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THE WETLAND VASCULAR FLORA OF FOUR SEEPS IN MCDONOUGH COUNTY, ILLINOIS

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ABSTRACT: The wetland vascular floras of four herbaceous-dominated west-central Illinois seeps that drain into tributaries of the Lamoine River were studied during 1983. Three were alkaline seeps and one was acid. Although there were some floristic differences among the seeps, in totality there were represented three divisions, 37 families, 71 genera and 122 species recorded with the Magnoliophyta being the largest taxon. Only seven species (5.7%) occurred in all four seeps.

INTRODUCTION

The four seeps in west-central Illinois which are the subjects of this paper became of interest when a cursory visit to each revealed obvious floristic differences that attracted attention. The Good Hope Marsh was the only one with Aster umbellatus, Saxifraga pensylvanica and Gentiana andrewsii, the Acorus Seep was the only one with Acorus calamus (which grew in a rather large stand), Spring Lake Seep was the only one with Solidago patula and the Argyle Lake Sphagnum Seep was dominated with the moss Sphagnum. Also in one or more of these seeps were the less common plants Chelone glabra, Pedicularis lanceolata, Aster puniceus and Caltha palustris. Knowing that these kinds of habitats are not common in west-central Illinois and that they should be appreciated and hopefully preserved, we decided to investigate them more thoroughly from a floristic viewpoint in order to make a record of some baseline data about them for future monitoring and comparison.

The Good Hope Marsh and the Lake Argyle Sphagnum Seeps are on the Illinois Natural Areas Inventory. O'Flaherty et al., (1975) described the Lake Argyle Sphagnum Seep from a bryological basis (including the report of a state record, Sphagnum fimbriatum Wils. ex J. Hook.) detailing the physical description and soil and water analyses. In east-central Illinois, Ebinger (1978) studied the vascular flora of seven hillside seeps, Parker and Ebinger (1971) studied the ecology of a hillside marsh and Phipps and Spear (1958) studied a hillside marsh.

METHODS

Each seep was visited at least once a month from March through October 1983. Voucher specimens are deposited in the R. M. Myers Herbarium of Western Illinois University (MWI). Mohlenbrock (1975)

was the source for the family and species nomenclature.

DESCRIPTION OF STUDY AREAS

The four seeps studied are in central McDonough County, Illinois within about a six mile radius from Macomb and within a 12 mile distance from each other. They are more or less tongue-shaped and occur on the south side of tributaries (into which they drain) of the Lamoine River which traverses central McDonough County from a northeast to southwest direction.

Good Hope Marsh (Fig. 1)--Located 3 miles east of Good Hope at the east side of county road 1500 E. Although this seep occurs on both sides of the road this study only includes the approximately 75,600 sq. ft. (420' x 180') on the east side. In the center of the marsh on August 1, 1983 the air temperature was 79°F and the water temperature 66°F with a pH 7.0. The seep is not shaded. The adjacent vegetation is a heavily grazed old field with scattered trees of Gleditsia triacanthos. Crataegus spp., Maclura pomifera, and Morus alba as well as scattered shrubs of Ribes spp., Rosa multiflora, and Symphoricarpos orbiculatus.

Acorus Seep (Fig. 2)--Located about 300 feet east of Good Hope Marsh with an area of about 65,100 sq. ft. (465' x 140'). In the center of the seep on August 1, 1983 the air temperature was 84°F and the water temperature 75°F with a pH 7.3. The seep is not shaded and the adjacent vegetation is the same as Good Hope Marsh.

Spring Lake Seep (Fig. 3)--Located about four miles northwest of Macomb in the northeastern part of Spring Lake Park and about six miles southwest of Good Hope Marsh, this seep consists of about 7,425 sq. ft. (165' x 45'). This seep, more of a hillside seep, is heavily shaded by the adjacent dense mesic woods the principal canopy trees at the perimeter being Juglans nigra, J. cinerea, Fraxinus americana, Carya spp., Quercus rubra, Q. imbricaria, Q. alba and Tilia americana. The main understory trees are Prunus serotina, Ostrya virginiana and Ulmus sp. The shrub Cornus racemosa was also present. In the center of the seep on August 1, 1983 the air temperature was 75°F and the water temperature 71°F with a pH 7.6.

Argyle Lake Sphagnum Seep (Fig. 4)--Located about six miles west of Macomb in the southwestern part of Argyle Lake State Park and about six miles southwest of Spring Lake Seep, this seep consists of about 986 sq. ft. (58' x 17'). This seep, which is a hillside coal seep dominated by the moss Sphagnum, is heavily shaded by the adjacent dense mesic woods. The principal canopy trees around it are Acer saccharum, Quercus rubra, Q. alba, Carya spp., Ulmus sp., and Fraxinus americana, with a few Betula nigra at the edge. The main understory trees are Ostrya virginiana, Amelanchier arborea and Prunus serotina. In the center of the seep on August 1, 1983 the air temperature was 66°F and the water temperature 65°F with a pH 3.5.

Figure 2. Acorus Seep

Figure 4. Argyle Lake Sphagnum Seep

Figure 3. Spring Lake Seep

LIST OF THE WETLAND SPECIES

GH = Good Hope Marsh, Sp = Spring Lake Seep, Ac = Acorus Seep, Ar = Argyle Lake Sphagnum Seep, * = alien species

DIVISION EQUISETOPHYTA
EQUISETACEAE
GH,Sp Equisetum arvense L.

DIVISION POLYPODIOPHYTA
POLYPODIACEAE
GH,Sp,Ac Onoclea sensibilis L.
GH,Sp Thelypteris palustris Schott var. pubescens (Laws.) Fern.

DIVISION MAGNOLIOPHYTA
CLASS LILIOPSIDA
ALISMACEAE
GH,Sp Alisma subcordatum Raf.
Sp Sagittaria brevirostra Mack. & Bush
GH, Ac Sagittaria latifolia Willd.

ARACEAE
Ac Acorus calamus L.

CYPERACEAE
Ac,Ar Carex cristatella Britt.
GH,Sp,Ac Carex hystricina Muhl.
GH Carex lacustris Willd.
Sp Carex laevivaginata (Kukenth.) Mack.
GH Carex lanuginosa Michx.
Sp Carex lurida Wahlenb.
GH, Ac Carex scoparia Schk.
GH Carex sterilis Willd.
Sp, Ar Carex stipata Muhl.
GH,Sp,Ac Carex stricta Lam.
Sp Carex trichocarpa Muhl.
GH, Ac Carex vulpinoidea Michx.
GH Cyperus esculentus L.
Sp Cyperus ferruginescens Boeckl.
GH Cyperus rivularis Kunth
GH,Sp,Ac Cyperus strigosus L.
GH,Sp,Ac Eleocharis erythropoda Steud.
GH Eleocharis obtusa (Willd.) Schult.
GH Eleocharis obtusa (Willd.) Schult. var. detonsa (Gray) Drap. & Mohlenbr.
GH,Sp,Ac Scirpus atrovirens Willd.
GH Scirpus cyperinus (L.) Kunth
GH Scirpus pendulus Muhl.
GH,Sp,Ac Scirpus validus Vahl

JUNCACEAE
GH Juncus dudleyi Wieg.
GH Juncus interior Wieg.

LEMNACEAE
GH,Sp,Ac Lemna minor L.
Sp Spirodela polyrhiza (L.) Schleiden

POACEAE
Ar Agrostis scabra Willd.
GH Alopecurus carolinianus Walt.
GH Calamagrostis canadensis (Michx.) Beauv.
GH,Sp,Ac,Ar Echinochloa pungens (Poir.) Rydb.
Sp Echinochloa pungens (Poir.) Rydb. var. wiegandii Fassett
GH,Sp,Ac,Ar Glyceria striata (Lam.) Hitchcock
GH,Sp Glyceria striata (Lam.) Hitchcock var. stricta (Scrib.) Fern.
GH,Sp,Ac,Ar Leersia oryzoides (L.) Swartz
Sp, Ar Leersia virginica Willd.
Sp Phalaris arundinacea L.
GH Sphenopholis obtusata (Michx.) Scribn.
Ac Sphenopholis obtusata (Michx.) Scribn. var. major (Torr.) Erdman

TYPHACEAE
GH, Ac Typha latifolia L.

CLASS MAGNOLIOPSIDA
ACERACEAE
Ar Acer saccharinum L.

ASCLEPIADACEAE
GH,Sp Asclepias incarnata L.

BALSAMINACEAE
GH,Sp,Ac Impatiens biflora Walt.

BETULACEAE

Ar *Betula nigra* L.

CAMPANULACEAE

GH, Ac *Campanula aparinoides* Pursh
GH,Sp,Ac *Lobelia siphilitica* L.

COMPOSITAE

Sp, Ar *Aster lateriflorus* (L.) Britt.
GH, Ac *Aster novae-angliae* L.
GH *Aster praealtus* Poir.
GH *Aster puniceus* L.
GH,Sp,Ac *Aster puniceus* L. var. *lucidulus* Gray
Sp,Ac *Aster simplex* Willd.
GH *Aster umbellatus* L.
GH,Sp, Ar *Bidens aristosa* L.
GH,Sp,Ac,Ar *Bidens cernua* L.
Sp, Ar *Bidens comosa* (Gray) Wieg.
GH, Ac *Bidens coronata* (L.) Britt.
Sp,Ac,Ar *Bidens frondosa* L.
Sp *Bidens vulgata* Greene
Ar *Eclipta alba* (L.) Hassk.
GH, Ac *Erechtites hieracifolia* (L.) Raf.
GH,Sp,Ac *Eupatorium maculatum* L.
GH,Sp,Ac *Eupatorium perfoliatum* L.
GH, Ac *Helenium autumnale* L.
Sp *Solidago patula* Muhl.

CONVOLVULACEAE

GH, Ac *Cuscuta polygonorum* Engelm.

CORNACEAE

GH, Ac *Cornus obliqua* Raf.
GH, Ac *Cornus racemosa* Lam.

CRUCIFERAE

GH,Sp,Ac *Cardamine bulbosa* (Schreb.) BSP.
GH, Ac *Rorippa islandica* (Oeder) Borbas var. *fernaldiana* Butt. & Abbe
GH *Rorippa sessiliflora* (Nutt.) Hitchc.

GENTIANACEAE

GH *Gentiana andrewsii* Griseb.

HYPERICACEAE

GH, Ac *Hypericum mutilum* L.
GH, Ar *Hypericum punctatum* Lam.

