gray, Proc. Amer. Acad. Arts 16:82. 1880. TYPE: Texas, Gonzales Co., post oak woods, April, 1849, C. Wright s.n. (Holotype: GH!; isotype: US). Shinners (1946a) discussed the location of the type collection, noting that it probably was either in Fayette or Gonzales county; now knowing the species distribution in some detail, it almost certainly was in the latter.

Annuals 4-15 cm tall from a slender taproot, branching from above the middle of the initial stem. Stems with thin, spreading hairs 0.5-1.2 mm long, thin and spreading or appressed above and spreading below, rarely appressed above and below, always prominently glandular with minute, sessile or short-stipitate resin glands. Leaves moderately hirsute with long, erect-spreading hairs, glandular like the stems; basal leaves oblanceolate-spatulate to oblanceolate-obovate, 8-26 mm long, 3-6 mm wide at the widest point, with a long-attenuate petiolar base about half the leaf length, apices rounded-obtuse to slightly emarginate; cauline leaves ascending, somewhat reduced in size, becoming epetiolate upwards. Heads turbinate-cylindric, 2-3 (-4) mm wide; phyllaries elliptic to lanceolate or oblanceolate, with broad, white, scarious margins, 3.5-4.5 mm long, the outer strongly rounded-keeled at fruit maturity, moderately strigose. Rays 8-19 in a single series, the ligules white, drying white to purplish, 4-5 mm long, 1.2-2 mm wide, coiling upon maturity. Disc corollas 2.5-3 mm long, with resin droplets on the upper part. Achenes brown to purplish, oblanceolate, slightly compressed, 8-nerved, 1.5-1.8 mm long, 0.5-0.6 mm wide, with long hairs in 8 lines. Pappus a white, hyaline, erose-margined, asymmetrical, cup-like crown 0.2-0.5 mm high, without bristles.

Endemic to southeast Texas, open areas in deep, loose, sandy soil, particularly of the Carrizo Formation (marked below by an asterisk), usually in oak woodlands; (Feb-) Mar-May (-Jun).

Representative specimens: Texas: *Atascosa Co., N of Pleasanton on Hwy 281, Whitehouse 10346 (SMU); Aransas Co., Goose Island State Park, Johnston 152 (TEX); *Bexar Co., 16 mi S of San Antonio, Schulz

445 (US, cited by Shinners); *Caldwell Co., 5.0 mi E of McMahan on FM Rd. 713, Nesom 6360 (NLU, RM, RSA, SMU, TEX); Goliad Co. Victoria-Goliad, Tharp 7471 (LL); *Gonzales Co., E of Ottine, 6.6 S of jct in Luling on Hwy 183, Nesom 6232 (ARIZ, ASU, CAS, F, GH, ILL, NLU, NMC, OS, SMU, TEX, UC); *Guadalupe Co., 13 mi S of Seguin on Hwy 123, Nesom 6224 (CAS, ENCB, MO, NCU, NY, SMU, TEX, US); Kenedy Co., Katherine (Armstrong), York s.n. (TEX); Nueces Co., Nueces Bay, Heller 1436 (GH, cited by Shinners); *Wilson Co., 14 mi NW of Nixon on FM Rd 1681, Nesom 6228 (MICH, NCU, SMU, TEX, UC).

Chaetopappa imberbis was first described by Asa Gray as a variety of Chaetopappa asteroides and later treated by Shinners at the same rank. Still later, Correll and Johnston (1970) did not recognize it at any rank, sinking it within C. asteroides. Both taxa are slender, taprooted annuals with narrow heads and at least a tendency to produce minute resin droplets on both the vegetative and floral organs.

Although C. imberbis appears to be very closely related to C. asteroides, its 8-nerved achenes with a crown-like pappus of fused scales, lacking bristles, is very different from that of the latter, which has 5 (-6)-nerved achenes with a pappus of 4-6 narrow, separate scales alternating with the same number of thick, awn-like bristles 1.5-3 mm long. The vestiture of loose, slightly crinkly, spreading stem hairs typical of C. imberbis is not known at all in C. asteroides, which has hairs that are shorter, straight, and antrorsely appressed, usually tightly, from top to bottom of the stem. Occasional variant individuals in populations of otherwise typical C. imberbis may have stem hairs ascending or loosely appressed on the upper part of the stems, or rarely the hairs may be appressed from top to bottom, similar to that of C. asteroides.

The newly recognized species has a very discrete geographic range in southeastern Texas. At least in most of its range, from Atascosa Co. to Caldwell Co., it appears to be restricted to the deep, loose, light-colored sands of the narrow exposure of the Carrizo Formation (Eocene). Chaetopappa imberbis joins a number of other narrow endemics at least primarily restricted to that outcrop. It is often extremely abundant there but completely absent immediately to either side, where sands are either absent or of a different texture and composition. North of northern Caldwell Co., where the Colorado River floodplain intersects the Carrizo Formation, C. asteroides is generally abundant on the Carrizo sands and C. imberbis appears to be completely absent. Neither taxon was noted in the list of species presented by McBryde (1933). The collections of C. imberbis from Aransas, Goliad, Kenedy, and Nueces Cos. are from sandy habitats in coastal or near-coastal localities separated from the Carrizo Formation.

III. Synopsis of the genus

The following synopsis summarizes what is currently known about the diversity, distribution, and ecology of Chaetopappa and provides

a key to species that emphasizes differences in pappus, which can be observed even on relatively immature fruits. Typification and more detailed synonymy are found in the revision by Shinners (1946a).

Keck (1958) considered the species of Pentachaeta to be congeneric with Chaetopappa. Van Horn (1973), however, on the basis of a wide range of evidence rejected this conclusion and maintained the two as separate genera.

CHAETOPAPPA DC.

Annual or perennial herbs 5-30 cm tall. Leaves alternate, simple, entire, linear to oblanceolate-obovate to spatulate. Heads solitary and terminal, not crowded, heterogamous, turbinate-cylindric to hemispheric, 2-10 mm wide; phyllaries elliptic to linear-lanceolate, in 2-6 graduated series, with wide, prominent, whitish-scarious margins. Receptacle scrobiculate, epaleate, flat or slightly convex. Ray flowers uniseriate, pistillate fertile, the ligules usually white, drying white to blue or purple, coiling upon maturity. Disc flowers hermaphroditic, fertile but the central ones sometimes abortive, the corollas yellow, tubular, regular; style appendages shallowly triangular to narrowly triangular. Achenes terete to strongly compressed, 2-5-, 8-, or 10-nerved; carpopodium absent or barely perceptible. Pappus of a hyaline crown, hyaline scales, awn-like bristles, or a combination of alternating scales and bristles, or reduced to a minute crown or ring and appearing essentially absent. Chromosome numbers, n=8, 9, 16 pairs.

KEY TO THE SPECIES

1. Pappus absent or essentially so, represented by a minute, thickened ring or corona at the achene summit. (2)

   2. Plants perennial, fibrous-rooted; lower cauline leaves lanceolate-oblong, 6-12 mm wide, subclasping, very abruptly reduced in size in the capitulescence; ray achenes 2-ribbed; pappus a thickened ring or minute, erose crown less than 0.1 mm high ..... C. effusa

   2. Plants annual, taprooted; lower cauline leaves obovate-spatulate, 1-3 mm wide, not clasping; ray achenes 10-ribbed; pappus a minute, thickened ring ..... C. bellidifolia

1. Pappus of awn-like bristles alone or of scales alone or a combination of alternating bristles and scales. (3)

   3. Pappus of bristles alone, or if scales present, minute and less than 0.1 mm high. (4)

      4. Plants forming low mats less than 20 mm high; pappus of (-4) 5 (-6) bristles 2-4.2 mm long and an outer series of minute scales or squamellae less than 0.1 mm long ..... C. hersheyi

4. Plants much taller; pappus usually of 25 bristles, without scales or squamellae. (5)

5. Basal leaves persistent, spatulate; cauline leaves non-overlapping, eglandular, glabrous beneath (abaxially), hairy above; heads 2-3 mm wide; phyllaries glabrous; endemic to northern Coahuila ..... C. plomoensis

5. Basal leaves absent by flowering; cauline leaves densely overlapping, usually glandular, hairy beneath but not above; heads 4-8 mm wide; phyllaries strigose; wdiepread in Mexico and the western United States ..... C. ericoides

3. Pappus of scales or a crown, with or without accompanying bristles. (6)

6. Pappus of a hyaline crown alone. (7)

7. Plants 4-15 cm tall, annual from a slender taproot ..... C. imberbis

7. Plants usually much taller, perennial from fibrous roots. (8)

8. Lower cauline leaves elliptic-oblanceolate, mostly 2-5 mm wide, not clasping, gradually reduced into the capitulescence; ray achenes 3-ribbed; pappus a hyaline corona 0.3-0.8 mm high ..... C. parryi

8. Lower cauline leaves lanceolate-oblong, 6-12 mm wide, subclasping, very abruptly reduced in size in the capitulescence; ray achenes 2-ribbed; pappus a thickened ring or minute, erose crown less than 0.1 mm high ..... C. effusa

6. Pappus of scales and bristles. (9)

9. Plants perennial, matted, saxicolous, from branching caudices and fibrous roots; leaves coriaceous. (10)

10. Heads 2.5-3.5 mm wide; longest phyllaries 4-4.5 mm long, glabrous to glabrate; rays 6-10; pappus of (-4) 5 (-6) bristles 2-4.2 mm long and an outer series of minute scales or squamellae less than 0.1 mm long C. hersheyi

10. Heads 6-7 mm wide; longest phyllaries 5-6 mm long, prominently hairy; rays 10-24; pappus of 13-19 bristles 3.5-4 mm long and an outer series of scales 0.5-0.8 mm long ..... C. elegans

9. Plants annual, erect, from slender taproots; leaves herbaceous. (11)

11. Heads turbinate-cylindric, 2-3 (-5 in var. grandis) mm wide; achenes 5-nerved ..... C. asteroides

11. Heads hemispheric, 4-10 mm wide; achenes 2-3 nerved. (12)

12. Stems and leaves mostly with appressed-ascending hairs, eglandular ..... C. bellioides

12. Stems and leaves with stiff, spreading hairs, prominently stipitate granular-glandular C. pulchella

CHAETOPAPPA ASTEROIDES (Nutt.) DC., Prodr. 5:301. 1836.
Chaetophora (as Chaetanthera) asteroides Nutt.

Abundant in the eastern half of Texas, to Oklahoma, Kansas, Missouri, Arkansas and Louisiana, northern Tamaulipas, Mexico, and one extremely disjunct locality in northern Hidalgo, Mexico; open sandy or clay soil or rocky soil from limestone or granite, with juniper, oak, or pine or in prairies or savannas; 15-500 m; Mar-Jul (-Nov). Chromosome number, n=8 pairs.

Var. grandis Shinners, recognized by its wider heads (2.5-5 mm wide vs. 2-3 mm) with more rays (10-18 vs. 5-13) and longer pappus scales (0.5-1.4 mm long vs 0.1-0.8 mm) occurs along the Rio Grande valley in Texas, at the extreme southwestern corner of the range of the species, in Hidalgo, Jim Hogg, Starr, Webb, and Zapata counties. Only the var. asteroides has been collected in Mexico.

CHAETOPAPPA BELLIDIFOLIA (A.Gray & Engelm.) Shinners, Wrightia 1:71. 1946.
Keerlia bellidifolia A. Gray & Engelm.

Abundant in the Edwards Plateau of south-central Texas; open habitats in sandy, clay, or rocky soil, commonly in calcareous alluvium, limestone hills, usually with juniper and oak; 200-650 m; Mar-Jul.

CHAETOPAPPA BELLIOIDES (A. Gray) Shinners, Wrightia 1:77. 1946.
Diplostelma bellioides A. Gray
C. bellioides var. hirticaulis Shinners

Chihuahua, Coahuila, Nuevo Leon, Tamaulipas, San Luis Potosi, Durango, Zacatecas, and Aguascalientes, Mexico, adjacent border counties of south-central and southwest Texas; commonly over limestone, in the area of matorral or chaparral, or juniper, oak, or pine woodlands, rarely in grasslands; (30-) 550-2500 m; Feb-Nov (-Dec). Chromosome numbers, n=8, 9, 16.

Var. hirticaulis was distinguished by Shinners at the eastern periphery of the species range in the Sierra de San Carlos,

Tamaulipas, by its stem pubescence of spreading or somewhat matted hairs. The typical form, however, occurs with var. hirticaulis in single, intergrading populations in the San Carlos area and does not seem worthy of formal recognition. Further, several collections of otherwise typical C. bellioides with spreading-ascending stem hairs have been made from different localities in Nue. Plants of C. bellioides with atypically large leaves also have been collected from Tamaulipas.

CHAETOPAPPA EFFUSA (A. Gray) Shinners, Wrightia 1:68. 1946.
Keerlia effusa A. Gray

Endemic to the central part of the Edwards Plateau in south-central Texas; limestone cliffs or hillsides, sometimes in seepy areas, oak-juniper, oak, or mixed deciduous woods; May-Oct. Chromosome number, n=9 pairs.

CHAETOPAPPA ELEGANS Soreng & Spellenberg, Syst. Bot. 9:1. 1984.

Endemic to the White Mountains of south-central New Mexico, crevices in granitic outcrops, area of fir-pine-oak woods; 2500 m; May-Jul. Chromosome number, n=9 pairs.

CHAETOPAPPA ERICOIDES (Torrey) Nesom, see above
Inula? ericoides Torrey
Leucelene ericoides (Torrey) E. Greene
Diplopappus ericoides (Torrey) Torrey & Gray
Leucelene arenosa Heller
Aster arenosus (Heller) Blake

Western United States from Texas and Oklahoma to Nevada, California and Wyoming, northern Mexico from Sonora, Durango, and Zacatecas to Tamaulipas and San Luis Potosi; common in a variety of habitats---grasslands, matorral, Larrea, oak, pine-oak, pine-juniper, mesquite, and thorn-scrub; 1100-2500 m; Mar-Nov. Chromosome numbers, n=8, 16 pairs.

A geographically widespread species highly variable in the type and amount of pubescence as well as other features. Of 34 chromosome counts made from Arizona, New Mexico, Texas, and Chihuahua by Ward and Spellenberg (1986), all except two were tetraploid (n=16 pairs). Shinners (1946) noted that the late season forms are taller with narrower, less pubescent leaves, narrower and fewer-flowered heads, and shorter ligules. Some plants lack the dense vestiture of stipitate glands, but there does not appear to be a clear geographic pattern to the occurrence of these. Shinners also noted that a variant form in northern Mexico with fewer, more widely spaced leaves with long-attenuate petiolar bases might be considered varietally distinct, but I find intergradation complete between these and more typical plants.

CHAETOPAPPA HERSHEYI S. F. Blake, Proc. Biol. Soc. Washington 59:47. 1946.

Endemic to the Guadalupe Moutains of southern New Mexico and adjacent Texas, rocky (limestone) walls, ledges, and banks in canyons; 1500-2400 m; May-Aug. Chromosome number, n=8 pairs.

CHAETOPAPPUS IMBERBIS (A. Gray) Nesom (see description and discussion above)

CHAETOPAPPA PARRYI A. Gray, Proc. Amer. Acad. Arts 16:82. 1880.
C. keerlioides Shinners

Coahuila, Nuevo Leon, Tamaulipas, and San Luis Potosi, Mexico, rare in south-central Texas (Brewster Co.); chaparral or areas of oak, oak-juniper, oak-pine-fir, or pine woods, moist stream sides, steep slopes in crevices or talus; 1400-3000 (-3600) m; May-Sep (-Oct).

Chaetopappa keerlioides was described by Shinners (1946) as differing from C. parryi by larger cauline leaves, but with more collections we find that the range of variation in this character is continuous. According to Shinners, achenes of C. parryi sometimes bear 1-5 bristles, but this must be very rare because I have never observed bristles at all.

CHAETOPAPPA PLOMOENSIS B. Turner, Sida 7:22. 1977.

A distinctive species known only from the type collection: Coahuila, Mexico, La Cuesta del Plomo on the Musquiz-Boquillas highway, steep limestone slopes and canyon, encinar/izotal; Sep.

CHAETOPAPPA PULCHELLA Shinners, Wrightia 1:79. 1946.

Chihuahua and Coahuila, Mexico; matorral or chaparral, commonly with Larrea; 950-1750 m; (Mar-) Apr-Oct. Chromosome number, n=8 pairs.

Acknowledgments

I gratefully acknowledge the hospitality and assistance of Barney Lipscomb, Curator at SMU, the company of Jack Neff on a rainy collecting trip, Julia Wells on a sunny one, the helpful comments of Rich Spellenberg, and the loan of a type from GH.

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NEW SPECIES AND A NEW COMBINATION OF MEXICAN THEACEAE

Bruce Bartholomew, Department of Botany
California Academy of Sciences, Golden Gate Park
San Francisco, California 94118

The new species and combination published in this article will be treated in relation to all the taxa of Mexican Theaceae in a monograph on the Theaceae of Mexico that is presently in preparation.

Cleyera velutina Bartholomew, sp. nov.

Arbor magna 10-20 m alta. Ramunculi velutini. Petiolus velutinus, ca. 5 mm longus, ca. 1.5-2 mm latus; lamina coriacea, elliptica, ca. 8-12 cm longa, ca. 3.5-5 cm lata, apice acuto, base obtusa, marginibus integris, supra glabrata, subter velutina. Flores axillares; pedicellus velutinus, ca. 1 cm longus, diametro 1.5-2 mm; bracteae 2, velutinae, 2-4 mm longae, ca. 2 mm latae; sepala 5, velutina, ca. 4 mm longa, 3-4 mm lata.

Species a *C. integrifoliae* affinis sed pedicellis, bracteis, sepalis, ramunculis, petiolis et foliis subter velutinis.

Type: Mexico, Guerrero, 5-10 km above and SW of Filo del Caballo along road to Puerto El Gallo, 2440 m, 19-X-1984, *D.E. Breedlove 61902* (holotype CAS; isotypes GH, K, MEXU, MICH).

Distribution: Mexico (Guerrero).

Representative additional specimens. Guerrero: N slope of Cerro Alquitrán, 10-14 km W of Highway 95 and Mazatlán, 2250-2450 m, 6-XII-1966, *W.R. Anderson & C.W. Laskowski 4435* (ENCB, MICH); Mpio. Tlacoapa, 53 km S of Tlapa on road to Malinaltepec, 2600 m, 26-VI-1982, *E. Martinez S. 1109* (CAS); Sierra Madre del Sur, along the Milpillas-Atoyac road via Puerto del Gallo, 2740 m, 16-X-1975, *J.L. Reveal et al. 4219* (CAS, GH, MARY, MEXU, MO, K, US); 4.8 km W of Omiltani, 2514 m, 11-VI-1953, *C.M. Rowell, Jr. 3257* (MICH); Mpio. Chichihualco, 5 km W of Camotla, 2600 m, 8-IV-1963, *J. Rzedowski 16420* (MICH).

Ternstroemia dentisepala Bartholomew, sp. nov.

Frutex vel arbor 6-8(-15) m alta. Petiolus ca. 5 mm longus, 1.5 mm latus; lamina, glabra, coriacea, oblanceolata vel anguste obovata, (8-)10-12 cm longa, (2-)3-4 cm lata, apice acuto vel obtuso, base attenuata, marginibus integris. Flores axillares; pedicellus 2-3(-4) cm longus; bracteae 2, 5 mm longae, base 2 mm lata; sepala 5, 8-10 mm longa, 5-6 mm lata, apice acuto vel obtuso, base cordata, marginibus denticulatis, dentibus nigris 0.3 mm longis.

Species *T. lineatae* affinis, a qua differt sepalis denticulatis et foliis latioribus.

Type: Mexico, Nayarit, Mpio. Tepic, N side of Cerro San Juan, 1350 m, 4-X-1985, *B. Bartholomew et al. 2628* (holotype CAS; isotypes GH, MEXU, MICH, NY).

Distribution: Mexico (Jalisco, Nayarit, Oaxaca).

Representative additional specimens. Jalisco: Mpio. Autlán de Navarro, Logging road from El Chante to El Guisar in the Sierra de Manantlán, 2160 m, 17-VIII-1980, *D.E. Breedlove & F. Almeda 45631* (CAS); Sierra de Manantlán (30-35 km SE of Autlán),

precipitous seaward-facing slopes 1-4 km below the summit called La Cubre, 1500-1900 m, 22-23-III-1965, *R. McVaugh 23182* (ENCB, MICH); Mpio. Cuautitlán, Sierra de Manantlán, 1500 m, 10-I-1980, *L.M. Villarreal de Puga 11550* (ENCB, IBUG).

Nayarit: Road to Cuarenteno off the road to Jalcocotán, 1420 m, 16-II-1970, *F. Boutin & M. Kimnach 3262* (CAS, HNT).

Oaxaca: 24 km N of San Gabriel along road from Puerto Escondido to Oaxaca, 1830 m, 9-V-1965, *D.E. Breedlove 9899* (CAS, ENCB); Mpio. Juquila, 4 km S of Lachao, km 183 on road from Oaxaca to Puerto Escondido, 1850 m, 14-IV-1965, *J. Rzedowski 19599* (ENCB).

Ternstroemia huasteca Bartholomew, sp. nov.

Arbor parva 6-10 m alta. Petiolus 8-10 mm longus; lamina angusta elliptica, 11-13 cm longa, 2.5-4 cm lata, apice acuto vel leviter acuminato, base acuta, marginibus integris. Flores terminales, 3-5(-10), fasciculati; pedicellus 3-4.5(-5.5) cm longus, diametro ca. 1 mm; bracteae 2, roseae, oppositae, 3-4 mm longae, 2 mm latae, apice acuto; sepala 5, rosea, 8-12 mm longa, 6-10 mm lata, apice acuto, base cordata, marginibus atroroseis integris vel base pausa dentata; petala alba set apice luteo, 7-8 mm longo, 4-5 mm lato, apice acuto, base connata.

Species a *T. hemsleyi* affinis sed floribus terminalibus fasciculatis erectis.

Type: Mexico, Hidalgo, Mpio. Metztitlán, 0.6 km S of Alumbres on road to Zacualtipán, *B. Bartholomew 4035* (holotype CAS; isotypes C, CHAPA, ENCB, F, G, GH, K, MEXU, MICH, MO, NY, TEX, US, WIS).

Distribution: Mexico (Hidalgo, Puebla, Veracruz, Queretaro).

Representative additional specimens. Hidalgo: Mpio. Tianguistengo, 10 km W of Tianguistengo, (Tepeoco), 2100 m, 25-IV-1981, *R. Hernández M. et al. 5817* (CAS, ENCB, MEXU); Mpio. Juarez Hidalgo, Itztacoyotla, 15 km N of Juarez Hidalgo, 1800 m, 10-V-1981, *R. Hernández M. et al. 6107* (CAS, ENCB, MEXU); Mpio. Tlanchinol, 1 km SE of Unidad Habitacional de Otongo, 900 m, 25-IX-1971, *J. Rzedowski 28673* (ENCB); Cerro de Tutotepec, 1800 m, 19-III-1946, *A.J. Sharp 46198* (A, MEXU, TENN).

Puebla: Mpio. Tlatlauquitepec, Chachalcin, 1500 m, 8-VII-1983, *E. Ventura V. 1063* (ENCB).

Queretaro: Mpio. Tancoyol, La Parada, 1400 m, 16-IV-1969, *H. Puig 4510* (ENCB).

Veracruz: Mpio. Alto Lucero, Mata Verde between Rancho Nuevo and Tierra Blanca, 1200 m, 9-IV-1981, *G. Castillo C. & F. Vazquez B. 1462* (F); Mpio. Juchique de Ferrer, Cerro de Villa Rica, near Mundo Nuevo, 1600 m, 7-V-1981, *G. Castillo C. et al. 1816* (F); Mpio. Yecuatla, Barranca del Sedral towards the mountains, 1400 m, 26-V-1981, *C. Gutierrez B. 135* (F); Mpio. Huayacocotla, Between Ocotes and Agua de la Calabaza, 14 km NE of Huayacocotla, 1670 m, 23-IV-1981, *L.G. Juarez & F. Vazquez 57* (F); Mpio. Atzalán, Tatzayanala, 1400 m, 23-V-1970, *F. Ventura A. 1142* (DS, ENCB, F, MICH, MO, NY).

Ternstroemia lineata subsp. *chalicophila* (Loes.) Bartholomew, comb. nov.

Ternstroemia chalicophila Loes., Bull. Herb. Boissier ser. 2, 3: 213. 1903. Type: Mexico, Chiapas, above Huitztan, 10-III-1896 *C. Seler & E. Seler 2276* (holotype B (destroyed); lectotype GH here designated).

Distribution: Mexico (Chiapas), Honduras.

Ternstroemia lineata subsp. *chalicophila* is distributionally disjunct from *T. lineata* subsp. *lineata* which occurs in the Mexican states of Guerrero, Jalisco, México, Michoacán, Morelos and Sinaloa. The two subspecies are very similar but *T. lineata* subsp. *chalicophila* consistently has impressed lateral veins on the upper leaf surfaces.

NEW TAXA OF VENEZUELAN ARACEAE—II

George S. Bunting

ANTHURIUM

Anthurium bonplandii Bunt. subsp. **rionegrense** Bunt., subsp. nov. TYPE: Steyermark & Bunting 102741 (holotype, MO): Venezuela: Amazonas: Depto. Río Negro: San Carlos de Río Negro, selva en los alrededores del aeropuerto, 125 m, 17 Apr 1970. Figure 1 & 2.

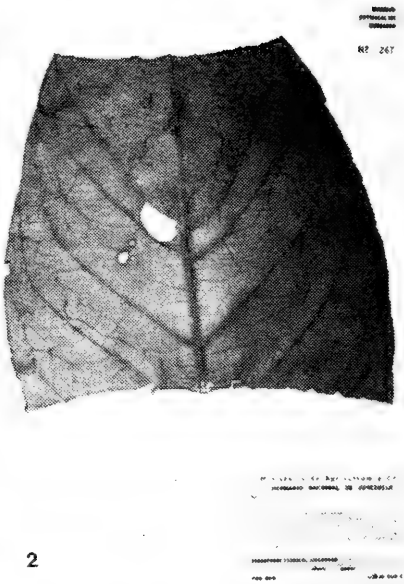
A subspecie typica foliorum lamina coriacea elliptico-spathulata deorsum longe attenuata basi ipsa plerumque anguste acutangulari aliquando costa excurrenti, abaxiale punctis fuscis facilius distinguibilibus, spadice saepe sub anthesi atropurpureo vel violaceo (ante anthesin interdum ex viridi bubalina), spatha etiam sub fructu ut videtur persistenti differt. Habitat ad terram in sylvis in arena alba; subspecies typica in locis saxosis ("lajas") ad basim fruticum et arbuscularum necnon ad saxa et scopulos crescit.

This subspecies is imperfectly understood. The simplicity of form of its leaf blade, combined with the considerable plasticity of that form, makes analysis of variation difficult in species of this sort. The problem is compounded by the paucity of morphological and phenological data obtainable from the specimens. In contrast to the typical subspecies, this is terrestrial, growing on white sand, in forest or [persisting] in adjacent disturbed areas.

The typical subspecies is somewhat better known, with a distribution apparently restricted to the upper and adjacent middle Orinoco River drainage within the limits of the area of superposed Roraima sediments. In the large region of Territorio Federal Amazonas that lies to the south and east, has been collected a number of specimens of Anthurium of rosulate habit and spathulate or elliptic leaf blade. It is a polymorphic assemblage having affinities with A. bonplandii, A. guayanum Bunt., etc., and remains under study. (Cf. A. vinillense Bunt. and A. xanthoneurum Bunt., recently described from this region.)

Anthurium bonplandii subsp. cuatrecasii Croat is inseparable from the typical subspecies of this taxon, having been based on a collection nearly identical to type material of A. bonplandii. Both collections were made from plants growing within the zone of continuous distribution of this taxon along the Orinoco, in localities separated by about 150 kilometers, and both were growing on top of boulders. It may have been the intent of Croat to distinguish nomenclaturally the broader-leaved form of this species that occurs near Puerto Ayacucho, but in view of the considerable variation of the leaf blade outline among plants in different growth phases and habitats, that form does not seem to merit recognition, or if so, at no more than the level of varietas or forma (Fig. 5).

1



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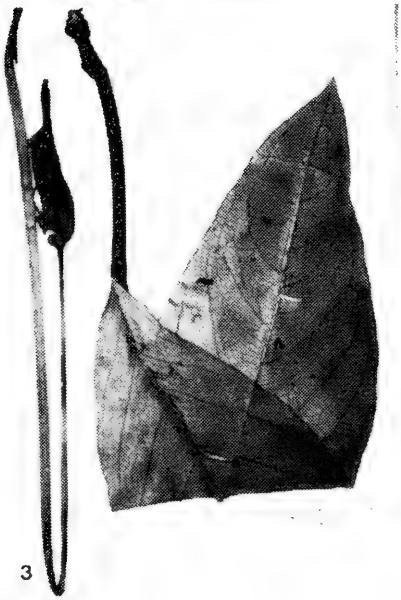

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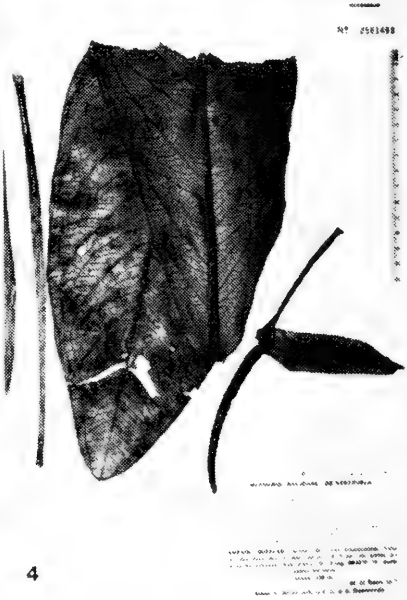

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Figure 5. **Anthurium bonplandii** Bunt. subsp. **bonplandii**, outline of adult leaf blade: **A**, based on type collection, Bunting et al. 3676; **B, C**, based on Croat 55065 (type of subsp. **cuatrecasii** Croat).