LABIATAE

GH, Ac,Ar *Lycopus americanus* Muhl.
GH *Lycopus uniflorus* Michx.
Sp, Ar *Lycopus virginicus* L.
GH, Ac *Mentha arvensis* L. var. *villosa* (Benth.) S.R. Stewart
GH, Ac *Pycnanthemum virginianum* (L.) Dur. & Jacks.
GH,Sp,Ac,Ar *Scutellaria lateriflora* L.
GH *Stachys palustris* L. var. *homotricha* Fern.

LEGUMINOSAE

GH, Ac *Amorpha fruticosa* L.

LYTHRACEAE

GH *Lythrum alatum* Pursh

OLEACEAE

Ar *Fraxinus americana* L.

ONAGRACEAE

GH,Sp,Ac *Epilobium coloratum* Muhl.
Sp *Jussiaea repens* L. var. *glabrescens* Kize.
GH, Ac,Ar *Ludwigia alternifolia* L.
GH *Ludwigia palustris* (L.) Ell. var. *americana* (DC.) Fern. & Grisc.
GH *Ludwigia polycarpa* Short & Peter

POLYGONACEAE

GH,Sp,Ac *Polygonum hydropiper* L.
Ar *Polygonum hydropiperoides* Michx.
Sp *Polygonum pensylvanicum* L. var. *laevigatum* Fern.
Sp,Ac,Ar *Polygonum persicaria* L.
GH,Sp,Ac,Ar *Polygonum punctatum* Ell.
GH,Sp,Ac *Polygonum sagittatum* L.
Sp *Rumex altissimus* Wood
Sp,Ac *Rumex crispus* L.

PRIMULACEAE

Sp, Ar *Lysimachia nummularia* L.

RANUNCULACEAE

GH,Sp *Caltha palustris* L.
GH,Sp,Ac *Ranunculus abortivus* L.
Sp *Ranunculus recurvatus* Poir.
Sp *Ranunculus sceleratus* L.
Sp *Ranunculus septentrionalis* Poir.

ROSACEAE

GH,Sp *Geum laciniatum* Murr. var. *trichocarpum* Fern.

RUBIACEAE

GH *Galium obtusum* Biegel.
GH,Sp,Ac *Galium tinctorium* L.

SALICACEAE

GH,Sp,Ac *Salix discolor* Muhl.
GH, Ac *Salix nigra* Marsh.
Sp,Ac *Salix rigida* Muhl.

SAXIFRAGACEAE

GH, Ac *Penthorum sedoides* L.
GH *Saxifraga pensylvanica* L.

SCROPHULARIACEAE

GH,Sp,Ac *Chelone glabra* L.
GH,Sp,Ac *Mimulus ringens* L.
Sp *Mimulus ringens* L. var. *minthodes* (Greene) Grant
GH,Sp,Ac *Pedicularis lanceolata* Michx.

ULMACEAE

GH,Sp,Ac,Ar *Ulmus americana* L.

UMBELLIFERAE

Ac *Cicuta maculata* L.

URTICACEAE

Sp, Ar *Boehmeria cylindrica* (L.) Siv.
Sp,Ac *Pilea pumila* (L.) Gray

VERBENACEAE

GH,Sp,Ac *Lippia lanceolata* Michx.
GH, Ac *Verbena hastata* L.

FLORISTIC ANALYSIS

The total wetland vascular flora of the four seeps consisted of three divisions (Equisetophyta, Polypodiophyta, Magnoliophyta), 37 families, 71 genera and 122 species (plus six additional varieties). As shown in Table 1 in all seeps the Magnoliophyta (and within it the class Magnoliopsida) contained the most families, genera and species. The Acorus Seep lacked Equisetophyta and the Argyle Seep lacked both Equisetophyta and Polypodiophyta. The Good Hope Marsh had the most families, genera and species while the Argyle Lake Sphagnum Seep had the fewest. Of the 37 families, Good Hope had 30 (81%), Acorus 27 (73%), Spring Lake 23 (62%) and Argyle 13 (35%). Of the 71 genera, Good Hope had 56 (79%), Acorus 47 (66%), Spring Lake 42 (59%) and Argyle 19 (27%). Of the 122 species, Good Hope had 85 (70%), Acorus 63 (52%), Spring Lake 66 (54%) and Argyle 26 (21%). A comparison of the largest families

and genera are shown in Tables 2 and 3. Carex is the largest genus in terms of the number of species in all the seeps except at Argyle where it is Bidens. Carex is the largest monocot genus in all four seeps and Bidens is the largest dicot genus at Spring Lake and Argyle whereas Polygonum is the largest at Acorus and Aster at Good Hope. The Cyperaceae is the largest family in terms of the number of species at Good Hope and Spring Lake whereas the Compositae is the largest family at Acorus and Argyle. The Cyperaceae is the largest monocot family at all the seeps except Argyle where the Poaceae is the largest. The Compositae is the largest dicot family at all four seeps. The relative numbers of woody and herbaceous genera and species are compared in Table 4. There are 10 woody species in seven genera and 112 herbaceous species in 64 genera. Although all of the seeps had woody plants, clearly they are dominated by herbaceous taxa which are about 92% of the species present. Spring Lake had the fewest woody taxa while Argyle had the highest percent woody taxa. Out of the seven woody genera present in the seeps Good Hope, Acorus, and Argyle each had four genera whereas Spring Lake had two. Salix with three species and Cornus with two species were the only genera of the seven to have more than one species each. Ulmus americana was the only woody species to occur in all four seeps. Herbaceous plants occurring in all four seeps were Echinochloa pungens, Glyceria striata, Leersia oryzoides, Bidens cernua, Scutellaria laterfolia, and Polygonum punctatum; these seven species being 5.7% of the 122 species found in all four seeps. Twenty-nine (23.8%) of all species were in three seeps, 40 (32.8%) were common to two seeps and 46 (37.7%) were located in only one seep (23 at Good Hope, 2 at Acorus, 15 at Spring Lake, 6 at Argyle. Table 5). Uncommon wetland species in west-central Illinois occuring in these seeps were Carex laevivaginata, Carex sterilis, Solidago patula, Aster umbellatus, Aster puniceus, Lycopus uniflorus, Galium tinctorium, Saxifraga pensylvanica, Campanula aparinoides and Caltha palustris. Per Mohlenbrock and Ladd (1978) the four taxa Campanula aparinoides, Carex sterilis, Aster puniceus (although the variety lucidulus has been reported by Scott and Henry (1982)) and Glyceria striata var. stricta (this variety has not been previously reported) have not been attributed to McDonough County and thus are county records. All four of these plants were found in (but all not limited to) Good Hope. Out of the 122 species only four (3.3%) were aliens (Lysimachia nummularia, Polygonum hydropiper, Polygonum persicaria, Rumex crispus) indicating a low invasion by non-indigenous wetland species to date. Spring Lake had all four species, Acorus had three, Argyle had two and Good Hope one.

GENERAL VEGETATION SUMMARY

Although this study is primarily floristic, some general vegetational observations are included here. A detailed ecological study would be desirable and should be done.

Table 1

Family, Genera and Species Analysis of the Four Seeps

	Good Hope Marsh		Acorus Seep		Spring Lake Seep		Argyle Lake Sphagnum Seep		Total
	Number	%	Number	%	Number	%	Number	%	
Families									
Equisetophyta	1	3.3	0	0	1	4.3	0	0	1
Polypodiophyta	1	3.3	1	3.7	1	4.3	0	0	1
Magnoliophyta	28	93.4	26	96.3	21	91.4	13	100	35
Liliopsida	6	20	6	22.2	4	17.4	2	15.4	7
Magnoliopsida	22	73.3	20	74.1	17	73.9	11	84.6	28
Total	30	100	27	100	23	100	13	100	37
Genera									
Equisetophyta	1	1.8	0	0	1	2.4	0	0	1
Polypodiophyta	2	3.6	1	2.1	2	4.8	0	0	2
Magnoliophyta	53	94.6	46	97.9	39	92.8	19	100	68
Liliopsida	15	26.8	12	25.5	12	28.6	5	26.3	19
Magnoliopsida	38	67.9	34	72.3	27	64.3	14	73.7	49
Total	56	100	47	100	42	100	19	100	71
Species									
Equisetophyta	1	1.2	0	0	1	1.5	0	0	1
Polypodiophyta	2	2.4	1	1.6	2	3.0	0	0	2
Magnoliophyta	82	96.4	62	98.4	63	95.5	26	100	119
Liliopsida	28	32.9	17	27	20	30.3	7	26.9	40
Magnoliopsida	54	63.5	45	71.4	43	65.2	19	73.1	79
Total	85	100	63	100	66	100	26	100	122

Table 2

The Largest Families in the Four Seeps

Seep	Families								
	Total			Liliopsida			Magnoliopsida		
	Family	Number of Species	%	Family	Number of Species	%	Family	Number of Species	%
Good Hope Marsh	Cyperaceae	16	18.8	Cyperaceae	16	18.8	Compositae	11	12.9
	Compositae	11	12.9	Poaceae	6	7.1	Labiatae	6	7.1
	Poaceae	6	7.1				Onagraceae	4	4.7
	Labiatae	6	7.1						
Acorus Seep	Compositae	10	15.9	Cyperaceae	9	14.3	Compositae	10	15.9
	Cyperaceae	9	14.3	Poaceae	4	6.3	Polygonaceae	5	7.9
	Polygonaceae	5	7.9				Labiatae	4	6.3
Spring Lake Seep	Cyperaceae	11	16.7	Cyperaceae	11	16.7	Compositae	11	16.7
	Compositae	11	16.7	Poaceae	5	7.6	Polygonaceae	7	10.6
	Polygonaceae	7	10.6				Ranunculaceae	5	7.6
	Poaceae	5	7.6						
	Ranunculaceae	5	7.6						
Argyle Lake Sphagnum Seep	Compositae	6	23.1	Poaceae	5	19.2	Compositae	6	23.1
	Poaceae	5	19.2	Cyperaceae	2	7.7	Labiatae	3	11.5
	Polygonaceae	3	11.5				Polygonaceae	3	11.5
	Labiatae	3	11.5						