Anthurium corocoroense Bunt., sp. nov. TYPE: Maguire & Maguire 35425 (holotype, NY): Venezuela: Amazonas: Depto. Atures: Cerro Yutaje, northwest ridge, in montane woodland, 1500 m, 1 Mar 1953. PARATYPE: Liesner & Holst 21816 (MO): 5-8 km NW of settlement of Yutaje, sandstone stream on S slope below plateau, stream flowing S from E side of unnamed peak, 3 km W of Río Coro-Coro, W of Serranía de Yutaje, 5°40' N., 66°9' W., 700-1000 m, 10 Mar 1987. Figure 3.

A A. bonplandii Bunt. foliorum lamina crassius coriacea fere cartilaginea plerumque elliptica apicem versus acuta apice ipso breviter acuminata differt.

Stem horizontal. Cataphyll to 11 cm long. Petiole (17-)27-47 cm long, semiterete. Leaf blade thickly coriaceous nearly cartilaginous, more or less flat, mostly elliptic or rhombic-elliptic sometimes widest slightly above middle, 40-58 cm long, 14-23 cm wide, 2.4-3(-3.8) times longer than wide, base narrowly cuneate (one margin sometimes slightly concave) to obtuse, brown-punctate abaxially. Spathe red to light green, curled to reflexed. Spadix light brown or gray-brown. Ripe fruits red-purple or purple.

This species is known only from the area of Cerro Yutaje. It is terrestrial, growing on white sand and in dry, rocky places, as well as on boulders, in seasonally dry forest.

Anthurium guaiquinimae Bunt., sp. nov. TYPE: Steyermark, Dunsterville & Dunsterville 113258 (holotype, MO): Venezuela: Bolívar: Dtto. Heres: cumbre del Cerro Guaiquinima, 1-2 km río arriba del Salto Szczerbanari (río Caparo), 5°44'4" N., 63°41'8" O., parte central del cerro, bordeando zanjón, 750 m, 20-25 Jan 1977. PARATYPE: Steyermark, Berry, Dunsterville & Dunsterville 117258 (MO): same locality, parte sur-oriental-central del cerro, lomas bosqueadas, 730-900 m., 24 May 1978. Figure 4.

A A. bonplandii foliorum lamina consistentia majore plana obovata ad extremitates ambas obtusa vel subtruncata, spatha latiore (in sicco ca. 10 cm longa et 2.5 cm lata) et persistenti concomitata distinguendum.

Rosulate herb. Petiole to 28 cm long, more than 2/3 as long as blade. Blade flexible or stiff coriaceous, obovate, 41-49 cm long, 15-15.7 cm wide, base and apex obtuse or subtruncate, abaxially sparsely brown-punctate. Spathe more or less oblong, to 9.7 cm long and 2.5 cm wide in sicco, 3.5 cm wide and pale green in vivo, persistent. Spadix dark purple, 10 cm long.

This is a common, terrestrial species on the summit of Cerro Guaiquinima, where it is apparently endemic.

Anthurium vinillense Bunt., sp. nov. TYPE: Huber 6201 (holotype, VEN; isotypes, MO, NY): Venezuela: Amazonas: Depto. Río Negro: sabana colinosa en el sector central de una altiplanicie en la

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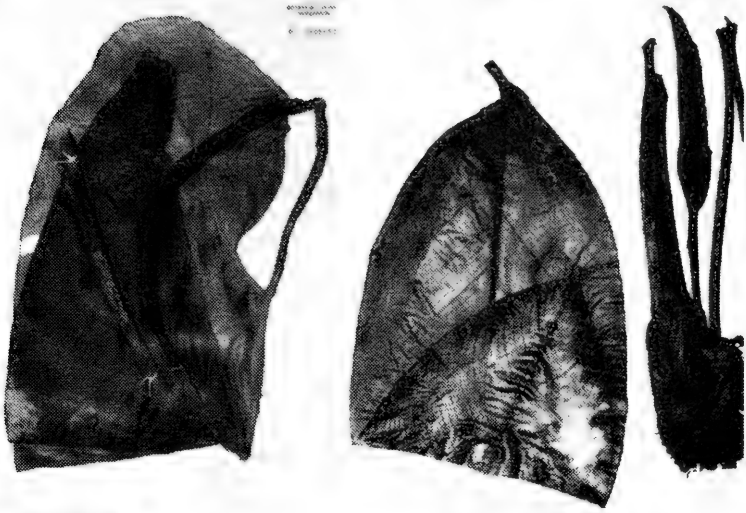

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Serranía del Vinilla, aprox. 20 km al SW de Mavaca, 2°26' N., 65°20' O., ca. 420 m, 13 Jun 1981. Figure 6.

A A. bonplandii Bunt. haud aegre distinguitur statura minore (ad 35 cm alta), foliorum lamina rigida dure coriacea ambabus superficiebus nitida et omnibus nervis atque venis reticulatis valde elevatis, abaxiale multis punctis brunneis prominentibus notata; a A. xanthoneuro Bunt. petiolo proportione longiore saltem ad medium usque vaginato, lamina quam petiolo ca. 4-6plo (3.8-6.2) longiore (in illo petiolo laminae basi tenus vaginato, lamina quam petiolo 11-14ies longiore), lamina elliptica vel anguste obovata (in illo spathulata), nervis reticulatis magis etiam elevatis, spadice breviore ad 10 cm longo (in illo ad 23 cm longo) stipiti longiori (ad 1.6 cm) insidente (in illo ad tantum 0.5 cm) recedit.

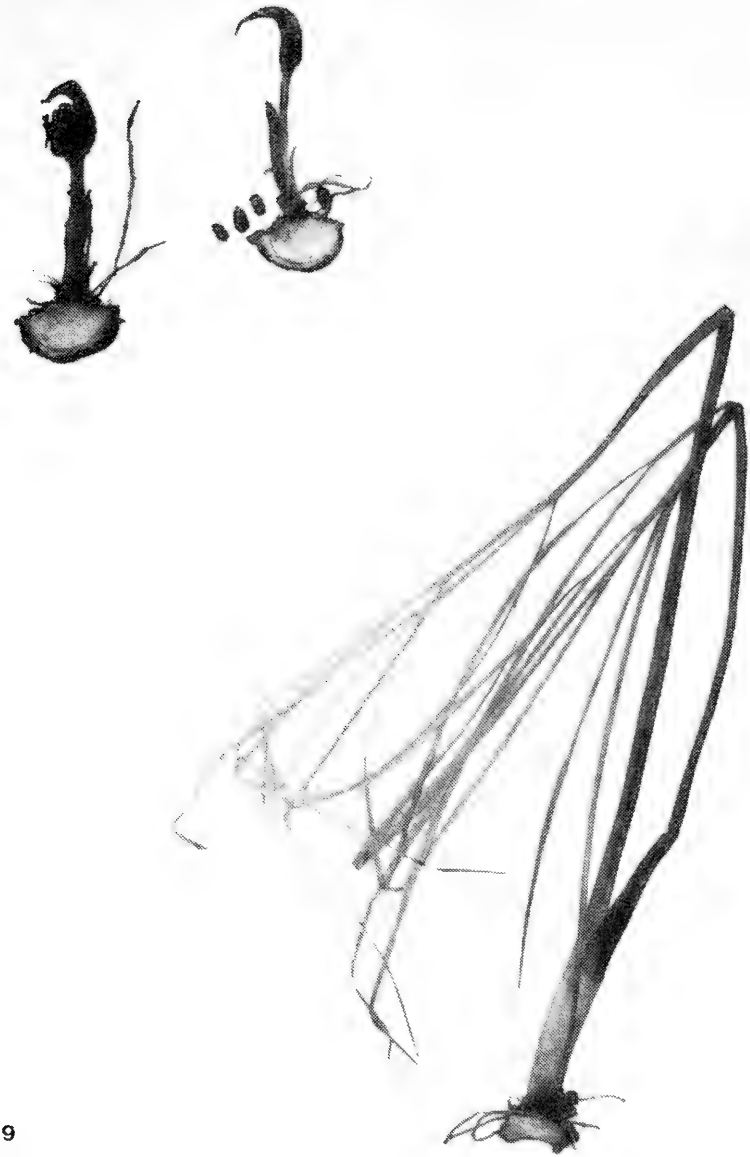
Small, tufted herb. Petiole stout, 3.2-5.2 cm long, sheath 1.5-2.7 cm long. Leaf blade stiff, very hard coriaceous but not extremely thick, elliptic to narrowly obovate and attenuate toward each end, 16-28 cm long, 4.3-9.5 cm wide (3-3.6 times longer than wide), very glossy on both faces with wide midrib and all veins strongly elevated and very prominent, abaxially densely brown-punctate. Peduncle 27-39 cm long. Spathe to 5 cm or more long and decurrent for 0.7-1 cm, early lost. Spadix to 10 cm long, 3.5-5 and 6 flowers wide respectively in contrary spirals, stipe 0.3-1.6 cm long. Fruits dark wine red.

Apparently pertaining to sect. Pachyneurium Schott, A. vinillense is known only from the Serranía del Vinilla, where it is terrestrial or uncommonly grows on rocks.

DRACONTIUM

Dracontium lineare Bunting & S. S. Tillett, sp. nov. TYPE: T. & G. Gragson 13 (holotype, US; isotype, MYF): Venezuela: Apure: Distritos Achaguas y Rómulo Gallegos: río Capanaparo, poco arriba de El Porvenir, en las cercanías del Hato San Joaquín (aprox. 6°48-52' N., 68°45-48' O.), en varios pequeños asentamientos Pumé incluso Tierra Fría, Doro Ana, Caño Negro, Tres Manantiales, Santa Bárbara, Los Mangos, Las Maravillas y Las Campanas, en estero, 80 m, 10 Jul 1986. PARATYPE: T. & G. Gragson 4 (US): same locality, open savanna in low, sandy areas, preferring hummocky ground near Caño Morichal, ca. 100 m, 4 May 1986. Figure 9.

Herba acaulescens 60-120 cm alta. Cormus ad 7.5 cm diam., ca. 4 cm crassus, supra cormulis obovoideis tectus, carne ex aurantiaco flava. Folia 2, ternato-pinnata. Petiolus teres 30-62 cm longus, sparsim papillosus, basi atropurpureus, apice in 3 petiolulos ascendentes divisus. Foliorum lamina omnibus partibus ascendentibus; pinna centralis petiolulo 6-19.5 cm longo in 3 pinnulas lineares divisa, pinnula centrali ad 45 cm longa in sicco 1.6 cm lata, pinnulis lateralibus ad 39 cm longis 0.9 cm latis; pinnae laterales petiolulo ad 12 cm longo in 2 pinnulas lineares ad 38-48 cm longas 1.1 cm latas divisae; pinnulae prope medium latissimae hinc ambas extremitates versus sensim attenuatae, costa prominenti, nervis lateralibus mani-



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festis et divergentibus supra medium in nervum collectivum a margine 0.2-0.25 cm remotum conjunctis. Inflorescentia praecox, solitaria. Pedunculus 6 cm longus. Spatha convoluta in dimidio superiore sensim attenuata et valde incurvata, in sicco ca. 5.5 cm longa, demum partim aperiens y cucullata, in fructu retenta. Spadix 1.4 cm longus, flavus. Infructescentia globoidea ca. 2 cm longa et crassa, multis fructibus. Baccae obovoideae atropurpureae, in sicco 0.6 cm longae, 1-2-spermae. Semina ambitu plerumque apostrophiformia interdum subcircularia, 0.45 cm longa, 0.3 cm crassa, sucinacia et irregulariter pusticulata.

The leaves of this species are unique in the genus. The ternately pinnate blade has entire, narrowly linear laminae to only 1.6 cm wide (in sicco) and to 45 cm long; the central part of the blade has three such segments, and each lateral part has two. It is said to be difficult to distinguish these leaves from those of grasses and other plants among which they grow.

In this taxon, there are two or three flowers near the apex of the spadix that are each subtended by a pointed bract to 4.5 mm long, comparable, no doubt, to the somewhat larger processes that occur in D. changuango Bunt. and D. aricuaisanum Bunt.

This species is common in open savanna in a zone with a marked dry season, growing in low, moist sandy areas. At the time of leaf production, the habitats are inundated by 6-8 inches of water. The corm, which grows 2-4 inches below the soil surface, can be eaten after being boiled or roasted.

Common names: gipaé (Pumé); changuango sabanero (Spanish).

HETEROPSIS

Heteropsis flexuosa (HBK) Bunt. var. **maguirei** Bunt., var. nov. TYPE: Maguire, Steyermark & Maguire 53515 (holotype, NY): Venezuela: Bolívar: alto río Cuyuni, río Uiri-yuk, El Foco, 30 Aug 1962.

A varietate typica differt petiolis multo longioribus, 1.4-2 cm longis (in illa 0.3-1.2 cm longis).

The longer petioles of this variety are very distinctive. Similar [sterile] material, with petioles to four cm long, has been collected at the base of Cerro Yapacana, Territorio Federal Amazonas.

PHILODENDRON

Philodendron brevispathum Schott subsp. **holmquistii** (Bunt.) Bunt., stat. nov. Philodendron holmquistii Bunt., Acta Bot. Venezuelica 10: 297. 1975. Philodendron brevispathum var. wurdackii Croat, Aroideana 9: 88. 1986.

The disjunct distribution and differences in floral characters easily distinguish this subspecies from the typical one. The apex

of the pistils is convex with three or four stigmatic pads, and the three or four locules per ovary are mostly 7-14-ovulate. Though existing collections suggest that this subspecies is not a common plant, it is widely distributed in the Orinoco drainage from Bolívar and Anzoategui to the south of Territorio Federal Amazonas, as well as in adjacent Colombia and Brazil. In typical P. brevispathum, the apex of the pistils is more or less truncate, with a marginal flange and a central, solitary stigmatic pad, while the locules of the ovary are mostly 14-18-ovulate. It occurs only in Central America from Nicaragua to Panama.

It seems unwarranted to maintain P. brevispathum var. wurdackii as a separate taxon. The type specimen (Maguire et al. 36692 [NY, 2 sheets] has deformed leaf blades: one is a monstrosity, the other imperfect. The VEN specimen of this collection is more nearly normal and offers insufficient bases for separation from the other material. It has a solitary inflorescence with the spadix borne on a stipe 11-12 mm long, as is typical in subsp. holmquistii, and the characters of the apex of the pistils correspond to this subspecies.

Philodendron callosum Krause subsp. **ptarianum** (Steyerm.) Bunt., stat. nov. Philodendron ptarianum Steyerm., Fieldiana Bot. 28: 99. 1951.

The subspecies ptarianum has nearly smooth petioles (sometimes the geniculum verruculose) and leaf blades adaxially smooth or striolate-sulcate but not rugulose. It has a wide distribution in southeastern Venezuela, occurring on the sandstone mesetas of Edo. Bolívar and Territorio Federal Amazonas, and apparently grows in adjacent Brazil.

Typical P. callosum has densely verruculose petioles, and the leaf blades are rugulose adaxially with sulcate lateral veins interconnected by sulcate transverse veins. Though its known distribution in Venezuela is restricted to the eastern margin of the Gran Sabana, it also occurs in adjacent Guyana and Brazil.

Philodendron conforme Bunt., sp. nov. TYPE: Croat 59355 (MO): Venezuela: Amazonas: Depto. Río Negro: vicinity of Cerro Neblina project base camp, just east of camp along "Bongo Trail", along south bank of Río Mawarinuma, 0°50' N., 66°10'W., 140 m., 27 Nov 1984. Figure 7.

P. deflexo Poepp. primo adspectu simile, sed ovarii loculis (2-)3-ovulatis statim dignoscendum (in illo uniovulatis); a P. yutajensi Bunt. omnium partium magnitudine majore, cataphyllis caducis itaque caule nudo, petiolo ad medium tereti, laminae costalis posticis in sinu per tantum 2.5 cm nudis (in illo 5.5-6 cm), spatha pedunculo suo 2-3plo longiore (in illo spatha pedunculum aequante), ovarii loculis ovulis paucioribus ferentibus differt; a P. nebulensi Bunt. iterum cataphyllis caducis itaque caule nuda, praeterea petiolo laminam aequante, lamina proportione paulo latiore differt.

Short climber. Petiole terete (at middle), 57-65 cm long. Leaf blade equaling petiole, stiff-chartaceous in sicco, ovate-triangular in outline, 55-67 cm long, ca. 32-48 cm wide (1.4-1.7 times longer than wide), base cordate-sagittate, apex obtuse and acuminate, sinus between posterior lobes mitriform and 16 cm deep, basal ribs nude 2.5 cm. Peduncle solitary, 4.5 cm long. Spathe to 13 cm long, not constricted. Spadix subsessile, 10 cm long, pistillate part 4 cm long. Ovary 6-8-locular, locules (2-)3-ovulate.

A member of section Oligospermium Engl. § Macrobelium Schott, this species has several (ca. 3) ovules present in each locule of the ovary, easily separating it from the vegetatively similar P. deflexum, which has the locules uniovulate.

Philodendron englerianum Steyerm. subsp. **duidae** (Steyerm.) Bunt., stat. nov. Philodendron duidae Steyerm., Fieldiana Bot. 28: 96. Fig. 13. 1951.

This taxon differs from typical P. englerianum by having proportionally wider leaf blades that are peltate, the posterior lobes being fused for 1.0-3.6 cm. It grows on the sandstone mesetas of Territorio Federal Amazonas and on some of those of Edo. Bolívar. The typical subspecies, distinguished by the unfused posterior lobes of the leaf blade, grows only in the northeastern area of the Gran Sabana.

Philodendron holstii Bunt., sp. nov. TYPE: Liesner & Holst 21252 (holotype, MO): Venezuela: Amazonas: Depto. Atures: seasonally dry forest along stream 0.5-2 km east of Rio Coro-Coro, west of Serranía de Yutaje, 3 km north of settlement of Yutaje, 5°38'N., 66°7'30" W., 200 m, 19 Feb 1987. Figure 8.

Herba erecta(?). Caulis 3 cm diam. parte terminali cataphyllis atque reliquiis suis et radicibus adventitiis occultus. Cataphyllum ca. 23 cm longum in situ marcescens paulatim fractans et solutum. Petiolus subteres sed adaxiale anguste sulcatus sulcae marginibus obtusangulis, 54-57 cm longus, vagina 5.5-5.8 cm longa; geniculum 1.5-2 cm longum. Foliorum lamina longitudine 0.7 petioli partes aequans, chartaceo-semicoriacea, elliptica, 37.5-39.5 cm longa 17.8-18.7 cm lata, ca. 2plo longior quam latior, ad ambas extremitates plus minusve aeque obtusa, apice ipso breviter acuminata, in superficiebus ambabus multis punctis brunnaceis notata, adaxiale nervis lateralibus omnibus subaequaliter manifestis, abaxiale nervis lateralibus I. utrinque 7-8 quam ceteros validioribus sub angulo 50-55° abeuntibus. Pedunculus solitarius 14-16 cm longus. Spatha sursum attenuata 13.5-15.5 cm longa tubo bene discreto 4.5 longo 2.1-2.7 cm crasso. Spadix spatha paulo brevior ad 13.5 cm longus stipite 0.6 cm longo insidens, parte pistillata 2.4 cm longa, parte staminata sterili 0.5-1 cm longa fertili 9.5-10 cm longa. Flores pistillati ovario 2-loculari, ovulis in quoque loculo ca. 6 superpositis. Flores staminati 4-andri.

Erect(?) herb. Stem hidden in upper part by adventitious roots and accumulated dry cataphylls and remains. Petiole terete but

adaxially with a slender median groove with rounded margins, 54-57 cm long, sheath to 5.8 cm long; geniculum ca. 1.5-2 cm long. Leaf blade 0.7 of petiole length, chartaceous-semicoriaceous, elliptic, 37.5-39.5 cm long, 17.8-18.7 cm wide (2.1 times longer than wide), equally obtuse at each end, with numerous, fine, dark brown punctations on both faces, all lateral veins fine and subequal adaxially, abaxially with ca. 7-8 lateral veins per side slightly stronger than the rest. Peduncle solitary, 14-16 cm long. Spathe 13.5 cm long, tube well-defined and 4.5 cm long. Spadix on a stipe 0.6 cm long, pistillate part 2.4 cm long, sterile staminate part 0.5-1 cm long, fertile part 9.5-10 cm long. Ovary 2-locular, each locule with ca. 6 ovules superposed in each of two rows. Staminate flowers 4-stamened.

Philodendron holstii pertains to section Philopsammos. It is distinguished by the rather thin-textured, elliptic leaf blades prominently dark-punctate on both faces. The epithet honors Bruce Holst, a fine collector now studying the flora of Venezuelan Guayana.

Philodendron linnaei Schott var. **rionegrense** Bunt., var. nov. TYPE: Liesner 6707 (holotype, VEN; isotype, MO): Venezuela: Amazonas: Depto. Río Negro: IVIC study site 4 km NE of San Carlos de Río Negro, ca. 20 km S of confluence of Río Negro and Brazo Casiquiare, 1°56' N., 67°3' W., 120 m, 16 Apr 1979.

A varietate typica foliorum lamina in sicco brunnescenti (in illa viridi vel griseo-viridi) et venulis transversalibus prominentibus inter nervos laterales carenti, pedunculis longioribus (16-35 cm), spatha extus ut videtur rubro-purpurea intus omnino rubra, florum pistillatorum ovario biloculari distinguenda (in varietate typica spatha extus intusque tubo rubro limbo albo, ovario (4-)5-7-loculari); a P. insigni foliorum lamina anguste obovata basi angustissime cuneata, multis nervis lateralibus omnibus subaequalibus (in illo aliquot nervis lateralibus quam ceteros validioribus), spatha extus omnino purpurea (in illo alba) differt.

Leaves of this variety dry a rather light brown color, in contrast to the more or less green color maintained by dry leaves of the typical variety. Furthermore, they lack transverse veinlets interconnecting the numerous lateral veins, the spathe is overall purple on the outside and red inside, and the locules of the ovary are bilocular.

Aside from the distinctive coloration of dried specimens, this new taxon bears much resemblance to the typical variety. By contrast, the leaves of P. insigne normally dry brown, but are obtuse to rounded-subtruncate at base with the lateral veins distinguished (especially abaxially) into primary and lesser lateral veins.

There is a similarity between this new taxon and P. decurrens Krause, a species collected in the Serra de Pacaraima in the present state of Roraima, Brazil. The latter, however, is described as having a shorter petiole, a white spathe, and a four-locular ovary. I have not seen the type material.

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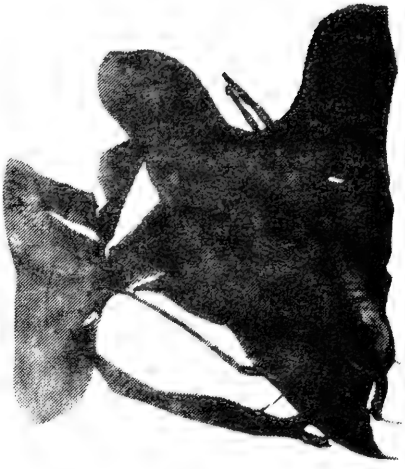

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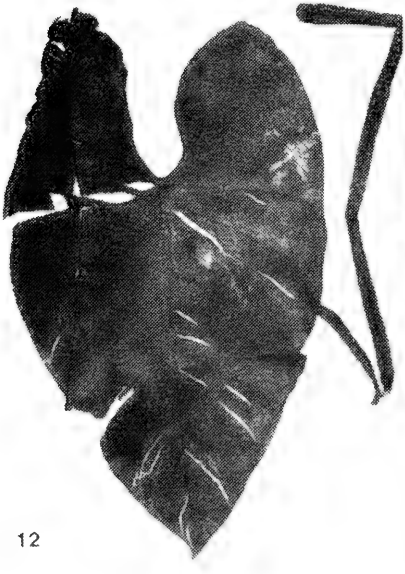

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The variety rionegrense appears to be restricted to southwestern Territorio Federal Amazonas (and probably adjacent Colombia), at lower elevations. A collection from Cerro Yapacana (Steyermark & Bunting 103275) differs from the San Carlos material only by the firmer consistency of the leaf blade. The typical variety is amply distributed in Venezuela from Monagas and Delta Amacuro to Amazonas, including the area of San Carlos de Río Negro!

Philodendron mawarinumae Bunt., sp. nov. TYPE: T. B. Croat 59339 (holotype, MO): Venezuela: Amazonas: Depto. Río Negro: vicinity of Cerro de la Neblina base camp on Río Mawarinuma, 0°50' N., 66°10' W., 140 m, 26 Nov 1984. Figure 10.

Herba scandens. Caulis internodiis 5-6.5 cm longis. Petiolus modice late alatus, 9-9.5 cm longus, alis patentibus 0.8-0.9 cm latis plus minusve planis inaequilateralibus latere latiore ad apicem auriculato usque ad 0.2 cm infra laminae basim attingentibus; geniculum 0.3 cm longum. Foliorum lamina petiolo duplo vel ultra longior, in vivo subcoriacea plerumque elliptica vel oblonga interdum paulo supra vel infra medium latissima (in stirpe juvenili anguste oblongo-elliptica ca. dimidio minor), ad 21 cm longa 8.7 cm lata, ca. 2-3plo longior quam latior, valde inaequilateralis latere altero quam alterum 0.5-1.6 cm latiore, ad basim late cuneata, ad apicem obtusa et abrupte acuminata (3 cm), adaxiale atroviridis impolitaque (in vivo) costa concava prominenti et nervis lateralibus obsoletis, abaxiale pallidior nervis lateralibus vix discretis et sine lateralibus primariis manifestis. Inflorescentia ignota.

Climbing herb. Stem with internodes 5-6.5 cm long. Petiole 9-9.5 cm long, rather broadly alate, wings more or less flat and spreading, 0.8-0.9 cm across, inequilateral with the wider side apically auriculate, reaching to within 0.2 cm of base of blade; geniculum 0.3 cm long. Leaf blade two or more times longer than petiole, in vivo subcoriaceous, mostly elliptic or oblong, sometimes widest a little above or below middle (in juvenile shoots narrowly oblong-elliptic and only about half as large), to 21 cm long, 8.7 cm wide, (2.1-)2.4-2.8 times longer than wide, strongly inequilateral with one side 0.5-1.6 cm wider than other, base obtuse with narrower side more or less convex and wider side nearly straight in lower 3-4 cm then becoming convex beyond (at least in sicco), apex obtuse and abruptly acuminate (3 cm), adaxially matte with concave midrib and scarcely visible lateral veins, abaxially with lateral veins weakly visible, without stronger (i.e., primary) laterals on either surface, all veins arising at angle of ca. 30°. Inflorescence unknown.

Philodendron mawarinumae is a member of sect. Pteromischum Schott. It is known only from the type collection.

Philodendron nebulense Bunt., sp. nov. TYPE: T. B. Croat 57479 (holotype, MO): Venezuela: Amazonas: Depto. Río Negro: Cerro de la Neblina, Camp #7, south slope of Cañon Grande, along river below camp, 0°55' N., 66° W., 1800 m, 29 Nov 1984. Figure 12 & 13.

A P. ornato Schott petiolo terete laevique (in illo fere semiterete et plerumque saltum parte distali verruculoso), foliorum lamina coriacea (in illo tenuiore), margine lobi antici altera ex medio deorsum sat recta, lobis posticis sat angularibus (in illo semper rotundatis) distinguitur.

Climbing herb. Stem to 4 cm diam., internodes short. Cataphyll to 26 cm long, wilting and drying in place, later decomposing to masses of fine, reticulate, tan fibers and epidermal remains. Petiole terete at middle, toward apex slightly flattened, 54-62 cm long. Leaf blade 0.73-0.85 as long as petiole, reflexed, subcoriaceous (in sicco), more or less ovate in outline, or one side with margin nearly straight in lower half, 45-51 cm long, 26-29 cm wide (1.6-1.76 times longer than wide), base cordate-sagittate, toward apex obtuse and widely acuminate (1.5 cm); posterior lobes introrse, trapeziform-triangular and angulose but apically blunt, or more or less rounded, separated by a somewhat spathulate or submitriform sinus 14-15.5 cm deep; matte on both faces (in sicco), I. lateral veins ca. 5 per side with well-marked II. and III. laterals, arising at angle of ca. 60-65°, arcuate throughout, posterior lobes with 2 principal lateral veins toward outside and 2-3 weaker ones descending, the basal ribs nude in sinus for 2-4 cm. Inflorescence unknown.

This species suggests P. ornatum Schott, but the petiole is terete and smooth rather than nearly semiterete and verruculose, and the coriaceous leaf blade often has the lateral margin on one side quite straight in the lower half and the posterior lobes rather angular. By its epiphytic habit, it differs from P. yutajense, as well as by its ovate leaf blade widest at a point opposite to, or slightly above, the petiole insertion, and by the shorter nude portion of the basal ribs. Differences between P. nebulense and P. conforme are discussed under the latter species. Until fertile material is collected, however, it is impossible to ascertain the natural affinities of P. nebulense.

Philodendron peperomioides Bunt., sp. nov. TYPE: B. Holst & R. Liesner 2704 (holotype, MO): Venezuela: Bolívar: Dtto. Piar: southwest base of Amaruay-tepui, W of Aparamán-tepui, 5°55' N., 62°15' W., 500-600 m, 25 Apr 1986. Figure 14.

Philodendri rudgeani Schott primo adspectu maxime simile, sed alis petiolaribus paulo tantum apertis et usque ad vel paulo ultra geniculi basim productis, foliorum lamina in sicco semicoriacea apice leniter acuminata, nervis lateralibus primariis utrinque ca. 6 sub angulo 35-40° prodeuntibus.

Scandent herb. Old stems with internodes 10.5-12.5 cm long, 0.5 cm diam.; terminal branches leafy and pendent, internodes 0.5-2 cm long, with yellowish, epidermal layer sloughing off. Leaves apparently distichous. Petiole slender; wings slightly open, apically rounded, prominently ribbed, ca. 0.5 cm wide, ending at or slightly beyond the base of geniculum; geniculum to 0.5 cm long. Leaf blade

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ca. 3 times longer than petiole, semicoriaceous, in sicco somewhat pliable, narrowly obovate, to 15.5 cm long, 4.6 cm wide (3.4 times longer than wide), flat, base narrowly cuneate, apex gently acuminate with a 1 mm-long cusp, matte on both faces, midrib slightly elevated on both faces, lateral veins all subequal adaxially, abaxially with 6 I. lateral veins arising at angle of 35-45°. Inflorescence unknown.