Table 3

The Largest Genera in the Four Seeps

Seep	Genera								
	Total			Liliopsida			Magnoliopsida		
	Genus	No. of Species	%	Genus	No. of Species	%	Genus	No. of Species	%
Good Hope Marsh	Carex	7	8.2	Carex	7	8.2	Aster	4	4.7
	Scirpus	4	4.7	Scirpus	4	4.7	Bidens	3	3.5
	Aster	4	4.7	Cyperus	3	3.5	Polygonum	3	3.5
							Ludwigia	3	3.5
Acorus Seep	Carex	5	7.9	Carex	5	7.9	Polygonum	4	6.3
	Polygonum	4	6.3	Scirpus	2	3.2	Salix	3	4.8
	Salix	3	4.8				Bidens	3	4.8
	Bidens	3	4.8				Aster	3	4.8
	Aster	3	4.8						
Spring Lake Seep	Carex	6	9.1	Carex	6	9.1	Bidens	5	7.6
	Bidens	5	7.6	Cyperus	2	3.0	Polygonum	5	7.6
	Polygonum	5	7.6	Scirpus	2	3.0	Ranunculus	4	6.1
	Ranunculus	4	6.1	Leersia	2	3.0	Aster	3	4.5
Argyle Lake Sphagnum Seep	Bidens	4	15.4	Carex	2	7.7	Bidens	4	15.4
	Polygonum	3	11.5	Leersia	2	7.7	Polygonum	3	11.5
	Carex	2	7.7				Lycopus	2	7.7
	Leersia	2	7.7						
	Lycopus	2	7.7						

Table 4

The Woody and Herbaceous Plant Components of the Four Seeps

	Good Hope Marsh		Acorus Seep		Spring Lake Seep		Argyle Lake Sphagnum Seep		Total	
	Genera	Number of Species	Genera	Number of Species	Genera	Number of Species	Genera	Number of Species	Genera	Number of Species
Woody	Cornus	2	Salix	3	Salix	2	Acer	1	Salix	3
	Salix	2	Cornus	2	Ulmus	1	Betula	1	Cornus	2
	Amorpha	1	Amorpha	1			Fraxinus	1	Acer	1
	Ulmus	1	Ulmus	1			Ulmus	1	Betula	1
									Amorpha	1
									Fraxinus	1
									Ulmus	1
Total	4(71%)	6(7.1%)	4(8.5%)	7(11.1%)	2(4.8%)	3(4.5%)	4(21.1%)	4(15.4%)	7(9.9%)	10(8.2%)
Herbaceous Total	52 (92.9%)	79 (92.9%)	43 (91.5%)	56 (88.9%)	40 (95.2%)	63 (95.5%)	15 (78.9%)	22 (84.6%)	64 (90.1%)	112 (91.8%)

Table 5

Species Located at Only One Seep

GOOD HOPE (23)	SPRING LAKE (15)
Carex lacustris	Sagittaria brevirostra
Carex lanuginosa	Carex laevivaginata
Carex sterilis	Carex lurida
Cyperus esculentus	Carex trichocarpa
Cyperus rivularis	Cyperus ferruginescens
Eleocharis obtusa	Spirodela polyrhiza
Scirpus cyperinus	Phalaris arundinacea
Scirpus pendulus	Bidens vulgata
Juncus dudleyi	Solidago patula
Juncus interior	Jussiaea repens glabrescens
Alopecurus carolinianus	Polygonum pensylvanicum laevigatum
Calamagrostis canadensis	Rumex altissimus
Aster praealtus	Ranunculus recurvatus
Aster umbellatus	Ranunculus scleratus
Rorippia sessiliflora	Ranunculus septentrionalis
Gentiana andrewsii	
Lycopus uniflorus	ARGYLE LAKE (6)
Stachys palustris homotricha	Agrostis scabra
Lythrum alatum	Acer saccharinum
Ludwigia palustris americana	Betula nigra
Ludwigia polycarpa	Eclipta alba
Galium obtusum	Fraxinus americana
Saxifraga pensylvanica	Polygonum hydropiperoides
	ACORUS (2)
	Acorus calamus
	Cicuta maculata

Good Hope Marsh--There are six rather distinct vegetational zones. In order from south (mouth) to north (source) they and their principal genera are: 1--sedge meadow (Eleocharis, Carex, Scripus), 2--shrub zone (Amorpha fruticosa), 3--sedge meadow (Carex), 4--herbaceous zone (Typha, Impatiens, Bidens, Sagittaria, Polygonum), 5--tree and shrub (woody) zone (Ulmus, Cornus, Amorpha, Salix) and 6--herbaceous zone of the southern and eastern edge surrounding the spring which is the major source of water (Glyceria, Carex, Scirpus, Eupatorium, Sagittaria, Onoclea and Impatiens being the major plants but also including Pedicularis, Gentiana, Chelone and Saxifraga). Carex lacustris and C. stricta were the dominant and sub-dominate sedges respectively.

Acorus Seep--Likewise has six rather distinct zones from the south (mouth) to north (source): 1--grass meadow which is about 50% the length of this seep (Glyceria), 2--sedge meadow (Eleocharis, Carex, Scirpus, with herbs as Sagittaria, Impatiens, Eupatorium and particularly on the west side Polygonum), 3--cattail zone (Typha) particularly at the west-central location, 4--sweet-flag zone (Acorus) which occupies about 25% of the seep's length, 5--tree and shrub (woody) zone east of the Acorus (Ulmus, Salix, Cornus, Amorpha), and 6--herbaceous zone of the southern and eastern edge surrounding the main water source (Glyceria, Sagittaria, Eupatorium, Carex, Impatiens, Typha, Scirpus). Carex hystricina and C. stricta were the dominant and sub-dominant sedges respectively.

Spring Lake Seep--This seep is not clearly zoned but is basically a sedge meadow (Carex) with the other species scattered throughout including a small grouping of several small woody plants (Ulmus, Salix) in the center. Along the lake edge (mouth) of the seep is a moderate stand of Phalaris where as at the eastern edge (a major source of the seep's water) there is a good stand of Impatiens.

Argyle Lake Sphagnum Seep--There is no zonation. The recorded species are generally scattered throughout the Sphagnum mat although most plants are near the periphery and the grass species appear to form a narrow band at the top and bottom of the seep.

DISCUSSION AND SUMMARY

These four herbaceous-dominated seeps, within a 12 mile distance of each other, occur on the south side of tributaries of the Lamoine River. The most apparent differences among them (excluding size) is that (a) one (Argyle) is an acid seep whereas the others are near neutral or alkaline, (b) two (Argyle and Spring Lake) are hillside seeps whereas the other two are not on such slopes, (c) two (Argyle and Spring Lake) are shaded and the other two are not, (d) two (Good Hope and Acorus) are surrounded by disturbed vegetation whereas the other two are not, and (e) two (Good Hope and Acorus) had generally well defined vegetation zones which the other two did not. Although the general floristic characters were similar in all the seeps, several differences were apparent (a) the acid seep (Argyle) clearly had fewer species than the others, (b) Carex was the genus with the most species in all the seeps except Argyle where Bidens was the largest genus, (c) only seven species (5.7%) were found in all four seeps (Ebinger (1978) found eight (8.4%) species in all seven seeps he studied in east-central Illinois), and (d) forty-six (37.7%) species were located in only one seep (Ebinger (1978) found 38 (40%) species at only one of his seven seeps in east-central Illinois which he considers to be due to chance dissemination, degree of disturbance and habitat differences).

At the present time the seeps' floristic integrity seem not to be seriously threatened by alien wetland species since the latter

component is rather low (3.3%), although present in all four seeps. The list of vascular plants from this seep study includes only characteristic wetland species. There were, however, some other species present in the seeps. These were species of the surrounding vegetation and occurred in the seeps usually at the periphery in small numbers and generally could not be considered as present threats to the seeps' floristic integrity. However, we feel it is important to state our comments about possible threats to each seep:

Good Hope Marsh and Acorus Seep--These are considered together since the threats are identical. There is a serious problem with cattle grazing around these privately owned seeps. They graze into the seep as far as they can, which varies with the water level. The edges (except the west edge of Good Hope Marsh which is a road) are severely trampled and often the Acorus in Acorus seep and Gentiana in Good Hope Marsh are badly mutilated. Also the effect of the large quantities of cattle feces and urine which sometimes discolor the water in places must not be neglected and should be evaluated. Species such as Barbarea vulgaris, Taraxacum officinale, Festuca pratensis, Hesperis matronalis, Poa pratensis, Agrostis perennans, Senecio plattensis, Vernonia missurica, Acalypha rhomboidea, Hypericum sphaerocarpum, Apios americana, and Amphicarpa bracteata, although presently not abundant, are often invasive from the surrounding fields.

Spring Lake Seep--There is a large degree of protection for this seep since it is in a publicly (city) owned park. This is the only seep that had all four of the alien wetland species present. Apios americana and Amphicarpa bracteata were common and could be a potential problem and Agrostis alba occasionally occurred. Because this seep borders the lake there is a moderate problem of foot traffic and littering. In 1968 a new dam was completed to enlarge the reservoir and with the rise in water level when the lake enlarged in 1969 the lower part of this seep was submerged. Some of the thus doomed Caltha palustris were transplanted to another nearby smaller and less floristically diverse hillside seep (which did not previously contain this species) in the spring of 1969. Today they are surviving well and spreading.

Argyle Lake Sphagnum Seep--This seep is located in a publicly (state) owned park and some protection is provided. However, a potential major problem is encroachment of woody and herbaceous plants from the surrounding forest. Woody plants are particularly threatening: Quercus rubra (an approximately 15-20 year old tree is in the northwestern part of the seep and there are numerous seedlings throughout), Corylus americana (several seedlings near the edge), Ostrya virginiana (several seedlings near the edge), Parthenocissus quinquefolia (a number of young plants), Prunus? sp. (several seedlings), Quercus (imbricaria?) (2 seedlings), Rubus (allegheniensis?) (one young plant), Rhus sp. (several young), Toxicodendron radicans (several young) Carya sp. (couple seedings),

and some Betula nigra and fewer Ulmus sp. seedlings throughout. Several woodland herbaceous plants such as Potentilla simplex, Claytonia virginica, and Cerastium sp. were in the seep at its edge and are not threatening presently. Most numerous of the herbaceous plants were many Muhlenbergia sylvatica and some Poa pratensis. These grasses were most prevalent near the lake margin. As noted, with the exception of the large red oak tree, the other plants were seedlings or very young. Perhaps the acid substrate will prevent the growth of these plants so that a major problem will not occur but a continued monitoring should be implemented. There is a minor problem at present where a foot path traverses the lower edge of this seep.

As a final comment, it should be noted that there was a severe drought during the course of the study (summer 1983). Although we observed no effect on the seeps, there is a possibility some effect on the flora could have resulted.

ACKNOWLEDGMENT

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Notes on Begoniaceae -- V

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BEGONIA

gehrigeri L. B. Smith, Phytologia 27: 214, pl. 4. 1973 = trapa L. B. Smith & B. G. Schubert, Contr. Gray Herb. 154: 26, pl. 1. 1945. Venezuela. In publishing gehrigeri Smith distinguished it from trapa because of its oblique leaf-blades. We know now that straight and oblique leaf-blades can occur on the same plant and that the important characters in Section Casparya are those of the ovary or capsule and in their appendages.

scabridoidea L. B. Smith & D. C. Wasshausen, scabrida sensu J. D. Hooker, Bot. Mag. 120: pl. 7347. 1894, non A. de Candolle in de Candolle, Prodr. 15, pt. 1: 367. 1864. The name scabridoidea was legally published in Phytologia 52: 445. 1983, but was improperly distinguished from scabrida. The plate shows a straight leaf-blade but the description says: "foliis oblique ovato- v. rotundato-cordatis." Thus the true distinction for scabridoidea is its deeply cordate leaf-base where that of scabrida is slightly if at all indented.

trapa L. B. Smith & B. G. Schubert var. pilosa L. B. Smith & D. C. Wasshausen, var. nov. A var. trapa planta pilis pallidis obtecta, inflorescentiae bracteis suborbicularibus rubris persistentibus differt. The capsules like those of the typical variety.

zenkerana L. B. Smith & D. C. Wasshausen, nom. nov. = zenkeri Irmscher, Bot. Jahrb. Syst. 81: 183. 1961, non Warburg ex Exell in J. Bot. 67: 197. 1929.

CALYMPERES NYMANII (FL.) REESE, A NEW COMBINATION BASED ON SYRRHOPODON NYMANII FL.

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The name Syrrhopodon nymanii ("-i") was published by Fleischer in 1904 for a new species of moss he described from Java, and has apparently been more or less ignored since then. However, it was published recently (and incorrectly) as a synonym of S. gardneri (Hook.) Schwaegr. (Tixier 1978, p. 1006), perhaps based on misinterpretation of Fleischer's Figure 31, that included S. gardneri as well as S. nymanii.

In any event, the moss described by Fleischer as S. nymanii is quite distinct in its own right and bears no relationship to S. gardneri except that they are both in the same family. The sole specimen that Fleischer had on hand when he described his new species was sterile, so that it was not possible to determine definitely that it represented Syrrhopodon or the closely related genus Calymperes. However, Fleischer did not hesitate to assign the species to Syrrhopodon: ("Ungeachtet der, wie bei Calymperes ausgebildeten Teniolen, ist diese Pflanze wohl ein Syrrhopodon ... ."), even though he recognized that the plants had at least one Calymperes-type feature. He was especially impressed, as indicating a relationship with Syrrhopodon, by the elongate hyaline cells borne on the margins of some leaves in his new species. Such marginal cells are very well illustrated in Fleischer's excellent and diagnostic illustration of his S. nymanii; however they are not always developed and in some leaves, or even in entire collections, they may be very scarce or even lacking.

Recently, while I was reviewing specimens of austral Calymperaceae, I found a specimen of Fleischer's S. nymanii housed in the New York Botanical Garden (Malay Peninsula: State of Perak, 777, Lumut Diuching [?], March 1899, Ridley [?]) that bore the characteristic sporophytes of Calymperes, in which the capsule lacks a peristome and is enclosed in a persistent perforate calyptra clasping the seta below the capsule. None of the other specimens of this moss that I have seen have included sporophytes, but this is not unusual among the mostly dioicous members of this family. Thus this species can be properly placed in Calymperes. I have also noted three other names that are later synonyms of C. nymanii, as shown below.

Calymperes nymanii (Fl.) Reese, comb. nov.

Basionym: Syrrhopodon nymanii Fl., Musci Flora Buitenzorg 1: 213. 1904. Type: Java. Leiosolo, Palabuan, Sud küste, leg. Nyman (FH; isotype, L).

Calmyperes kanakense Par., Rev. Bryol. 35: 50. 1908. TYPE: New Caledonia: Col d'annieu dans la Chaine Centrale, fevrier 1907. Le Rat (isosyntype, SP!). Syn. nov.

Calymperes sublaevifolium Par. ex Broth., Nat. Pflanzenfam., ed. 2, 10: 240. 1924. TYPE: New Caledonia: C. sublaevifolium Par. (isotype, SP!). Syn. nov.

Calymperes albo-limbatim Dix., Proc. Linn. Soc. N. S. Wales 55: 274. 1930. TYPE: Fiji, Vanua Levu, Labasa, on rotten wood, in mountains; June 1923; Greenwood 483 (BM!). Syn. nov.

Plants of C. nymanii are mostly very small and delicate, often glossy, and immediately recognizable by their strongly dimorphic leaves, some of which bear rather delicate, elongate hyaline marginal cells, mostly toward the bases. Plants of C. nymanii most closely resemble those of C. cougiense Besch., also with strongly dimorphic leaves, but leaves of the latter lack elongate marginal cells and do have well-developed teniolae instead. In both C. nymanii and C. cougiense, the strongly modified, ± elaminate gemmiferous leaves bear their gemmae right on the top of the bluntly enlarged apex, rather than ventrally on the leaf tip as in C. dozyanum, for which C. nymanii has been mistaken.

I have seen specimens of C. nymanii from Thailand; Malaysia, Perak; Borneo; Bangka Island; Java; Papua, New Guinea; Irian Jaya; Australia, Queensland; Fiji: Viti Levu, Vanua Levu; New Caledonia; and the Solomon Islands, San Cristobal.

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I thank the curators of the following herbaria for making specimens available to me: BM, FH, H, L, NY, SP, U; I also thank D. H. Norris for allowing me to study his important collections of Calymperaceae from austral regions, and H. Mohamed for valuable discussions.

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NEOTROPICAL MYRSINACEAE -- XII

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AMATLANIA Lundell, Wrightia 7: 38. 1982

AMATLANIA ELLIPTICA Lundell, sp. nov. -- Arbor, 6 m. alta; ramuli minute puberuli; folia glabra, petiolata, petiolo 2--3 cm. longo, marginato; lamina chartacea, minute crenulata, elliptica vel obovato-elliptica, 10--18 cm. longa, 5--10.5 cm. lata, apice subabrupte acuminata, basi acuta, punctata; inflorescentia terminalis, sessilis, late paniculata, pyramidalis, ad 11 cm. longa et lata, basi minute puberula; flores 5-meri, corymbosi; pedicelli 2.5--4 mm. longi; sepala oblongo-lanceolata, 1--1.4 mm. longa, apice obtusa, ciliolata, hyalina, medio dense punctata; ovarium glabrum, punctatum; stylo ca. 3 mm. longo.

Mexico: Oaxaca, Municipio Comaltepec, km. 149 carr. Tuxtepec, Sierra Juarez, Puerto Eligio, alt. 800 m., June 17, 1966, Gpe. Martinez C. 884 (holotype, XAL), arbol perenne de 6 m. de alto, flor amarilla.

Related to A. Schippii (Standl.) Lundell, it differs in its shorter pedicels and smaller flowers. The sepals are scarcely half as large in A. elliptica, oblongish and obtuse or rounded. The sepals of A. Schippii are acuminate and conspicuously ciliate. The indument of A. elliptica is so minute that it is difficult to distinguish, and all parts are reddish.

AURICULARDISIA Lundell, Phytologia 49: 341. 1981

AURICULARDISIA SQUAMATA Lundell, sp. nov. -- Frutex, ad 25 cm.; ramuli furfuracei; folia subchartacea vel membranacea, supra glabra, subtus furfuracea, punctata, petiolata vel subsessilifolia, petiolo ad 4 mm. longo, marginato; lamina oblanceolata, 6--17 cm. longa, 2--5 cm. lata, apice acuta vel subacuminata, basi attenuata, integra; inflorescentia squamata, terminalis, parva, paniculata, ad 3 cm. longa; flores 5-meri, corymbosi, furfuracei; pedicelli furfuracei, 4--6 mm. longi; sepala 5, asymmetrica, furfuracea, nigropunctata, late ovata vel suborbicularia, 1--1.2 mm. longa, hyalina, auriculato-fimbriata; corolla glabra, purpurea, ca. 3 mm. longa, nigropunctata; petala basi connata, elliptica, ca. 2.5 mm. longa, apiculata; stamina ca. 2 mm. longa; filamenta crassa, ca. 0.5 mm. longa;

antherae crassae, ovato-ellipticae, ca. 1.8 mm. longae, apice rotundatae, apiculatae; ovarium glabrum, punctatum; ovula 9 vel 10, uniseriata.

Costa Rica: Prov. Heredia, original forest near the Rio Puerto Viejo, about 2 km. upstream from the confluence with Rio Sarapiqui, alt. 100 m., June 14--17, 1968, William C. Burger & Robert G. Stolze 5853 (holotype, F), small plant on forest floor, perianth purple, anthers yellow. Two additional collections, Paul A. Opler 188 (F) and 332 (F), from the same general area, are referable here.

This is one of the most unusual species of the Myrsinaceae in Mesoamerica. A subshrub up to 12 inches tall, its inflorescences are borne at the apex of long slender apparently axillary branches (peduncles) up to 10 cm. long which are foliaceous with reduced leaves at the apex below the small terminal panicles. These small sessile panicles consist of 3 or more stalked corymbs, all furfuraceous. The flowers are very small, with the purple corolla glabrous and short-tubular at base at the apex of which the filaments are attached. The sepals are asymmetrical and fimbriate-auriculate on the overlapped edges, typical of the genus Auriculardisia.

The plants appear to be rhizomatous.

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

ICACOREA ACUMINATA (Willd.) Lundell, comb. nov. Ardisia acuminata Willd., Sp. Pl. I. 1062. 1797.

ICACOREA ANGUSTIFOLIA (Mez) Lundell, comb. nov. Ardisia angustifolia Mez, Pflanzenreich IV. 236: 94. 1902.

ICACOREA BRASILIENSIS (Spreng.) Lundell, comb. nov. Ardisia brasiliensis Spreng., Systema I. 662. 1825.

ICACOREA HAMILTONII (A.DC.) Lundell, comb. nov. Ardisia Hamiltonii A.DC., Trans. Linn. Soc. XVII. 126. 1834.

ICACOREA REFLEXA Lundell, sp. nov. -- Frutex, 3.5 m.; ramuli minute et dense lepidoti; folia parva, coriacea, supra glabra, subtus novella parce lepidota, petiolata, petiolo anguste marginato, 2--5 mm. longo; lamina coriacea, punctata, anguste elliptica vel lanceolata, 2.5--5.6 cm. longa, 1.2--2.2 cm. lata, apice abrupte acuminata, acumine obtusiusculo, basi acuta; inflorescentia parva, terminalis, subsessilis, tenuis, minute et dense lepidota, paniculata, ad 5 cm. longa; flores 5-meri, corymbosi; pedicelli 2.5--4.5 mm. longi; sepala coriacea, late ovata, 1--1.2 mm. longa, apice rotundata vel acutiuscula, margine hyalina, medio dense punctata, reflexa, effusa, vel

erecta; alabastrum glabrum, paucipunctatum ad 5.5 mm. longum, obtusum; stamina ca. 5 mm. longa; filamenta ca. 1.4 mm. longa; antherae lanceolatae, 4 mm. longae, apice birimosae; ovarium glabrum; stylo ca. 4.5 mm. longo; ovula 10, pluriseriata.