This taxon is a member of sect. Pteromischum. It differs from P. rudgeanum by the petiole wings only slightly open (not spreading) and reaching only to or slightly beyond the base of the geniculum (not to or beyond the base of the blade). Moreover, the leaf blade has a thicker consistency, its apex is gently (not abruptly) acuminate, and the fewer primary lateral veins arise at a sharper angle. Unfortunately, the available material is sterile.

Philodendron peperomioides is known only from the type collection made at 500-600 m elevation, in a dryer habitat than that of the coastal lowland forests were P. rudgeanum occurs.

Philodendron phlebodes Bunt. var. **kermesinum** Bunt., var. nov. TYPE: Maguire, Wurdark & Bunting 37383 (holotype, NY): Venezuela: Amazonas: Depto. Río Negro: Cerro de la Neblina, slope forest between camp 2 and 3, on top of boulders, ca. 500 m, 24 Jan 1954.

A varietate typica foliorum lamina majore ad 66 cm longa qua ex supra medium deorsum plus minusve oblonga est (in illa ad tantum 56 cm longa et ambitu ovata), spatha intus ubique kermesina (non cremicolori), spadicis parte pistillata multo breviore tantum 2.3 cm longa (in illa 7-10 cm longa) differt.

The leaf blade of this variety, which reaches 66 cm long and 35 cm wide, is more or less oblong in outline in the lower two-thirds. While the spathe is cream-colored on the outside, as in the typical variety, it is red overall on the inside, and the pistillate part of the spadix is quite short. There is some question if the latter characteristic is a valid difference or only a manifestation of ovary maturation.

This taxon is represented by a single collection made at an altitude of 500 m on the slopes of Cerro de la Neblina. Typical P. phlebodes occurs more widely in the southern part of Territorio Federal Amazonas, as a climber on tree trunks in lowland forest at ca. 125 m altitude.

Philodendron remifolium Schultes subsp. **sabulosum** (Bunt.) Bunt., stat. nov. Philodendron sabulosum Bunt., Phytologia 60: 326. 1986.

The leaf blade of typical P. remifolium has the form of a paddle used by indigenous peoples of the area, in the type specimen being 1.7 times longer than wide, with the petiole shorter than the blade

(0.8 as long). Venezuelan material of this affinity has narrower leaf blades 2-3(-3.5) times longer than wide, with a petiole to 1.5 times longer than the blade.

There are also differences in the inflorescences. In subspecies sabulosum, the inside of the spathe tube is red or wine, while the limb is white becoming rose dotted with wine. No red coloration has been reported in the spathe of the typical subspecies. The staminate flowers, which are mostly 4-stamened in subsp. sabulosum, are apparently identical to those of subsp. remifolium, judging from the fine illustration accompanying its original publication, notwithstanding a statement to the contrary in the description.

The known area of distribution of subsp. sabulosum in Venezuela (Ríos Atabapo, Guainía and Negro) is separated from that of the typical subspecies in southeastern Colombia by more than 350 km, but it is unknown if this represents a disjunction or only a lack of botanical collection in the intervening region.

Philodendron samayense Bunt., sp. nov. TYPE: R. Liesner & B. Holst 18850 (holotype, MO): Venezuela: Bolívar: Dtto. Roscio: 5 km S of El Paují, "El Abismo", Río Samay, affluent of Icabarú, 4°23' N., 61°38' W., 520 m, 21 Oct 1985. Figure 15.

Herba scandens. Caulis ramulis terminalibus pendentibus ca. 0.5 cm diam. internodiis 5-6.5 cm longis. Petiolus 6.5-8.5 cm longus, praeter per 0.2-0.6 cm distalia omnino vaginatus alis apertis planisque, 0.6-0.7 cm latus (in folia inflorescentia subtendenti latioribus); geniculum 0.3-0.5 cm longum. Foliorum lamina petiolo sesqui-2plo (1.3-2.2) longior, rigida, chartaceo-semicoriacea (in sicco fragilis) ovata conspicue inaequilateralis, 9.5-18.5 cm longa 3.8-5.3 cm lata, ex loco latissimo sursum apicem versus attenuata demum acuminata (2.5 cm), marginibus subtiliter undulatis, in ambabus superficiebus laevissima, nervis lateralibus utrinque ca. 6 sub angulo 40-55° oreuntibus adaxiale obsoletis. Pedunculus solitarius, 1.8-2.3 cm longus. Spatha 7.5-9 cm longa vix contracta tubo 4.5-4.8 cm longo. Spadix spatha 0.3 cm brevior stipiti 1 cm longo insidens, parte pistillata necnon parte staminata uterque 3.8 cm longa. Flores pistillati ovario 4-loculari, ovulis in quoque loculo numerosis superpositisque.

A member of sect. Pteromischum, this species is separated from other Guayanan species of this group by its distinctive leaf. The blade, which is narrowly ovate in outline (2.5-3.8 times longer than wide), is somewhat inequilateral as well as lightly falcate - both characters accentuated at the acuminate apex. It has only ca. 6 primary lateral veins on each side, and these are scarcely discernible on the adaxial face. Moreover, the wings of the petiole do not extend beyond the base of the geniculum. This taxon is close to P. guttiferum; unfortunately, the latter, as presently construed, is either very polymorphic or, more probably, a collection of several different species.

Philodendron scitulum Bunt., sp. nov. TYPE: Liesner 17771 (holotype: MO): Venezuela: Amazonas: Depto. Atures: slope of Cerro

Marahuaca, Río Yameduaka arriba, 3°38' N., 65°28' W., 1225 m, 21 Feb 1985. Figure 11.

Herba scandens. Caulis internodiis elongatis (18 cm) reliquiis cataphyllicis tenuiter fibrosis persistentibus. Cataphyllum 14.5 cm longum. Petiolus fere teres, ca. 16 cm longus. Foliorum lamina in sicco plus minusve chartacea ambitu plus minusve triangularis 29 cm longa 19.2 cm lata (inter apices loborum posticorum latissima); lobo antico marginibus leviter convexis sed in loco 2.5 cm supra basim costae paulo contracto et 14 cm lato, apice leniter acuminato (ca. 2.5 cm); lobis posticis suboblongis 5.7 cm latis apice rotundatis, aliquantum extrorsis sinu late parabolico 6.5 cm profundo sejunctis; nervis lateralibus I. tenuibus in lobo antico 4-5, pari laterale infimo sub angulo ca. 90° pari secundo ca. 75° pari tertio ca. 65° abeuntibus, lobis posticis uterque nervis lateralibus validis ca. 3 basim versus conjunctis et in sinu per ca. 1.5-2 cm nudis. Inflorescentia ignota.

This species is totally distinct from P. auyantepuiense Bunt., differing by the proportionally broader leaf blade of thinner consistency with a few, more or less prominent, primary lateral veins. The latter species, known only from Auyántepui in the state of Bolívar, has a coriaceous (in vivo possibly somewhat fleshy) leaf blade with numerous, subequal lateral veins all manifest and a few primary lateral veins weakly discernible abaxially.

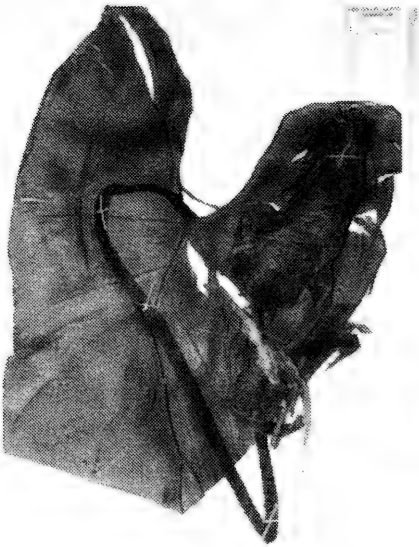
This differs from P. yutajense by the extrorse posterior lobes of the leaf blade and the nearly terete petiole. Moreover, it is an epiphyte, while the latter is terrestrial or grows on boulders.

There is some question if the type specimen of P. scitulum is adult or not.

Philodendron simulans Bunt., sp. nov. TYPE: T. B. Croat 59427 (holotype: MO): Venezuela: Amazonas: Depto. Río Negro: Cerro de la Neblina, Camp #7, south slopes of Cañon Grande, along river below camp, 0°55' N., 66° W., 1800 m, 29 Nov 1984. Figure 16.

Quoad ambitum foliorum laminae ad P. acutatum Schott accedit, sed ab eo differt caule in parte terminali reliquiis cataphyllicis persistentibus, costa et nervis lateralibus principalibus minus insignibus et in sicco quam lamina obscurioribus, nervis lateralibus sub angulo acutiore in lobo antico sub angulo ca. 50-55° in lobis posticis sub angulo ca. 30-40° abeuntibus (in illo nervis principalibus insignibus in sicco quam lamina pallidiore, in lobo antico nervis lateralibus sub angulo ca. 70-80° in lobis posticis sub angulo ca. 45-60° abeuntibus); a P. yutajense Bunt. habitu epiphytico, petiolo adaxiale paulo tantum applanato, foliorum lamina in loco insertione petioli opposito latissima, costulis in sinu brevius nudis recedit.

Climbing herb. Stem 1-2 cm diam., internodes 1-4 cm long, in upper part with semi-intact, dry cataphylls persistent and slowly weathering to shreds and fibers. Petiole somewhat spongy, weakly flattened adaxially, to 48 cm long (equaling or slightly exceeding blade). Leaf blade subcoriaceous, ovate, to 42 cm long, 25 cm wide at point just below petiole insertion, apex briefly acuminate, posterior lobes more or less trapeziform and separated by a narrow-



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ly parabolic sinus to 12 cm deep. Inflorescence unknown.

The retention of the old cataphylls easily distinguishes this species from P. acutatum. Also, the nervature is inconspicuous, drying darker brown than the ground color of the blade, and the primary lateral veins arise at a sharper angle. In P. acutatum, the veins are conspicuous, drying much paler than the base color of the blade, and the primary lateral veins originate at a wide angle (70-80°). From P. ornatum Schott, this taxon differs by the petiole weakly flattened adaxially and the leaf blade of different outline.

Philodendron yutajense Bunt., sp. nov. TYPE: R. Liesner & B. Holst 21858 (holotype, MO): Venezuela: Amazonas: Depto. Atures: 5-8 km northwest of settlement of Yutaje, 3 km W of Río Coro-Coro, west of Serranía de Yutaje, 5°40' N., 66°9' W., streambank in forest, 800-1000 m, 11 Mar 1987. PARATYPE: Liesner & Holst 21556 (MO): same locality; on boulders in open forest, 1000-1050 m, 3 Mar 1987. Figure 17.

Herba. Caulis ca. 3 cm diam. sed radicum adventitiarum et reliquiarum cataphyllicarum strato crasso vestitus, internodiis brevissimis. Cataphyllum 20-25 cm longum. Petiolus abaxiale rotundatus adaxiale plus minusve planus marginibus bene discretis, 68-76 cm longus. Foliorum lamina longitudine 0.74-0.85 petioli partes aequans, reflexa, semicoriacea, ambitu plus minusve triangularis, 50.5-59.5 cm longa 30.5-ca. 34 cm lata (plus minusve sesquilongior quam latior) inter apices loborum posticorum latissima, ad apicem acuminata, lobis posticis obtusis latere interiore rotundatis sinu late campaniformi vel submitriformi 15-18 cm profundo 9.5 cm lato sejunctis, nervis lateralibus I. ca. 5-7 sub angulo 55-60° ex costa abeuntibus, costulis posticis per 5.5-6 cm in sinu nudis. Pedunculus solitarius ca. 11 cm longus. Spathe aliquantum crassa, 12 cm longa tubo antice 6 cm postice 4 cm longo. Spadix 8.5 cm longus, parte pistillata ca. 2.5 cm longa, parte staminata sterili non discreta. Flores pistillati ovario 6-7-loculari, loculis 4-6-ovulatis, ovulis secus placentae totam longitudinem affixis.

With a superficial resemblance to P. deflexum Poepp., this species differs by the presence of a thick layer of fibrous debris on the upper part of the stem. Furthermore, the peduncle is scarcely as long as the spathe, and the locules of the ovary are 4-6-ovulate.

The habitat of this taxon is terrestrial or on boulders, in contrast to the epiphytic nature of P. nebulense. It also differs from the latter by the petiole with the adaxial face flat, and the nearly triangular leaf blade widest across the tips of the posterior lobes, the basal ribs of which are nude in the sinus for a longer distance. Differences from P. conforme are discussed under that species.

Perhaps most closely related to members of sect. Oligospermium Engl., P. yutajense does not agree well with the description of that section in regard to the insertion of the ovules. In this species, they are fixed along the whole length of the placenta, rather than at or near the base of the locules.

RHODOSPATHA

Rhodospatha brachypoda Bunt., sp. nov. TYPE: Liesner 15978 (holotype, VEN; isotype, MO): Venezuela: Amazonas: Depto. Río Negro: white water river 0-1 km south of Rio Mawarinuma, 3 km by air east of Cerro de la Neblina base camp, 0°50' N., 66°9' W., 140 m, 15 Feb 1984. PARATYPE: T. B. Croat 59586 (MO): same locality, along trail straight across Rio Mawarinuma from base camp, 3 Dec 1984. Figure 18.

Herba scandens. Caulis 1.5-2 cm diam., internodiis 1-2 cm longis. Petiolus 31-32 cm longus ad basim geniculi usque vaginatus alis persistentibus; geniculum adaxiale sulcatum, 2.5-3.3 cm longum. Foliorum lamina chartacea vel subcoriacea, elliptica vel obovata, inaequilatera, 48-56 cm longa 15.5-17.5 cm lata magis quam 3plo (3.3) longior quam latior, basi acuta vel obtusa et brevissime angustata, apice obtusa cum acumine, in sicco viridula vel ochracea pallida margine fuscata, nervis lateralibus I. numerosis sub angulo ca. 50-70° abeuntibus et inter se 0.9-1.7 cm distantibus. Pedunculus 19-31 cm longus. Spatha caduca ignotaque. Spadix griseo-venetus sub anthesi 9.5 cm longus 0.7 cm crassus demum 15.5 cm longus 1.6 cm crassus, stipitatus stipite postice 1.3-1.8 cm antice 0.3 cm longo.

There is a superficial resemblance between this species and R. oblongata Poepp., both having the leaf blade more than three times longer than wide, but in this, the blade is more nearly obovate, the petiole is proportionally shorter (0.56-0.64 of blade length) with the sheath reaching up to the base of the geniculum, and the flowers at the base of the spadix are not widely separated and sterile.

Rhodospatha cardonae Bunt., sp. nov. TYPE: Liesner & Stannard 16911 (holotype, MO): Venezuela: Amazonas: Depto. Río Negro: Cerro de la Neblina, Camp V, valley north base of Pico Cardona, 0°49' N., 66° W., 1250 m, 21-24 Mar 1984. Figure 19.

Herba scandens. Caulis 1.3 cm diam. internodiis 1.5 cm longis. Petiolus usque ad 40 cm longus fere vel omnino ad basim geniculi vaginatus alis persistentibus (non siccantibus); geniculum ad 2.3 cm longum. Foliorum lamina plus minusve rigida chartaceo-semicoriacea, elliptico-oblonga aliquantum inaequilatera usque ad 35.5 cm longa 12.7 cm lata, fere 3plo (2.8) longior quam latior, ad basim valde inaequalis marginibus rotundatis, ad apicem late acuta apice ipso breviter acuminato, in sicco superficiebus ambabus brunnea, nervis lateralibus I. utrinque ca. 30 inter se 0.8-1.7 cm distantibus sub angulo ca. 70-80° oreuntibus. Pedunculus 25 cm longus. Spathe ignota. Spadix 12.5 cm vel plus longus 0.9 cm crassus stipitatus stipite postice 0.7 antice 1.6 cm longo.