Panama: Province of Chiriqui, path from Linarea farm ca. 1400 m. to top of Cerro Hornito at 1730 m., Dec. 27, 1977, J. P. Folsom, R. Dressler & R. Channell 7257 (holotype, LL), 3 m. shrub, buds pink-white.

Unfortunately only mature flower buds are available and measurements were made from these. The most unusual feature of this small-leaved taxon is that the small depressed-ovate coriaceous sepals are often reflexed. The stamens of I. reflexa resemble those of I. rigidifolia (Lundell) Lundell in having short filaments, and in having large and similar lanceolate anthers. These are rugose and dry blackish after anthesis. In bud the anthers of I. reflexa are smooth and show no discoloration. There are only 10 pluriseriate ovules in I. reflexa compared with 17 to 19 in I. rigidifolia.

The various other small-leaved species of Icacorea in the mountains of Panama and Costa Rica have a superficial resemblance but they differ in significant morphological characteristics. This probably will not keep "lumpers" from placing them all under one name.

PARATHESIS (A.DC.) Hooker f., Bentham & Hooker f., Gen. 2: 645. 1876

PARATHESIS CUSPIDATA Lundell, sp. nov. -- Frutex; ramuli gracillimi, minute et peradpresse tomentelli; folia glabrata, petiolata, petiolo ad 1.3 cm. longo, canaliculato; lamina membranacea, elliptica vel oblanceolato-elliptica, 10--13.5 cm. longa, 3.5--4.5 cm. lata, apice subabrupte acuminata, basi acuta, integra, punctata; inflorescentia axillaris, paniculata, ad 12 cm. longa, longe pedunculata, glabra vel subglabra; flores corymbosi, 5-meri; pedicelli 5--8 mm. longi; sepala ad 3 mm. longa, basi connata, glabra, triangulata, cuspidata, aurantiaco-punctata; corolla ca. 8 mm. longa; sepala basi connata, auguste triangulata, attenuato-acuminata, lineato-punctata, aurantiaca, intus villosa; stamina ca. 5 mm. longa; filamenta crassa, ca. 2 mm. longa; antherae anguste lanceolato-triangulatae, ca. 4 mm. longae, cuspidatae, dorso dense aurantiaco-punctatae; ovarium parce puberulum; ovula 8, parva; stylo ca. 6 mm. longo.

Mexico: Oaxaca, Comaltepec, Ixtlan, Vista Hermosa, elev. 4500 ft., May 1, 1972, T. MacDougall H411 (holotype, F), shrub, white flowers.

The large glabrous calyx with firm cuspidate sepals, the very thick filaments, and the large cuspidate anthers densely

orange-punctate to apex are very distinctive features setting the taxon apart in Mesoamerica.

PARATHESIS IMPLEXA Lundell, sp. nov. -- Arbor parva, 4 m.; ramuli crassiusculi, minute ferrugineo-tomentelli; folia glabrata, parce punctata, pallida, petiolata, petiolo 1--1.2 cm. longo; lamina subcoriacea, elliptica vel oblanceolato-elliptica, 10--12.5 cm. longa, 3.5--5 cm. lata, apice subabrupte acuminata, basi acuminata, subintegra; inflorescentia axillaris, paniculata, ad 10.5 cm. longa, gracilis, longe pedunculata, glabrata; flores 5-meri, corymbosi, minute ferrugineo-tomentelli; pedicelli graciles, 7--12 mm. longi; sepala subcoriacea, triangulata, ca. 1.5 mm. longa, obtusiuscula, rubro-punctata; corolla ca. 6 mm. longa; petala basi connata, anguste triangulata, obtusiuscula, rubro-lineato-punctata, intus villosa; stamina 3--3.4 mm. longa; filamenta crassiuscula, ca. 1.4 mm. longa; antherae lanceolatae, ca. 2.5 mm. longae, apiculatae, dorso anguste nigropunctatae; ovarium minute et dense tomentellum; stylo basi puberulo; ovula 7, uniseriata.

Costa Rica: Cordillera de Tilaran, Reserva, Vert. Pacifico, en bosque primario cerca de Divis, elev. 1520--1580 m., June 21, 1976, V. J. Dryer 316 (holotype, F), flores rosadas.

The minute, dense, matted tomentum covering the upper two thirds of the ovary is noteworthy, whence the name of the taxon. Its affinity is to P. glabra Donn. Sm. which is quite similar in appearance, but with essentially glabrous ovary.

PARATHESIS KALLUNKII Lundell, sp. nov. -- Arbor, 5 m.; ramuli peradpresse ferrugineo-tomentelli; folia petiolata, petiolo 1--1.5 cm. longo, canaliculato; lamina crenulata, subcoriacea, pallida, perpunctata, anguste elliptica vel oblanceolata, 6.5--11 cm. longa, 2--3.7 cm. lata, apice acuta vel subacuminata, basi acuminata vel subacuminata, novella peradpresse ferrugineo-tomentella, glabrata; inflorescentia axillaris, paniculata, ad 11 cm. longa, tenuis, longe pedunculata, pauciflora, novella minute tomentella, glabrata; flores 5-meri, minute ferrugineo-tomentelli; pedicelli 4--6 mm. longi; sepala lanceolata, acuminata ca. 1.6 mm. longa; corolla ca. 5 mm. longa, petala lanceolata, basi ca. 1.2 mm. lata, dense rubro-lineato-punctata, intus villosa; stamina ca. 3 mm. longa; filamenta ca. 1.5 mm. longa; antherae ovatae, ca. 1.5 mm. longae, basi sagittatae, apice acutiusculae, dorso nigropunctatae; ovarium glabrum; ovula parvissima, ca. 4; fructus dense punctatus.

Panama: Province of Chiriqui, Cerro Punta, 2.5 km. SE of town, along trail in remnant oak forest, April 20, 1975, S. Mori & J. Kallunki 5646 (holotype, LL; isotype, MO), tree, 5 m. tall, corolla pink, anthers yellow.

Related to P. montana Lundell of Darien, a species that differs in its larger thinner entire leaves, sparser indument, smaller anthers with fewer dorsal glands, and hirtellous apex of ovary and base of style. In P. Kallunkii the thicker smaller leaves are crenulate and densely black punctate. The ovary of P. Kallunkii is glabrous.

PARATHESIS LINEATA Lundell, sp. nov. -- Arbor parva, ca. 4 m. alta; ramuli graciles, minute peradpresse ferrugineo-tomentelli, glabrati; folia glabrata, parva, longe petiolata, petiolo 1--1.7 cm. longo; lamina membranacea, anguste elliptica vel lanceolata, 5--9 cm. longa, 2--3.8 cm. lata, apice obtusiuscula vel subabrupte obtusiuscula, basi acuminata, integra, lineato-nigropunctata; inflorescentia axillaris, gracilis, paniculata, 5--10 cm. longa, longe pedunculata, parce et minute puberuli; flores 5-meri, corymbosi, minute puberuli; pedicelli 4--8 mm. longi; sepala anguste triangulata, 1.4--1.7 mm. longa, acuminata, nigropunctata; corolla ad 6.2 mm. longa, nigro-lineata; petala basi connata, lineari-lanceolata, ad 1.5 mm. lata, intus supra villosa; stamina ca. 3 mm. longa; filamenta gracilis, ca. 1.5 mm. longa; antherae lanceolatae, dorso anguste nigropunctatae, acutiusculae; ovarium glabrum; ovula 6 vel 7, uniseriata; fructus parvus, subglobosus.

Costa Rica: San Jose, forests of Tablazo, out from Higuito, near San Miguel near San Jose, ca. 5300 ft., April 29, 1966, James W. Walker 415 (holotype, US), tree ca. 12 ft. tall, flowers cream-pink, fruits red and then black.

PARATHESIS LUNATA Lundell, sp. nov. -- Arbor, 12 m. alta, 40 cm. diam.; ramuli crassiusculi, dense et minute tomentelli; folia parva, petiolata, petiolo 6--10 mm. longo, canaliculato; lamina chartacea, supra glabra, subtus novella minute tomentella, punctata, oblonga, ad 9.5 cm. longa, 2.5 cm. lata, apice acuminata, basi acuta, venosa, margine crenulata; inflorescentia axillaris, anguste paniculata, 3--7 cm. longa, pedunculata, minute adpresse tomentella; flores 5-meri, corymbosi; pedicelli 4--7 mm. longi; sepala anguste triangulata, ad 1.2 mm. longa, acuminata, punctata; corolla ca. 4 mm. longa, petala basi connata, intus villosa, extus glabrata, lineato-punctata; stamina ca. 3.4 mm. longa; filamenta crassa, ca. 1.2 mm. longa; antherae ca. 2.3 mm. longae, basi sagittatae, apice acutae, dorso basi minute nigropunctatae vel raro epunctatae; ovarium minute tomentellum; ovula parva, 10.

Mexico: Chiapas, Saxchanal, Sierra Madre, in cloud forest, alt. 2000 m., May 12, 1948, Eizi Matuda 17810 (holotype, F), a tree, 12 m. tall, 40 cm. diam.

Apparently related to Parathesis subulata Lundell, a poorly known taxon of Chiapas and Guatemala, which was described from a fruiting specimen.

The anthers of P. lunata are crescent shaped in side view, whence the name.

PARATHESIS MINUTIFLORA Lundell, sp. nov. -- Frutex; ramuli obscure tomentelli, glabrati; folia glabrata, longe petiolata, petiolo anguste marginato, 1--3 cm. longo; lamina membranacea, punctata, crenulata, elliptica vel obovata, 9--15 cm. longa, 5--7 cm. lata, apice abrupte acuminata, basi acuminata; inflorescentia axillaris, laxa, paniculata, tenuis, pauciflora, ad 25 cm. longa, glabrata; flores 5-meri, umbellati; pedicelli 4--6 mm. longi; sepala minuta, ad 0.6 mm. longa, anguste triangulata, acuta, nigropunctata; corolla ca. 3 mm. longa; petala basi connata, anguste lanceolata, lineata, intus villosa; filamenta ca. 0.5 mm. longa; antherae lanceolatae, ca. 1 mm. longae, epunctatae; ovarium glabrum; stylo 3 mm. longo, basi puberulo; ovula 5, uniseriata.

Mexico: Oaxaca, 8 km. S of Vista Hermosa, moist lower cloud forest, elev. 3200 m., July 3, 1981, William Hahn 632 (holotype, LL).

One of the most distinctive taxa in the genus Parathesis, the species was collected at an altitude of 3200 meters. Its minute umbellate flowers, only one available with petals and stamens, has sepals not much over one-half millimeter long, and very slender pedicels.

The taxon has affinity to P. melanosticta (Schlecht.) Hemsl., but the relationship is remote.

PARATHESIS MIRANDAE Lundell, sp. nov. -- Arbor, 4 m.; ramuli gracillimi, rubiginoso, stellato-tomentelli; folia longe petiolata, petiolo 1--2 cm. longo, canaliculato, subtus tomentello; lamina membranacea, oblanceolata, 10--18 cm. longa, 3--5 cm. lata, apice subabrupte acuminata, basi attenuato-acuminata, crenulata, subtus novella adpresse stellato-tomentella, glabrata, supra glabra, minute punctata; inflorescentia axillaris, paniculata, ad 14 cm. longa, minute tomentella; flores 5-meri, corymbosi; pedicelli graciles, 4--8 mm. longi; sepala punctata, anguste triangulata, ca. 1.2 mm. longa, acuminata, tomentella; corolla ca. 6 mm. longa, minute tomentella; petala angusta, lineata, intus minute villosa; stamina ca. 4 mm. longa; filamenta ca. 1.7 mm. longa; antherae lanceolatae, 2.7--3 mm. longae, apiculatae, dorso nigropunctatae; ovarium basi glabrum; stylo basi minute stellato-tomentello; ovula 7.

Mexico: Chiapas, Cerca de Santa Maria del Rio Mixcun (Cacahuatan), hacia 600 m. de alt., en selva alta secundaria, Dec. 4, 1941, Faustino Miranda 1809 (holotype, US), arbolito de unos 4 m.

The inflorescence appears to be terminal, but the panicles are axillary with the upper leaves reduced to bracts.

The species is dedicated to the memory of Faustino Miranda, eminent botanist and student of the Mexican flora.

PARATHESIS OROANA Lundell, sp. nov. -- Arbor, ca. 9 m.; ramuli minute adpresse tomentelli; folia membranacea, supra glabra, subtus parce adpresse stellato-pubescentia, glabrata, anguste petiolata, petiolo canaliculato, 1--1.5 cm. longo; lamina integra, punctata, obovata vel elliptico-obovata, 10--16 cm. longa, 4--6.5 cm. lata, apice abrupte acuminata, acumine acuto, basi attenuato-acuminata; inflorescentia axillaris, paniculata, tenuis, pedunculata, 6.5--14 cm. longa, multiflora, minute tomentella; flores 5-meri, subcorymbosi vel umbellato-corymbosi; pedicelli minute puberuli, 4--5 mm. longi; sepala parva, anguste triangulata, 1.2--1.4 mm. longa, subulata, minute puberula, punctata; corolla ca. 6 mm. longa; petala basi connata, anguste triangulata, ca. 5.5 mm. longa, rubro-lineato-punctata, intus villosa; stamina ca. 2.4 mm. longa; filamenta ca. 1 mm. longa; antherae lanceolatae, ad 1.5 mm. longae, acutae, dorso minute et parce nigropunctatae; ovarium apice vestitum; stylo ca. 5 mm. longo, basi parce puberulo; ovula 9, uniseriata.

Mexico: Chiapas, Municipio of Cintalapa, ridge with Montane Rain Forest - Pine - Oak - Liquidambar forest with Ulmus, Zinowiewia, Weinmannia and Styrax, southeast of Cerro Baul on the border of the state of Oaxaca, 16 km. northwest of Rizo de Oro along a logging road to Colonia Figaroa, elev. 1600 m., April 27, 1972, D. E. Breedlove 24910 (holotype, Dudley Herbarium), tree 30 ft. tall, flowers pink.

P. oroana is closely related to P. cintalapana Lundell, a species with glabrous ovary and fewer ovules, and to P. tonana Lundell, also of Chiapas.

PARATHESIS TOMENTOSA Lundell, Wrightia 3: 74. 1963.

Guatemala: indefinite, Los Andes to Entre Rios, March 1, 1926, S. J. Record G.44 (holotype, US; isotype, Y), small tree. Dept. Izabal: vicinity Lago Izabal, NW of Lake Izabal, elev. 400--500 m., May 8, 1966, Gayle G. Jones & Lynden Facey 3299 (LL, NY), tree 8 m., mature fruits reddish green.

Mexico: without locality, Plantae mexicanae Liebmann, 1841--1843, F. M. Liebmann 15345 (F, US), 15346 (F).

Flowers of this taxon are unknown except for fragments in the holotype. That the Liebmann collections are referable here is based on a study of fruiting material. Until flowers are collected questions will remain as to the identification of the Mexican collections cited!

Associated collections of Liebmann (no. 15349) came from the vicinity of Tontalcingo, Veracruz. If the numbering has any significance, we can record his collections of P. tomentosa from this locality, a great extension of range, but not improbable.

PARATHESIS TONANA Lundell, sp. nov. -- Frutex, ca. 3 m.; ramuli peradpresse tomentelli; folia membranacea, glabra, petiolata, petiolo canaliculato, 1--1.5 cm. longo; lamina dense

nigropunctata, subintegra vel minute crenulata, oblongo-lanceolata, 8--16 cm. longa, 3--5.5 cm. lata, apice acuminata, basi acuta; inflorescentia axillaris, parce adpresse tomentella, glabrata, paniculata, ad 18 cm. longa, longe pedunculata, tenuis, multiflora; flores 5-meri, subcorymbosi; pedicelli 5--7 mm. longi, minute puberuli; sepala parva, ovato-triangulata, 1--1.2 mm. longa, minute puberula, parce rubro-punctata; corolla ca. 5 mm. longa; petala anguste lanceolata, lineato-punctata, basi connata, intus villosa; stamina ca. 2.5 mm. longa; filamenta ca. 1.5 mm. longa; antherae ovato-lanceolatae, ca. 2 mm. longae, apiculatae, dorso minute et parce nigropunctatae; ovarium minute tomentellum; ovula 8, uniseriata; stylo ca. 4 mm. longo, basi puberulo.

Mexico: Chiapas, Municipio of San Andres Larrainzar, steep slope, evergreen cloud forest near summit of Chuchil Ton, northeast of Bochil, elev. 2700 m., May 1, 1973, D. E. Breedlove 34640 (holotype, Dudley Herbarium), shrub 10 ft. tall, flowers white.

In the complex of taxa with axillary inflorescences to which P. tonana belongs, there are a score or more of closely related species which occupy altitudinal niches mostly in the mountains of Chiapas. Oaxaca and Veracruz. P. tonana is nearest P. cintalapana Lundell.

PARATHESIS VILLALOBOSII Lundell, Wrightia 7: 249. 1983.

Mexico: Veracruz, Municipio Minatitlan, 12 km. al NE de Uxpanapa, Poblado 12, sobre camino a Diaz Ordaz, loma al SO de Diaz Ordaz y al NO del Poblado 13, elev. 200 m., March 14, 1982, Tom Wendt, A. Villalobos C. & I. Navarrete 3698 (LL), arbolito de 3 m., poco ramificado; same locality, May 13, 1983, Wendt et al. 4056 (LL), arbolito de 3--5 m., petalos rosados muy palidos o rosados subidos, filamentos verdes, anteras amarillas con conectivos rojo-pardos abaxialmente; lomas al SO de La Garganta, 5.8 km. al O de Uxpanapa, Poblado 12, en los cerritos que forman el extremo NE de la Sierra de La Garganta, elev. 200 m., May 18, 1983, Wendt et al. 4125 (LL), arbolito de 4 m., corolla rosada.

The leaves of these fine collections are whitish beneath and bizonal, the latter a peculiarity of most species of the genus.

All the collections were made in the same municipality as the type of P. Villalobosii.

PARATHESIS VIRIDIS Lundell, sp. nov. -- Arbor parva, 2.5 m. alta, ramulis tenuis, glabris; folia glabra, viridis, nigropunctata, petiolata, petiolo marginato, 5--13 mm. longo; lamina laevis, chartacea vel subcoriacea, anguste oblongo-lanceolata, 10.5--18 cm. longa, 4--5.4 cm. lata, apice acuminata, basi rotundata et acutiuscula, integra; inflorescentia terminalis tenuis, glabra, paniculata, ad 8 cm. longa et lata; flores

corymbosi, 5-meri, parvissimi; pedicelli erecti, 3.5--6 mm. longi, parce et minute puberuli; sepala basi paullo imbricata, parvissima, ovato-elliptica vel rotundata, ca. 0.75 mm. longa, apice rotundata, minute et parce ciliolata, medio parce rubro-punctata; ovarium glabrum, apice parce puberulum; stylo ca. 2.5 mm. longo, basi parce puberulo; ovula 5, uniseriata.

Venezuela: Terr. Fed. Amazonas, seasonally flooded forest, 0--1 km. S of San Carlos de Rio Negro, alt. 120 m., Feb. 4, 1980, Ronald Liesner 9046 (holotype, MO), 2.5 m. tree.

The smooth narrow leaves, dark green even when dried, and the glabrous inflorescence with short peduncle and very slender rachis and branches, together with the small flowers not over three millimeters long are features of note. The rounded reddish-punctate sepals are united at base where they overlap inconspicuously. The dispersed glands of the leaves are larger than usual in the genus.

In the absence of flowers at anthesis the relationship of the taxon is doubtful. It is unique in the genus.

STUDIES OF AMERICAN PLANTS -- XXI

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CELASTRACEAE

MAYTENUS WENDTII Lundell, sp. nov. -- Arbor parva, ad 5 m. alta, 8 cm. diam., omnino glabra; folia alterna, magna, petiolata, petiolo 5--7 mm. longo, canaliculato; lamina subcoriacea, elliptica vel lanceolato-elliptica, 14--28 cm. longa, 7--11 cm. lata, apice subabrupte acuminata, basi rotundata et acutiuscula, integra, viridis; inflorescentia axillaris, aggregata, multiflora, glabra; flores 5-meri; pedicelli 3--4, raro ad 6 mm. longi; sepala coriacea, late rotundata, 1.4--1.6 mm. lata, 0.5--0.7 mm. longa, parce rufo-ciliolata; petala crassa, late ovata, ca. 1.8 mm. longa et lata, apice rotundata; discus rotundatus, crassus, ca. 3 mm. diam.; filamenta reflexa, ca. 1 mm. longa; antherae late ovatae, ca. 0.5 mm. longae; pedicelli fructiferi crassi; capsula obovata, ca. 1.7 cm. longa.