The distinctive features of this species are the rather small, strongly inequilateral leaf blade and persistent wings of the petiole sheath that reaches to within 2 cm of, or quite up to, the base of the geniculum. A similar leaf shape occurs in R. latifolia Poepp., a Peruvian species, but in that, the blade is proportionally broader, and the wings of the petiole sheath, which ends 4-5

cm below the leaf blade, are not persistent but rather slowly dry and slough off.

SPATHIPHYLLUM

Spathiphyllum bariense Bunt., sp. nov. TYPE: Liesner 16984 (holotype, MO): Venezuela: Amazonas: Depto. Río Negro: upper Caño Baria, swampy area between Río Mawarinuma and headwaters of Río Baria, 0°53' N., 66°15' W., 130 m, 28 Mar 1984. Figure 20.

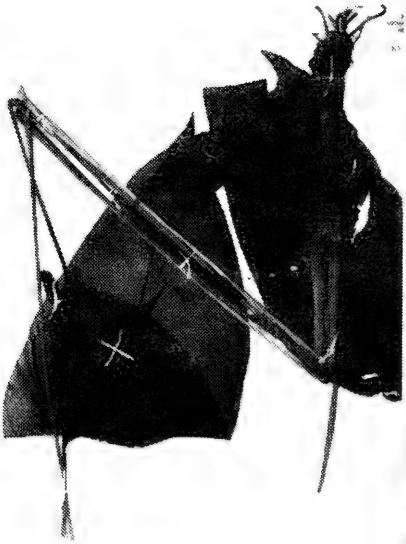
Herba ca. 75 cm alta. Petiolus crassitie modica, ad 56 cm longus, per 24 cm proximalia vaginatus; geniculum 2.1 cm longum. Foliorum lamina longitudine 0.59 petioli partes aequans, ambitu ovata, ad 33 cm longa 13.8 cm lata, latitudine 2/5 (0.37-0.42) longitudinis suae partes aequans, basi obtusa et brevissime angustata, apice acuta acuminataque, nervis lateralibus validis numerosis 0.5-0.8 cm inter se distantibus, sub angulo ca. 60-70° abeuntibus. Pedunculus ad 75 cm longus. Spatha patens elliptico-ovata (caudicula 2 cm longa inclusa) ad 14 cm longa 3.7-4.1 cm lata, basi acuta et breve angustata plus minusve substipitata (ca. 1 cm), apice longissime attenuata, alba demum viridis. Spadix sub anthesi 6.7 cm longus 0.6 cm crassus (in sicco), sub fructu 8.5 cm longus 0.9 cm crassus, stipiti 2-2.2 cm longo insidens, albus demum viridis. Pistilla apice ut videtur truncata ovario 2-loculari et loculis 3-ovulatis.

This species apparently pertains to sect. Amomophyllum Engl. It differs from S. mawarinumae Bunt. by the much longer petiole (1.7 times longer than blade), the proportionally broader leaf blade (2.4-2.7 times longer than wide), and the much longer peduncle. From S. cuspidatum Schott, it can be distinguished by the much broader leaf blade. The shape of the pistils as well as the broader leaf blade separate this from S. humboldtii Schott.

Spathiphyllum mawarinumae Bunt., sp. nov. TYPE: W. W. Thomas & T. Plowman 3104 (holotype, VEN): Venezuela: Amazonas: Depto. Río Negro: Cerro de la Neblina, vicinity of base camp on Rio Mawarinuma, 0°50' N., 66°10' W., forest on alluvial flood plain across river from base camp, 140 m, 17 Apr 1984. Figure 21.

A S. humboldtii Schott omnibus partibus minoribus, foliorum lamina proportione paulo latiore, petiolo laminam subaequante vel ea breviore (in illo plus minusve sesquilongiore), pistillis subtruncatis dignoscendum.

Tufted herb. Petiole to 22 cm long with sheath reaching to middle or above; geniculum 1.3-1.7 cm long. Leaf blade elliptic, ca. 23 cm long, 6.8 cm wide, equally narrowed toward each end, apex acuminate; primary lateral veins ca. 9 on each side, forming angle of ca. 35-40°. Peduncle to 35 cm long. Spathe of more or less same shape as leaf blade but apically longer acuminate, 7.8 cm long, 2.2 cm wide, apparently erect, green (in age). Spadix a little shorter than spathe, borne on a stipe to 2.2 cm long, green. Pistils apically subtruncate.



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Spathiphyllum monachinoi Bunt. var. **perangustum** Bunt., var. nov. TYPE: O. Huber 3118 (holotype, NY; isotype, MYF, VEN): Venezuela: Amazonas: Depto. Atabapo: en bosque inundado basimontano al N del Cerro Cucurito, ribera al SE del medio Caño Yagua, 3°37' N., 66°34' O., 120 m, 17 Jan 1979. Figure 22.

A varietate typica foliorum lamina proportione angustiore (10-14ies longiore quam latiore) differt, sed cum illa petiolo laminam subaequanti vel ea paulo breviore congruens.

The collections identified as S. monachinoi show considerable variation of leaf blade width in proportion to length, as well as of petiole length in relation to blade length. The type material of this species has leaf blades 8.2-9.4 times longer than wide and petioles subequaling the blade length. The material with the narrowest leaf blades (10.3-14 times longer than wide) is here segregated as var. perangustum. The remaining assemblage of specimens have somewhat similar characteristics, but with leaf blades as broad as 6.3 times longer than wide, and with petioles up to 1.5 times longer than the blades. Although all were collected in the Orinoco drainage in the general area between Puerto Ayacucho, Cataniapo, and Santa Bárbara del Orinoco, the number of specimens is small and they exhibit no patterns of variation that permit farther varietal recognition at this time. One of the most distinctive of the group (Liesner 18748 [MO]) was collected on Cerro Yureba (350 m) in the lower Río Ventuari drainage.

STENOSPERMATION

Stenospermation nebulense Bunt., sp. nov. TYPE: Maguire, Wurdack & Bunting 36857 (holotype, NY): Venezuela: Amazonas: Depto. Río Negro: Cerro de la Neblina, 2-8 km south of Camp 3; high montane forest, 1600 m, 24 Dec 1953. Figure 23.

Stenospermatio ammitico Bunt. petiolorum alis latis geniculi basi tenus attingentibus et foliorum laminae consistentia simile, sed ab eo foliorum lamina angustiore et fere oblonga latitudine tantum ca. 1/4 (ad 0.28) longitudinis suae partes aequanti (in illo lamina plerumque elliptica, latitudine ca. 2/5 (0.42) longitudinis suae partes aequanti) et pedunculo prope apicem suum recurvato spadice cum spatha nutanti distinguitur; a S. multiovulato (Engl.) N. E. Brown foliorum lamina minori (in foliis majoribus tantum 20-25 cm longa), basi et apice plus minusve obtusa et, a saltem exemplaribus Venezuelicis ejus, lamina ambitu elliptico-oblonga (non obovata) differt.

Herb. Stem . . . Petiole 16.5 cm long, broadly winged up to base of geniculum with wings persistent or margins tardily drying and sloughing off; petiole of leaf subtending inflorescence to 26 cm long; geniculum 0.9-1.3 cm long. Leaves strict. Leaf blade subcoriaceous, elliptic-oblong, or in leaf subtending inflorescence slightly obovate-elliptic, base obtuse and briefly attenuate or wide acute, apex obtuse and abruptly acuminate (1.5-2 cm); lateral

veins all subequal, arising at angle of ca. 25-30°. Peduncle to 52 cm long, near apex recurved, spadix and spathe nodding. Spathe (base only present in specimen) inserted at angle of ca. 45°. Spadix 9 cm long, on a stipe 0.4 (back)-0.8 (front) cm long.

This taxon is the one intended to have been treated in the description of S. ammiticum Bunt. subsp. neblinae Bunt. (Phytologia 60: 339. 1986). Working without benefit of either specimen or photograph at hand, the wrong collection (Maguire et al. 37281 [VEN]) was cited as type of that name and the description drawn from same. The error was readily discerned by subsequent study of that specimen which agrees closely with typical S. ammiticum, although the label states that the plant was vining, a character not associated with this species. At present, our meager knowledge of S. ammiticum does not justify recognition of a distinct taxon based on habit alone. Therefore, the subsp. neblinae should be ignored and the name placed in synonymy under S. ammiticum.

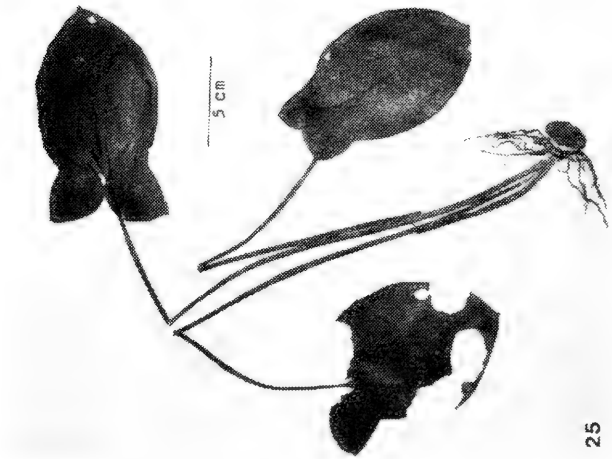
The species here described as new is based on the distinctive specimen (Maguire et al. 36857 [NY]) that, according to the label, was collected on the slopes of Cerro de la Neblina not far below the place of collection of Maguire et al. 37281. Other label data, viz., "Epiphyte to 25 m high ... calyx 3-lobed; corolla 5-lobed", are baffling; plants of this genus are generally rather short and not known to grow in tree tops (at least in Venezuela), and their flowers have neither calyx nor corolla.

XANTHOSOMA

Xanthosoma contractum Bunt., sp. nov. TYPE: Steyermark, Liesner & Holst 131318 (holotype, VEN): Venezuela: Bolivar: Dtto. Cedeño: km 88.7 SW of Caicara del Orinoco, level forest (now flooded) on road to Salto Chavaripa, 7°7' N., 66°28' W., 100 m, 4 Sept 1985. Figure 25.

Herba acaulis. Cormus valde compresso-sphaeroideus, in sicco ca. 2.3 cm diam., 1.4 cm crassus. Folia ca. 3. Petiolus usque ad 33 cm longus, parte proximali vaginatus. Foliorum lamina membranacea ambitu plus minusve oblonga vel obovata sed in loco petioli insertione opposito utrinque contracta, 11-12 cm longa, inter apices loborum posticorum necnon in loco ca. 4 cm supra petioli insertionem 6-7.7 cm lata sed ubi contracta tantum 4.5-6 cm lata; lobo antico late elliptico ad 9.5 cm longo apice obtuso et acuminato (0.3 cm); lobis posticis ovato-subtrapeziformibus directis vel paulo extrorsis apice obtuso-angulatis, imbricatis vel in sinu 2.1-2.8 cm longo vix sejunctis, secus costulam posticam 3-4.2 cm longis 2.3-3 cm latis; nervis lateralibus I. costalibus utrinque ca. 5-6 sub angulo ca. 45° abeuntibus, nervorum pari secundo in nervum collectivum ad apicem currentum a margine 0.7-1.1 cm remotum transiente. Inflorescentia ignota.

This cormous plant does not seem to agree with any other known from Venezuela or adjacent areas. The petiole reaches 33 cm long, while the leaf blade, with its broadly elliptic anterior lobe and distinctive posterior lobes, does not exceed 12 cm in length.



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Xanthosoma exiguum Bunt., sp. nov. TYPE: H. Clark, F. Delascio & C. Broome 7830 (holotype, MO): Venezuela: Amazonas: Depto. Río Negro: 5.3 km NNE of San Carlos de Río Negro, 1°56' N., 67°3' W., on Solano road, near secondary radar construction site, in bulldozed white sand, 119 m, 23 Mar 1981. Figure 24.

Species insignis pumila ca. 20 cm alta, fortasse ex affinitate X. pilosi, sed ubique glabra et spatha in tubo et fauci ut videtur sine colore rubro; a congeneribus aliis differt foliorum lamina ambitu longe triangulari basi plus minusve subcordata vel auriculata apice sensim attenuata, nervo collectivo rectiusculo (non repando) a margine 0.25-0.6 cm remoto.

This is a distinctive, dwarf species ca. 20 cm tall. It is characterized by the leaf blade elongate triangular in outline, more or less subcordate or auriculate at base and long attenuate at apex, with a smooth (not scalloped) principal collective vein running to the apex about 2.5-6 mm from the margin. The petiole is slightly shorter than the blade.

Xanthosoma mafaffoides Bunt., sp. nov. TYPE: R. Liesner & B. Stannard 16952 (holotype, MO): Venezuela: Amazonas: Depto. Río Negro: Cerro de la Neblina, Camp V, valley north base of Pico Cardona, 0°49' N., 66° W., 1250 m, 21-24 Mar 1984. Figure 26.

Differt a X. mafaffa Schott caule aerio usque ad 1 m longo et costulis posticis in sinu longius nudis; a X. undipes Koch et X. maximilianii Schott foliorum lamina proportione angustiore latitudine sua plus quam sesquilongiore (1.6-1.8) (in illis lamina latitudine sua paulo breviore vel ad fere sesquilongiore [0.9-1.4]), inflorescentiis ut videtur solitariis spathae tubo (praesertim intus) haud atropurpureo autem viridi (fide collectorum) distinguitur; praeterea a X. undipes lobis posticis apice plus minusve acutangularibus distinctum.

Large herb. Stem ca. 1 m long, 9-13 cm thick, with some light brown fibers retained. Petiole unknown. Leaf blade ovate-sagittate

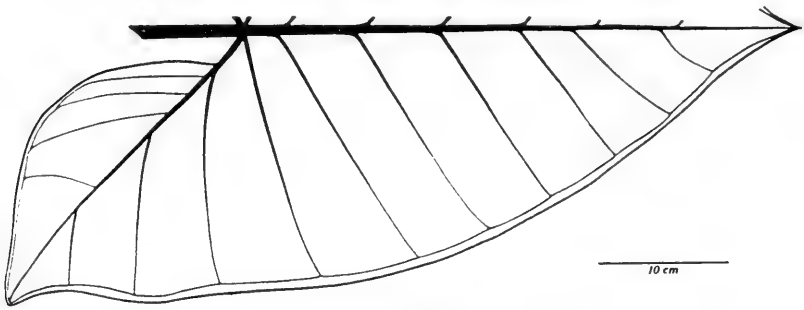

Figure 26. **Xanthosoma mafaffoides** Bunt. (based on Liesner & Stannard 16952 [MO]).

in outline, ca. 63 cm long, 40 cm wide (1.6 times longer than wide), apex acuminate; posterior lobes trapeziform, more or less flaring in apical 5 cm, 39 cm long (along basal rib), 18 cm wide, apically acutely angular but blunt-tipped, outer margin repand, inner margin strongly convex, portion of blade between basal rib and sinus margin to 8 cm wide; sinus 21 cm long, 5 cm wide; primary lateral veins in anterior lobe ca. 7-8 on each side of midrib arising at angle of ca. 55-65°, collective vein 0.45-0.7 cm from margin, basal ribs nude in sinus ca. 3 cm. Spathe 14.5 cm long, [limb?] at anthesis white, [tube?] green.