Mexico: Oaxaca, Municipio Sta. Maria Chimalapa, Arroyo Chocolin, poblacion de Nicolas Bravo, cerca del Rancho de Agustin Montero, ca. 3--4 km. al S de la poblacion de Rio Alegre (Veracruz), selva alta perennifolia con Dialium, Calophyllum, Symphonia, etc., cerco del arroyo, elev. 150 m., Oct. 21, 1983, Tom Wendt, A. Montero H. & I. Almaraz G. 4240 (holotype, LL), arbolito 5 m., 8 cm. diam., flores verde palidas, frutos anaranjado brillantes, bivalvados, arilo blanco, entero, ligeramente dulce-y-amargo. Oaxaca, Municipio Matias Romero, lomas al E de Arroyo Amaca, al N del Rio Verde, 9.5 km. por camino al SE de Aserradero La Floresta, ca. 21.5 km. al S de Esmeralda, lomas con suelos profundos, selva perennifolia, elev. 400 m., May 22, 1981, Tom Wendt, A. Villalobos, I. Navarrete & J. Anguiana 3286 (paratype, LL), arbolita de 2.5 m., pendiente en selva, flores amarillas.

Unusual in having large elliptic dark green leaves up to nearly one foot in length, and large 2-celled capsules with white aril, this is the most distinctive species of Maytenus in Mesoamerica. It is a pleasure to dedicate it to Dr. Tom Wendt who has discovered so many fine new taxa in his exploration of southern Mexico.

Since the species was collected on the border of Veracruz (Wendt et al. 4240), it should be considered one of the Celastraceae of that state.

VIOLACEAE

ORTHION GUATEMALENSE Lundell, sp. nov. -- Arbor, ad 20 m. alta, omnino glabra; ramuli crassiusculi; folia alterna, petiolata, petiolo 6--10 mm. longo; lamina chartacea, anguste oblongo-elliptica, lineari-oblanceolata vel oblanceolata 12--16 cm. longa, 2.5--6.5 cm. lata, apice longe caudata, attenuata vel acuminata, acumine acutiuscula, basi acuta vel decurrens, margine remote adpresso-serrata; flores albi, cymosi, cymis ad 9 cm. longis, longipedunculatis axillaribus et al apice ramorum dense pseudo-umbellatis; pedicelli ca. 2 mm. longi; sepala late ovata, ca. 1 mm. longa; petala 2--2.5 mm. longa.

Guatemala: Dept. Izabal, bordering Rio Cienaga, in zapotal at Cienaga, on the Izabal-Peten road, March 4, 1975, C. L. Lundell & Elias Contreras 19043 (holotype, LL), tree, 40 ft. high, 8 in. diam., flowers whitish; El Estor, in high forest, March 18, 1972, Contreras 11373 (LL), tree, 60 ft. high, 15 in. diam., flowers white.

This is the species which has been confused with O. oblanceolatum Lundell. It has been collected in the rain forest of the Department of Izabal, as well as downstream from Sebol in Alta Verapaz. The long caudate-acuminate apex of the leaves distinguishes it from O. oblanceolatum.

ORTHION MALPIGHIIFOLIUM (Standl.) Standl. & Steyerm., Field Mus. Bot. 22: 250. 1940. Hybanthus malpighiifolius Standl., Carnegie Inst. Wash. Publ. 461: 73. 1935.

Guatemala: Dept. of Peten, Camp 32 on the Guatemala (Peten)-British Honduras boundary, on hillside in forest shade, alt. 2100 ft., March 7, 1934, W. A. Schipp 1278 (holotype, F; isotype, LL), tree, 10 m. high, 15 cm. diam.

Belize: Toledo District, in high ridge, hill slope, near Mauga Camp, Edwards Road, beyond Columbia, March 30, 1948, Percy H. Gentle 6492 (LL), tree, 5 in. diam., white flowers, bark dark, wood brownish color, hard.

Although various collections from Guatemala and southern Mexico have been identified as O. malpighiifolium, only Gentle 6492 matches the type. So this taxon remains known from only two collections, both from the same rain forest area of southeastern Peten and adjacent Belize.

ORTHION MONTANUM Lundell, Wrightia 4: 115. 1969.

Mexico: Chiapas, Municipio of Jitotol, steep wooded slope on the bank of the Rio Hondo, 4 miles north of Jitotol on road to Pueblo Nuevo Solistahuacan, elev. 5500 feet, Feb. 12, 1965, D. E. Breedlove 8959 (holotype, LL), tree, 40 ft. tall.

The small cymes, solitary in the axils of the upper leaves, are similar to those of O. veracruzense Lundell, but the leaves of the two taxa differ. Both are known only from the type collections.

ORTHION OBLANCEOLATUM Lundell, Lloydia 4: 54. 1941.

Mexico: Chiapas, Rio Salinas, above mouth of Rio Pasion, on riverbank, Feb. 8, 1964, C. L. Lundell 17810 (LL), tree, 25 ft. high, flowers greenish. Veracruz, Municipio Catemaco, vicinity of Playa Escondida, 10 km. N of Sontecomapan, evergreen tropical forest, on slopes above Hotel Playa Escondida and the beach, alt. 0--150 m., April 6, 1983, M. Nee 26497 (LL), tree, 12 m. tall, 35 cm. diam., immature fruit and inflorescence branches light green.

Guatemala: Dept. Peten, in Montana San Simon en la margen del Rio Cancuen, in forest on riverbank, April 17, 1935, Mercedes Aguilar H. 497 (holotype, MICH; isotype, LL), a tree.

The Catemaco collection from Veracruz has smaller but typical leaves with prominent reticulate venation on lower surface. A short wide obtuse acumen and broad leaves oblanceolate-elliptic or obovate-elliptic serve to distinguish O. oblanceolatum.

Lundell 17810 from Chiapas matches the type of O. oblanceolatum, which was collected in Peten (Aguilar 497), and clearly distinguishes this species with its distinctive leaves, and inflorescences consisting of crowded elongated cymes borne at apex of stems.

ORTHION SUBSESSILE (Standl.) Steyerm. & Standl., Field Mus. Pub. Bot. 22: 250. 1940. Hybanthus subsessilis Standl., Carnegie Inst. Wash. Publ. 461: 72. 1935.

Mexico: Chiapas, Rio Salinas, above Rio Pasion, on riverbank, Feb. 8, 1964, C. L. Lundell 17819 (LL), tree, 4 in. diam., 20 ft. high, inflorescence greenish-white; Rio Lacantun, in high forest along bank of river, Feb. 9, 1964, Lundell 17868 (LL), tree, 4 in. diam., 30 ft. high.

Guatemala: Dept. of Peten, Lacandon, in bajo, about 1 km. 700 m. south, March 12, 1962, Elias Contreras 3515 (LL), tree, 25 ft. high, 8 in. diam. Dept. of Peten, Rio Pasion, ca. 3 km. above Altar de Sacrificios, in high forest on riverbank, Feb. 7, 1964, Lundell 17783 (LL), tree, 6 in. diam., 20 ft. high. Dept. of Izabal, Jocolo, Rio Perdonales, Harry Johnson 1071 (holotype, F); between Cienaga and Seja, on Peten-Guatemala road, May 28, 1971, Contreras 10875 (LL), tree, 35 ft. high, flowers white; same locality and date, Contreras 10876 (LL), tree, 40 ft. high, flowers white; same locality and date, Contreras 10877 (LL), tree, 60 ft. high, 12 in. diam., flowers white; El Estor, in high forest, Contreras 11157 (LL), tree, 60 ft. high, 15 in. diam., fruit green; El Estor, bordering Lake Izabal, in high forest, about 4 km. west of El Zapotillo, Jan. 29, 1975, C. L. Lundell & Elias Contreras 18894 (LL), small tree, 30 ft. high, 5 in. diam., flowers pale green.

Belize: Toledo District, Bolo Camp, upper reach of Golden Stream, in high ridge, April 5, 1944, Percy H. Gentle 4495 (LL), tree, 12 in. diam.; Toledo District, in cohune ridge, near creek,

near San Antonio, Jan. 22, 1946, Gentle 5495 (LL), tree, 9 in. diam., flowers white.

Of the species of Orthion, this is the most distinctive. Its large, thick, subsessile leaves are narrowed, rounded and emarginate at base, and its cymes are up to 20 cm. long with elongated peduncles. All the other species in the genus have distinctly petiolate leaves, with slender petioles, and much shorter cymes.

ORTHION VERACRUZENSE Lundell, sp. nov. -- Arbor parva, omnino glabra, ramulis gracilibus; folia chartacea, petiolata, petiolo 1--1.4 mm. longo; lamina viridis, oblongo-lanceolata vel lanceolata, 8--17 cm. longa, 2.5--6 cm. lata, apice acuminata, basi acuta vel acutiuscula, margine crenata vel subintegra; flores cymosi, cymis paucifloris longipedunculatis axillaribus, 3--6 cm. longis; pedicelli fructiferi 2--2.5 mm. longi, crassi; capsula subglobosa, parva, 8--10 mm. longa; semina globosa, ca. 4 mm. diam., laevia.

Mexico: Veracruz, Municipio Hidalgotitlan, cenotes 0.3 km. al O de La Raya, 6.5 km. al N de la Laguna, sobre camino al Poblado 7, elev. 130 m., March 30, 1981, Tom Wendt, A. Villalobos C. & I. Navarrete 3108 (holotype, LL), arbolito de 1.5--3 m., frutos verdes; abundante entre piedras en cenote.

The small solitary axillary cymes, small capsules, and mostly oblong-lanceolate rather large leaves are distinguishing features. It appears to be related to O. montanum Lundell.

Excluded Species of Orthion

MAYANAEA CAUDATA (Lundell) Lundell, Wrightia 5: 59. 1974. Orthion caudatum Lundell, Wrightia 4: 38. 1968.

Guatemala: Dept. Izabal, south shore of Lake Izabal between Izabal and Mariscos, at sea level, May 29, 1966, Gayle C. Jones & Lynden Facey 3512 (holotype, LL), tree, 8 m., fruits green; Peten-Guatemala road, in high forest on rocky hill, 6 km. from La Ruidoza, May 20, 1971, Elias Contreras 10790 (LL), tree, 40 ft. high, 10 in. diam., flowers whitish and lilac-violet; same locality and date, Contreras 10791 (LL), 10792 (LL), 10793 (LL), 10794 (LL); El Estor, in high forest, March 21, 1972, Contreras 11442 (LL), tree, 60 ft. high, 15 in. diam., flowers white.