Xanthosoma mafaffoides is poorly known. The type collection lacks adequate field notes, thus limiting its value both in circumscribing this taxon and in correlating it with other Xanthosoma collections from Cerro de la Neblina.

LIST OF NEW TAXA AND ILLUSTRATIONS*

*Anthurium bonplandii
subsp. bonplandii (included for comparision). Fig. 5
subsp. rionegrense (Steyermark & Bunting 102741). Fig. 1 & 2
*A. corocoroense (Maguire & Maguire 35425). Fig. 3
*A. guaiquinimae (Steyermark, Dunsterville & Dunsterville 113258). Fig. 4
*Anthurium vinillense (Huber 6201). Fig. 6
*Dracontium lineare (T. & G. Gragson 4, infls.; 13, leaf). Fig. 9
Heteropsis flexuosa var. maguirei
Philodendron brevispathum subsp. holmquistii
P. callosum subsp. ptarianum
*P. conforme (Croat 59355). Fig. 7
P. englerianum subsp. duidae
*P. holstii (Liesner & Holst 21252). Fig. 8
P. linnaei var. rionegrense
*P. mawarinumae (Croat 59339). Fig. 10
*P. nebulense (Croat 57479). Fig. 12 & 13
*P. peperomioides (Holst & Liesner 2704). Fig. 14
P. phlebodes var. kermesinum
P. remifolium subsp. sabulosum
*P. samayense (Liesner & Holst 18850). Fig. 15
*P. scitulum (Liesner 17771). Fig. 11
*P. simulans (Croat 59427). Fig. 16
*P. yutajense (Liesner & Holst 21858). Fig. 17
*Rhodospatha brachypoda (Liesner 15978). Fig. 18
*R. cardonae (Liesner & Stannard 16911). Fig. 19
*Spathiphyllum bariense (Liesner 16984). Fig. 20
*S. mawarinumae (Thomas & Plowman 3104). Fig. 21
*S. monachinoi var. perangustum (Huber 3118). Fig. 22
*Stenospermation nebulense (Maguire, Wurdack & Bunting 36857). Fig. 23
*Xanthosoma contractum (Steyermark, Liesner & Holst 131318). Fig. 25
*X. exiguum (Clark, Delascio & Broome 7830). Fig. 24
*X. mafaffoides (Liesner & Stannard 16952). Fig. 26

NOTES ON SOME DICOTYLEDONS

HAWAIIAN PLANT STUDIES 167

Harold St. John
Botany Dept., University of Hawaii, Honolulu, Hawaii, 96922, USA.

Pittosporaceae

Pittosporum radiculatum St. John, Phytologia 63: 458, 1987, and 64: 178, 1988.

Euphorbiaceae

Euphorbia celastroides Boiss., var. limahuliensis var. nov.

A var. Nelsonii differt in petiolis 2-4 mm longis, laminis spatulatis.

Var. limahuliensis is distinguished by having the petioles 2-4 mm long, and the blades spatulate, and it is found on the north side of Kauai.

Var. Nelsonii St. John is separable by having the petioles 4-6.5 mm long, and the blades narrowly oblong spatulate, and it was found in 1979 in Kona on the west side of Hawaii Island.

Holotypus: Hawaiian Islands, Kauai Island, Limahuli Valley, sw. end on exposed slopes, 1,400 - 1,700 ft alt., common, April 12, 1978, Steve Perlman 9 (BISH).

Gesneriaceae

Cyrtandra amische St. John, nom. nov.
C. sessilis St. John, Phytologia 63: 474, 1987, non St. John & Storey (1950).

C. bilobata St. John, nom. nov.
C. intrafissa St. John, Phytologia 64: 39, 1988, non St. John, Phytologia 63: 473, 1987.

C. duploserrata St. John, nom. nov.
C. biserrata St. John, Phytologia 63: 495, 1987, non Hillebr. (1888).

C. chartiformis St. John, nom. nov.
C. chartacea St. John, Phytologia 63: 646, 1987, non St. John & Storey (1950).

C. glenwoodensis St. John (transferred to section Schizocalyces), Phytologia 63: 488, 1987.
C. prasina St. John, Phytologia 63: 501, 1987, non St. John, Phytologia 63: 481, 1987.

C. karykrous St. John, nom. nov.
C. badia St. John, Phytologia 63: 495, 1987, non St. John, Phytologia 63: 470, 1987.

C. lysiosepala (A. Gray) C.B. Clarke, var. Ewartii St. John, replacing C. lysiosepapa, var. Ewartii St. John, Phytologia 63: 499, 1987.

C. quinquefasciata St. John, Phytologia 63: 472, 1987.
C. puberula St. John, Phytologia 63: 472, 1987, a typonym.
C. spartoides St. John, nom. nov.
C. fruticosa St. John, Phytologia 63: 498, 1987,
non C. fruitocosa St. John, Phytologia 63: 470, 1987.
C. subaequalis St. John, Phytologia 63: 483, 1987.
C. prasina St. John, Phytologia 63: 481, 1987,
non St. John, Phytologia 63: 501, 1987, which is
C. glenwoodensis St. John (1987).

MISCELLANEOUS NOTES ON NEOTROPICAL FLORA XVII. NEW SPECIES OF MELIOSMA

Jose Cuatrecasas
Department of Botany, Smithsonian Institution, Washington, D.C.

MELIOSMA ECHEVERRYANA Cuatr.n.sp.

Arbor circa 12 m alta frondosa. Rami terminales valde robusti, hornotini angulati denseque tomentoso-hirsutuli ferruginei vel brunnescentes pilis acutis subflexuosis, densis subpatulis antrorsis distale subadpressis, deinde adulti teretes cortice sublaevi elliptici-lenticellato griseo glabro.

Folia crasse rigideque coriacea spiraliter alterna simplicia petiolata. Lamina (24-)40-53 x (9-)17-23 cm obovata vel obovato-elliptica basim versus attenuata base cuneata acuta, apice rotundata vel obtusa, margine leviter revoluta integerrima sed interdum subtiliter sinuata et minutis dentibus mucroniformibus ad terminaciones nervorum lateralium; adaxialiter lutescente- viridis nitida juvenili sparsis pilis, adulta glabra praeter costam et nervos laterales depressos minute pubescentibus, superficie bullato-rugulosa minuto reticulo venorum inter rugas valde impresso; abaxialiter pallide viridi-ochracea in vivo, sicca ferruginea, dense hirto-pilosa pilis patulis vel supatulis pluricellularibus cellula terminali longissima acutaque base conico-tuberculata 0.5-1.5 mm supra nervis ad 2 mm longis; costa validissima eminenti villoso-tomentosa, nervis secundariis prominentibus 23-24 utroque latere parallelis ascendentibus juxta marginem curvatis anastomosatisque, nervis tertiis transversis in amplum reticulum elevatum anastomosatis, venulis minoribus reticulum immersum sed bene conspicuum formantibus, areolis pluribus minutis papillis rotundatis nitidis et parcis pilis patulis munitis. Petiolus robustus (ad 1 cm latus ad basim), adaxiale paulo canaliculatus reliquo teres brunneo-tomentulosus 4-6.5 cm, ad basim

incrassato-pulviniformis.

Synflorescentia thyrsoide-paniculata ad 45 cm longa 22 cm lata. Rami numerosi laxe dispositi patentes ad 13 cm longi sursum gradatim decrescentes. Axis rami ramulique antrorse tomentoso-hirti pilis albis crassiusculis acutis nitidis ca 0.5 mm longis. Flores numerosi in ramulis dense glomeratis glomerulis sessilibus spiciforme aggregatis. Alabastra pallide viridia 1.2-1.5 mm diam, basi 1-2 bracteolis ovato-triangulatis vel oblongo-ovatis viridulis marginibus ciliatis, 0.5-0.8 mm longis. Sepala 5, viridia ovata subacuta, dorso glabra, margine ciliata pilis 2-3-cellulatis acutissimis et parcis pilis crassiusculis obtusis vel capitato-glandulosis. Petala 3 suborbiculata alba glabra convexa integra, interdum ciliata, basi minute staminodio squamoso connato, 2 petala interiora valde brevia lineari-oblonga ad basim utrumque cum stamen adnato. Stamina duo 1 mm longa filamento rigido erecto glabro, connectivo crasso, thecis duabus globosis albis nitidis unilocularibus dehiscentibus. Ovarium obsoletum. Flores in specimen immaturi. Fructus drupaceus nigro-violaceus subglobosus basi paulo asymmetricus, 24-26 x 21-22 mm, in sicco (herbario) 19-21 x 17-18 mm, exocarpio succulento ca. 5 mm crasso, endocarpio durissimo 14-15 x 12.5-14.5 mm.

Typus: Colombia, Tolima, Cordillera Central: Hoya del rio Combeima, Cañon del Combeima: El Silencio, 2600-2800 m, bosque en vias rápidas de destrucción, árbol 12 m, hojas grandes coriáceas verde amarillento oscuro haz, pálidas envés, fruto negruzco 22 mm diám, 3 Mar 1969, J. Cuatrecasas & R. Echeverry 27633 (holotype US, isotype COL).

Meliosma echeverryana, dedicated to the founder of the "Humboldt Botanical Garden of Tolima" in Ibague, Prof. Raul Echeverry, co-collector of the type specimens, is closely related to M.bogotana Steyerm. The Tolima plant differs essentially by having the leaves thicker and firmer coriaceus, and is provided usually with shorter hairs. More important is that the

leaf-lamina is adaxially glabrous, bright, rugose, minutely bullate, with the reticular venation strongly depressed between the rugae, being the minor reticulum well marked but flat abaxially. In M. bogotana the reticulum is raised on the upper surface of the blade and very prominent in the underneath, in addition the number of lateral nerves is lower in this species.

MELIOSMA LINDAE Cuatr. sp nov.

Arbor circa 5 m alta. Ramuli terminales dense hirsutis pilis rigidis pluricellularibus antrorsis subapressis vel subpatulis.

Folia alterna chartacea petiolata. Lamina 18-32 x 6-9 cm, lanceolata utrinque acuta, integra vel parce sinuata; adaxialiter viridis pilis flexuosis sparsis, ad costam et nervos laterales filiformes minute pilosa vel tuberculosa; subtus pallidior costa prominenti valde hirta pilis flavis 0.5(-1) mm ascendetibus vel patentibus, nervis secundariis parallelis 21-22 utroque latere anguste prominentibus profuse hirtis, nervis minoribus in reticulum plus minusve elevatum anastomosatis, areolis valde papillosis papillis obtusis nitidis et raris pilis. Petioli 2.6-3.8 cm subtomentosi pilis antrorsis dense subadpressis.

Synflorescentia thyrsoideo-paniculata 24 x 18 cm, proximaliter foliati-bracteata, base sterile circa 6 cm longa. Rami ramulisque divaricati, valde patentes. Axis rami et ramusculi hirsuto-tomentosi viridi-brunnescenti. Alabastra obovoidea 1.5-2 mm diam. Flores sessiles vel subsessiles congeste glomerati ad ramusculis spicati. Bracteolae ovoideae tringulares ciliatae 1-1.5 x 0.8-1.5 mm. Sepala 5 viridia quincuncialia ovoidea subacuta glabra sed ad marginem ciliata 1.2-1.5 x 1 mm, ciliis 2-3 cellulis uniseriatis acutis 0.1-0.3 mm praeterea parcis pilis crassioribus glandulato-capitatis. Petala alba vel rosea 3 orbicularia vel rotundato-obovata glabra in alabastro valde convexa anthesi plana 2.4-2.2 x 1.9-2.1 mm base utrumque cum staminodio minute squamato

adnato. Petala 2 interiora minora elliptico-oblonga subacuta 1.5-1.9 x 0.5-0.7 mm utrumque cum stamine basim connato. Stamina filamento plano rigido erecto glabro 0.8-1.2 mm. Antherae connectivo crassothecis duobus lateralibus sphaeroidalis albis nitentibus 0.3 mm diam. Ovarium pyriforme 0.8 mm long bicellatum, stylo 0.2-0.3 mm bilobato.

Typus: Colombia, Antioquia: mun. Caldas, Vereda La Corrala, finca La Zarza, 2440 m, "Arbol 5 m, doblado, en sombra del bosque húmedo muy perturbado, flores rosadas." 14 Apr 1987, Linda Albert de Escobar & Patricia Velasquez 7527, holotype HUA.

Meliosma lindae is similar to M. litlei which differs mainly by having a lower number of glabrous secondary nerves. It approches also to M. boliviana which has the leaf-blade rather obovate-oblong, obtuse. M. lindae differs also by the densely subhirsute or sutomentose inflorescence and for the more carnose petals. The species is dedicated to the first collector of the plant, Mrs. Linda Albert Escobar, Professor of Botany at the University of Antioquia in Medellin, Colombia.

MELIOSMA WURDACKII Cuatr. sp. nov.

Arbor circa 25 m alta ramis hornotinis pilosis vetustis glabratis.

Folia alterna simplicia breviter petiolata. Lamina chartaceo-membranacea viridis vel leviter brunnescens, elliptica subspicem breviter angustata subite acuminata, tertia parte proximali basim versus gradatim attenuata base cuneata, 26-33 x 9.5-12.3 cm plus acumine subacuto 1.6-2 cm longo; margine subplana integra; adaxialiter viridis glabra, costa anguste impressa, nerviis secundariis leviter impressis, venulis minoribus leviter elevatis subobsoletisque; abaxialiter subglabra viridis sed nervatione principali brunnescenti, costa valde robusta tereti striolulata, nervis secundariis 14-15 utroque latere, angulo 55-60° divergentibus, marginem versus arcuatis

anastomosantibus, mediis 2-3.7 cm inter se distantibus, nervis tertiis prominentibus brunnescentibusque patulis laxi-anastomosatis, venulis graciliter reticulum albidum prominulum formantibus; ad nervos, parcissimis minutis pilis adpressis fere obsoletis praedita. Petiolus 1.3-1.6 cm longus ad modum pulvinulum incrassatus. Folia subtendentia cum proximalia similima sed minora.

Synflorescentiae axillares subterminales et terminales, 5-20 cm longae, racemiforme paniculatae. Axis erectus rigidus quam folia subtendentia aequalis vel brevior, ramis numerosis alternis patulis 1-3 cm longis sursum parce ramulosis. Flores albi numerosi glomerati, glomerulis ad ramos et ramusculos sessilibus racemiforme vel spiciforme dipositis. Axis rami et ramusculi copiose vel dense minuteque hirsuti pilis rigidis acutis patentibus 0.2-0.4 mm, interdum in parte proximale axis longioribus. Alabastra rotundata alba circa 1.5 mm diam. Bracteae duae ovata-suborbiculatae concavae 1.2-1.1 mm longae et latae glabrae, margine laxi-ciliata excepta. Sepala quincunciale disposita basi breviter coalita persistentia, ovato-orbiculata vel intima ovato oblonga, 1.2-1.5 mm longa, glabra margine excepto parce ciliata. Petala glabra 3 exteriora 2.2 x 2.2 mm altera 2 x 2 et 1.8 x 1.8 m orbicularia margine integra, crossiuscula basi cum staminodia mambranacea oblonga apice dentata, 0.5-0.8 mm longa. Petala 2 interiora breviora oblonga 1-1.2 mm longa apice bifido. Stamina 2, filamenta crassa complanata 1 mm longa base cum petalis interioribus coalita. Anthera connectivo crassissimo 2 thecas laterales orbiculares albas nitidas patentes ferens. Ovarium oblongum biloculare. Stylus 0.4 mm bifidus.

Typus: Peru, Dep. Loreto, Prov. Alto Amazonas: Rainforest on lower north slopes of Cerros Campanquíz at Pongo de Manseriche, right bank of Río Marañón, 300-500 m, tree 25 m, flowers white, 19-21 Oct 1962, J.J.Wurdack 2342, holotype in US.

Meliosma wurdackii is related to M.schlimii and M.

violacea, both of which differ by having larger number of lateral nerves; it is also closely related to M.littlei and M.panamensis, from which M.wurdackii differs, as well from the other two mentioned species, by the almost unique character of having the petiole reduced to a thickly pulvinate base. Other differences can not be establish due the lack of flowers in the material at hand of M.panamensis and M.littlei.

REFERENCES

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A NEW SPECIES OF POTAMOGETON (COLEOGETON, POTAMOGETONACEAE) FROM PERU

ANTONIO GALAN-MERA

Museo de Historia Natural, Lima - Perú

Because the studies we are doing on Potamogeton L. genus in Perú, now we are giving a new species that is found in many lagoons in the Departments of Cuzco, Junín, and Puno.

Potamogeton punense Galán-Mera, sp. nov.

Planta ca. 70 cm. longa. Caulis basiusque ramosus, cilindricus, striatus. Folia angusta, plerumque 15-30 cm. longa, filiformia 2-4 mm. lata, plerumque 3-5 nervia, scabra. Stipulae hyalina 50-80 mm. longae. Spicae laxa ad septem verticilli. Fructus globosus, subapiculatus 1,5 mm. longus et 1 mm. latus.

This plants grows up to 70 cm. length. Branched stems since the bottom, cylindrical and grooved. Ribboned and uniform leaves in all of it, 3 to 5 nerves, very rough, with 15 to 30 cm. length, and 2-4 mm. width. Hyaline stipules with 50 to 80 mm. length. Lax spike with 20 to 30 mm. and up to 7 verticils. Ballooned fruits, a little bit apiculated, with 1,5 mm. length and 1 mm. width.

TYPE: Dept. Puno. Prov. Lampa (on San Román border). At road and railroad crossing of stream draining LAGO JARACOCHA, ca. 9 km. SW of SANTA LUCIA. Jan. 12, 1963. Alt. ca. 4000 m. H.H. & C.M. Iltis, D. & V. Ugent. Nº 1441. (holotype USM; isotype US).

It is distinguished from the rest of the sudamerican species of the Coleogeton subgenus for its strongly rough leaves. From Potamogeton strictus Phil. in the size, number of nerve leaves, and achenes morphology. From Potamogeton striatus R. & P. for the ribboned leaves, not rounded in the apex, and uniform length; more lax inflorescence, different morphology fruit, and smaller dimensions.

REFERENCES

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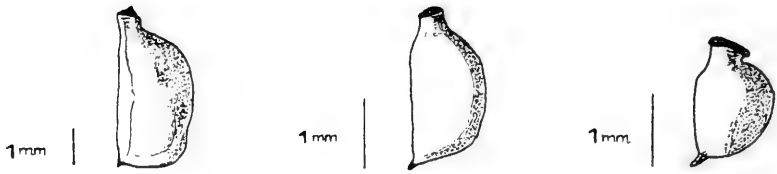
ACHENES



1 2 3

1 Potamogeton striatus R. & P.
2 Potamogeton strictus Phil.
3 Potamogeton punense Galán-Mera

ACKNOWLEDGMENTS

I want to express my gratitude to Prof. Oscar Tovar for his assistance in this work; to Prof. R. R. Haynes and Prof. J. A. Molina for the references and advises given; and the curators of the following herbaria for the help and leaving of specimens: AMAZ, CHI, F, K, P, US, USM.

STELLARIA PARVA PEDERSEN NEW TO NORTH AMERICA

by

Garrie P. Landry, William D. Reese, Dept. of Biology, University of Southwestern Louisiana, Lafayette, LA 70504. Charles M. Allen, Division of Biological Sciences, LSU, Eunice, LA 70535.

Stellaria parva Pedersen has recently been identified as occurring in Louisiana. Although misidentified herbarium (LAF) specimens date back to 1966, recent field collections and studies of fresh material led to the identification of this plant. Specimens were collected in Acadia and Jeff Davis Parishes from wet ditches in golf courses (Landry & Reese 8166, 11 April 1988, Landry & Reese 8176, 29 April 1988) and near drainage pipes in lawns (Landry & Reese 8171, 8172, 29 April 1988). Associated species include S. media, Alternanthera philoxeroides, Hydrochloa carolinensis, Ludwigia palustris and various species of sedges.

Stellaria parva, originally described in 1961 (Pedersen 1961), is presumably native to Argentina, Paraguay and southern Brazil. It is frequently misidentified as S. media, but can easily be distinguished by its solitary, axillary flowers and small, sessile leaves.

A more complete account of the occurrence of this species in Louisiana is forthcoming.

ACKNOWLEDGMENTS

We would like to thank Karl Vincent of the New York Botanical Garden for his assistance in determining the species.

LITERATURE CITED

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Studies on Mikania (Compositae)-XIV

Walter C. Holmes
Louisiana Scholars' College
Northwestern State University
Natchitoches, Louisiana 71497

Continued studies of Mikania have resulted in the discovery of the following new species from South America.

Mikania summinima W.Holmes, sp. nov.

Suffrutex volubilis; foliis triangulo-ovatis, ca. 4 x 3 cm, apice acuminatis, basi cordatis, marginibus crenatis vel integris. Capitulescentiis corymbosis, 5 x 10 cm. Capitulis ca. 4.5 mm longis. Corollis ca. 3 mm longis, dentibus limbi late triangularibus, ca. 0.8 mm longis. Achaenis 2.5 2.7 mm longis. Pappi setis 40-45, ca. 3 mm longis, scabridis.

Suffrutescent twining vine. Stems terete, hispid, the younger parts pilose. Leaf blades triangular-ovate, ca. 4 x 3 cm, 3-5 nerved from the base; upper surfaces puberulent to crisp-hairy, glandular; lower surfaces pilose, glandular, the veinlets reticulate; apices acuminate; margins crenate (to entire on upper leaves); bases cordate; petioles 1-1.5 cm long, puberulent. Capitulescence a corymb, ca. 5 x 10 cm, the heads somewhat congested toward the tips of the branchlets; branchlets crisp-hairy; ultimate branchlets 1-2 mm long, crisp-hairy; bracteal leaves linear to lance-ovate, otherwise similar to cauline leaves but reduced in size. Heads ca. 4.5 mm long; subinvolucral bracts borne at the base of the ultimate branchlets, linear, 2-3 mm long, crisp-hairy. Phyllaries oblong-obovate, ca. 3 mm long, puberulent; apices rounded, densely puberulent. Corolla white, ca. 3 mm long; tube ca. 1 mm long, glandular; throat funnelform, ca. 1.2 mm long; teeth broadly triangular, ca. 0.8 mm long, glandular. Achenes (immature) 2.5 2.7 mm long, glandular. Pappus bristles white, 40-45, ca. 3 mm long, margins scabrid. Style branches hirsute.

TYPE: Argentina. Misiones. San Ignacio, Puerto Nuevo, 12 March 1946, G.W.Schwarz 2208 (S (holotype); S (isotype).

The new species is characterized by its crisp-hairy pubescence, small heads and phyllaries, capitulescence with the heads clustered toward the tips of the branches, and hirsute style branches. Several characteristics, but especially the nature of the heads, suggest resemblance to Mikania minima (Bak.) B.L.Robins. That species has heads 3-3.5 mm long, phyllaries 2-2.5 mm long with acute apices, and a capitulescence with the heads more racemosely disposed. The stem is also conspicuously hexagonal and the style appendages lack hirsute papillae.

BOOK REVIEWS

Alma L. Moldenke

"COMBATING RESISTANCE TO XENOBIOTICS: Biological and Chemical Approaches" edited by M.G. Ford, D.W. Holloman, B.P.S. Khambay and R.M. Sawicki, 320 pp., 35 fig. & 67 Tab., VCH Publishers Inc., New York, N.Y. 10160-0425. 1987. $114.00.

The 25 papers in this book are from a Society of Chemical Industry Conference in Southampton University, U.K., in 1986 in reference to pesticide-insecticides, fungicides, herbicides and veterinary products -- resistance which may be biochemical, behavioral or genetic. Much of this information is presented, on the molecular/cellular level explaining genetically how and why so many control methods fail not only in the immediate organisms treated, but also in additional ones that eat them and suffer from their pathological effects. This is a more advanced and detailed treatment of this topic than most publications in this field present. The price seems way too high considering the poor type of hardcover and binding.

"MARINE INVERTEBRATES OF THE PACIFIC NORTHWEST" by Eugene N. Kosloff in collaboration with Linda H. Price and contributions by other specialists. viii + 511 pp., 710 black/white fig. incl. 179 photo., University of Washington Press, Seattle, Washington 98145-5096. 1988. $35.00.

This book got its start in the Friday Harbor Laboratories of the University of Washington with the cataloging and subsequent keying of the marine invertebrates of the San Juan Archipelago, Puget Sound and adjacent areas. This material was published by this press in 1974. Subsequent collections spread to include the Queen Charlotte Islands, the whole Oregon coast and even that of northern California. The keys, descriptions and illustrations are arranged by phyla and their subdivisions. The first illustration in each group has body parts labeled to facilitate use of the keys. This publication will prove to be a very important text for relevant courses on several levels and an important guide for individual hobbyists.

"GRAY'S MANUAL OF BOTANY" Eighth (Centennial) Edition - Illustrated - Largely rewritten and expanded by Merritt Lyndon Fernald lxiv + 1632 pp., 1806 draw., Dioscorides Press, Portland, Oregon 97225. 1987. $59.95.

This printing of the great classic Gray's "Manual" is useful and needed not only in the northeastern United States and Canada, but also over a far greater range because the descriptions, illustrations and keys are so well done that they are therefore helpful not only because the plants may exist there but also because they may not, but their contrasting characteristics can be clearly recognized. The "Manual" first appeared in 1850 and had four revisions under Asa Gray himself until 1908. Fernald's extensive revisions appeared with the eighth edition in 1950 marking the centennial of this truly classical work. In 1970 R.C. Rollins' much appreciated revision appeared and it too has been out of print. It is this one that is republished here filling an important void and so timed that it honors the 100th anniversary of Gray's death. It is now too big to be carried in a field jacket pocket as was my leather-bound onion skin paper 7th edition, but it can go into a knapsack. Mostly it will be consulted and studied in the lab, herbarium, or home. It is wonderful to have it readily available again for botanists, botany students, amateur naturalists, and student and professional ecologists. The book is priced so reasonably considering its size, quality of paper and print, and good binding.

"WEEDS OF THE UNITED STATES AND THEIR CONTROL" by Harri J. Lorenzi & Larry S. Jeffrey, 355 pp., 306 color photo., 306 geog. dist. maps & 9 tab., Van Nostrand Reinhold, New York, N.Y. 10003. 1987. $74.95.

This is an important book that has these weeds arranged phylogenetically, with common and scientific individual and family names, dotted U.S. geographic distribution maps, descriptions, habitats and suggested controls. It certainly should be much appreciated that environmentally destructive controls are only listed after other non-poisonous ones are given. The color plates, nine to a page, are shown very clearly against black backgrounds. Considering their small size, the plants are all readily identifiable.

"A MONOGRAPH OF THE LICHEN GENUS *PARMELIA* ACHARIUS SENSU STRICTO (ASCOMYCOTINA: PARMELIACEAE)" by Mason E. Hale Jr. iii + 55 pp., 109 black/white photo. & 6 maps. Smithsonian Institution Press, Washington, D.C. 20560. 1987. Paperbound.

This publication is no. 66 in the Smithsonian Contributions to Botany Series and is the excellently prepared work of the world-famous lichenologist long on the Smithsonian staff. The author characterizes the genus with gross features and those revealed by SEM and chemical tests that lead to dividing the genus into 38 described species including 7 new ones. Since *Parmelia* is found world-wide in temperate forests on rocks and trees and in tundra on rocks, mosses and humus with concentration and dispersement centers in Japan and New Zealand this monograph proves to be worldwide in scope and yet a finely detailed definitive taxonomic study. When black/white photographs of lichens appear in print, the results typically are poor; but the many photographs in this monograph are the best I have ever seen.

"THE TREES OF NORTH AMERICA" text by Alan Mitchell and illustrations by David Moore, 208 pp., 85 color full plates and half plates, 156 tree silhouette and North American geographic distribution maps, Facts on File Publications, Inc. New York, N.Y. 10016. 1987. $24.95.

This is a very attractive and informative book about virtually all trees - native and introduced - found in the United States and Canada in their original niches, naturally or artificially spread and intentionally or accidentally introduced from beyond these borders. For hundreds of these taxa the text gives common and scientific names, descriptions, uses, horticultural variations, specially well known growing sites (as from botanical gardens and historic areas), and geographic distributions using the U.S. 2-letter space-saving abbreviations. The book just sparkles with its copious, effective, accurate, colored drawings of these plants and their parts. This book will prove of great value to horticultural, forestry, arborist students, schools and practitioners. And to anybody else who likes to look at attractively and effectively illustrated books on trees.

"FLORA OF THE BRITISH ISLES" Third Edition, by A.R. Clapham, T.G. Tutin & D.M. Moore xxix + 688 pp., 82 black/white fig. Cambridge University Press, Cambridge & London, U.K. & New York, N.Y. 10022. 1987. $125.00.

This very important countrywide floral study was first published in 1952, reprinted in 1957 and 1958, had its second edition in 1962, and now appears again updated with new findings from the field and from taxonomic studies. The preface to this third edition claims to continue "to provide general descriptions which include lifeform and chromosome numbers and some notes on phenology and mechanisms of pollination and seed dispersal and also on variability, distribution within and outside the British Isles, preferred habitats and commonly associated species." The introductory synopsis of classification starts with the pteri-dophytes and proceeds through the angiosperm orders and ends with a clearcut artificial key to families. There is a useful glossary at the end. The detailed plant descriptions are as clearcut as nature permits. This publication will prove to be so useful in so many different pursuits.

"CONIFERS" by Keith Rushforth, 232 pp., 20 color photo., 26 black/ white draw., 1 chart & 2 maps. Facts on File Publications, New York, N.Y. 10016. 1987. $24.95.

The author is a former curator of the outstanding Hilier Arboretum in England and long interested in conifers. He tells of their use in different kinds and parts of gardens and even indoor in bonsai, and their propagation, pests and diseases. The bulk of the text is a gazetteer of conifers arranged by genera. This book should prove a valuable and attractive source of such information to gardeners, arborists, nursery specialists and horticulture students for years to come.

Index to Authors of Volume 64

Index to supraspecific taxa in Volume 64

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All scientific plant and animal names and group names should be typed either in italic type (if available) or underscored. Any corrections in the text made by the author must be complete and neat as they will be photographed as they are.

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