A monotypic genus which is known only from the rain forest of the Department of Izabal in Guatemala. Aside from differences in the inflorescences and flowers, all parts of M. caudata dry blackish in contrast to the pallid or greenish leaves in the genus Orthion.

ADDITIONAL NOTES ON THE GENUS *GMELINA*. III

Harold N. Moldenke

GMELINA L.

Additional bibliography: Hooper, Pharm. Journ. Trans., ser. 3, 22: 573. 1892; Kraemer, Am. Journ. Pharm. 66: 538. 1894; Hubert, Trav. Lab. Mat. Méd. Pharm. 13: [Verb. Util. Mat. Méd.] 3, 96--102, & [129], pl. 8, fig. 1--7. 1921; Wise, Murphy, & D'Addieco, Paper Trades Journ. 122: 2 & 35. 1946; Setten, Malay. For. 16: 165--169. 1953; Munir in Morley & Toelken, Flow. Pl. Austral. 286--288, fig. 174 b & c. 1983; Mold., Phytologia 55: 424--442, 460--499, 507--509, 511, & 512. 1984.

GMELINA ARBOREA Roxb.

Additional bibliography: Hooper, Pharm. Journ. Trans., ser. 3, 22: 573. 1892; Kraemer, Am. Journ. Pharm. 66: 538. 1894; Hubert, Trav. Lab. Mat. Méd. Pharm. 13: [Verb. Util. Mat. Méd.] 96--100 & 192, pl. 8, fig. 4--7. 1921; Wise, Murphy, & D'Addieco, Paper Trades Journ. 122: 2 & 35. 1941; Setten, Malay. For. 16: 165--169. 1953; Mold., Phytologia 55: 460--473, 493, 494, & 497. 1984.

Additional illustrations: Hubert, Trav. Lab. Mat. Méd. Pharm. 13: [Verb. Util. Mat. Méd.] [97], pl. 8, fig. 4--7. 1921.

GMELINA ASIATICA L.

Additional bibliography: Hubert, Trav. Lab. Mat. Méd. Pharm. 13: [Verb. Util. Mat. Méd.] [97] & 101--102, pl. 8, fig. 1 & 2. 1921; Mold., Phytologia 55: 473--497. 1984.

Additional illustrations: Hubert, Trav. Lab. Mat. Méd. Pharm. 13: [Verb. Util. Mat. Méd.] [97], pl. 8, fig. 1 & 2. 1921.

GMELINA BRASSII Mold.

Additional bibliography: Mold., Phytologia 55: 499. 1984.

Leaf-blade secondaries flat above, prominent beneath; veinlet reticulation very abundant, flat and not conspicuous above, beautifully prominulous to the finest details beneath; inflorescence terminal, to 25 or more cm. long, 2--4 cm. wide, erect, racemose or pseudospicate, densely many-flowered, paniculately branched at and toward the base with very short erect branches, the upper flowers arranged in subsessile cymules, densely short-puberulent throughout with brownish hairs, very conspicuously bracteolate and glanduliferous; peduncles 3--4.5 cm. long, similar to the upper portion of the branchlets in all respects; sympodia 1--2.7 cm. long, more conspicuous toward the apex of the inflorescence; bractlets very numerous and conspicuous, elliptic or lanceolate, 5--17 mm. long, 1.5--8 mm. wide, tapering to the apex or caudate-acuminate, sessile, tapering to the base or the largest ones basally broadly rounded, densely short-puberulent on both surfaces, usually conspicuously glanduliferous with 1--3 large, flat, black glands on the lower surface; pedicels very short, puberulent; calyx densely puberulent, usually also black-glanduliferous; corolla white, purplish, pale-purple, or yellowish with a

purple lip, sometimes purplish-white with a yellow-crested lip or pale-lilac with darker markings, to 2 cm. long, externally densely appressed-puberulent, the lower lip faintly blue with 2 yellow markings; fruit drupaceous, 10--14 mm. long and wide, green and blue-tipped when young, enclosed basally by the fruiting-calyx, black or purple when ripe.

This species is based on *Brass 21915* from a rainforest on limestone, at 30 m. altitude, at Dabora, on the Cape Vogel peninsula, Milne Bay District, Papua, New Guinea, collected on April 10, 1953, deposited in the herbarium of the Department of Forests at Lae, New Guinea. A recorded vernacular name for the species is "alongaya" and its wood is used for carving drums. A wood sample accompanies *Croft & al. LAE.68823*.

Collectors have found this plant growing at the margins of *Pandanus* swampy gullies, at the edges of rainforests, behind beach strand, and in disturbed lowland forests, at 17--100 m. altitude, in flower in November, and in fruit in June. It is frequent as a minor canopy tree and in the subsidiary layer of rainforests. It has been found in both flower and fruit in March and April. Womersley mistakenly refers to the flowers as being in "terminal heads".

Citations: NEW GUINEA: Papua: *Brass 21719* (Ng--17096), *21915* (Ng--17164--type); *L. S. Smith 1298* (Ld, Ng--6594, Ng--16969); *Womersley 8680* (Ng--16845). Fergusson Island: *Brass 27281* (W--2408550); *Croft & al. LAE.68823* (Mu). Normanby Island: *Brass 25383* (W--2408135); *Croft & al. LAE.68878* (Mu).

GMELINA CHINENSIS Benth., Fl. Hongk. 272. 1861 [not *G. chinensis* L., 1962].

Bibliography: Benth., Fl. Hongk. 272. 1861; Maxim., Bull. Acad. Imp. Sci. St.-Pétersb. 3: 81. 1886; Maxim., Mél. Biol. 12: 514. 1886; Oliv. in Hook. f., Icon. 19: 3, pl. 1874. 1889; Forbes & Hemsl., Journ. Linn. Soc. Lond. Bot. 26 [Ind. Fl. Sin.. 2]: 257. 1890; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1039. 1893; Dunn & Tutcher, Kew Bull. Misc. Inf. Addit. Ser. 10: 203. 1912; Dop, Bull. Soc. Bot. France 61: 323. 1915; H. Hallier, Meded. Rijks Herb. Leid. 37: 56 & 58. 1918; Chung, Mem. Sci. Soc. China 1 (1): 227. 1924; Stapf, Ind. Lond. 3: 299. 1930; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 116--117. 1932; Dop, Rev. Internat. Bot. Appliq. Agric. Trop. 13: 896. 1933; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 57, 58, 73, & 93. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1039. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 132, 135, 160, & 186. 1949; Mold., Résumé 170, 174, 218, & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1039. 1960; Mold., Résumé Suppl. 3: 19 & 32. 1962; Tingle, Check List Hong Kong Pl. 38. 1967; Mold., Fifth Summ. 1: 289, 292, 294, & 363 (1971) and 2: 879. 1971; Hsiao, Fl. Taiwan 6: 12. 1980; Mold., Phytol. Mem. 2: 279, 281, 283, 354, & 549. 1980; Raj, Rev. Paleobot. Palyn. 39: 356, 372, & 395. 1983; Mold., Phytologia 55: 330, 335, 468, 493, 494, 498, & 499. 1984.

Illustrations: Oliv. in Hook. f., Icon. 19: pl. 1874. 1861.

A low bush or bushy shrub, rarely a small tree, 2--3.2 m. tall, often conspicuous on the landscape; branches and branchlets glabrous;

leaves decussate-opposite; petioles 2.5--5 cm. long, canaliculate above, pubescent when young, later glabrous; leaf-blades chartaceous, oblong-ovate or ovate to elliptic, 6--14 cm. long, 4.5--5.5 cm. wide, apically acute or acuminate, basally cuneate or subtruncate, marginally entire, dull-green or dull deep-green and glabrous above, somewhat (but not conspicuously) bluish-green and minutely farinose beneath, often basally trinerved and occasionally with 2 or 3 glands between the secondaries there; secondaries 3--5 per side; inflorescence terminal, paniculate, short and narrow, slightly pubescent or tomentose; bracts foliaceous, small, apically obtuse, caducous; flowers conspicuous, fragrant; calyx campanulate, 7--8 mm. long, 5 mm. wide, green, persistent, externally glandulose and slightly downy or hoary, internally glabrous, usually with 1--3 large (or small) glands, the rim truncate, with 5 distant and minute teeth; corolla large, about 3 cm. long, 2.5 cm. wide at the throat, somewhat bilabiate, only slightly oblique, mostly yellow or orange (at least externally), internally white or bright-orange, the upper lip often purple, the lower lip orange or red-tinged, externally only minutely whitish-farinose, densely glandulose, internally sparsely so, the tube short, the limb usually 4-lobed, rarely 5-lobed; stamens 4, didynamous, inserted in the corolla-tube; filaments glabrous; anthers divaricate; style apically unequally bilobed, one lobe very minute; ovary 4-celled, externally densely pubescent on the upper portion, glabrous below; fruit obovate, about 2.2 cm. long, 1.5 cm. wide in the upper half, 5 mm. wide near the base.

The species is based on an unnumbered Wright collection from the New Territory part of Hong Kong, deposited in the Kew herbarium. The species greatly resembles *G. hainanensis* Oliv. in general appearance, but differs in its truncate calyx and ovate-elliptic and less glaucous leaves. Dop (1933) comments on its close resemblance, also, to *G. lecomtei* Dop [now regarded as a synonym of *G. racemosa* (Lour.) Merr.]: *G. chinensis* being mostly only a shrub, 2--3 m. tall, with only 1--3 very large calicinal glands and a 4-lobed corolla, while *G. lecomtei* is a tree, 10--15 m. tall, with very numerous small calicinal glands and a 5-lobed corolla.

Raj (1983) has studied the pollen of *G. chinensis* on the basis of *Hu 10231* from Lantau Island in the Stockholm herbarium.

Yip describes the plant which he collected, cited below, as a "woody climber, leaves darker green above". Collectors have encountered *G. chinensis* on stream banks and on plains, in ravines, and along open roadsides, at 600 m. altitude, in flower from April to June, and in fruit in June.

Dunn & Tutcher (1912) list this species from Lantau Island and from Hong Kong's New Territory. P'ei (1932) cites *Ying 628* from Lantau, *Wright s.n.* from Hong Kong, and *Chun 3075* and *McClure 378* from Kwangtung. Forbes & Hemsley (1890) cite an unnumbered Ford collection from Lantau and of Wright from Hong Kong, deposited in the Kew and British Museum herbaria. They comment that "Since the publication of the figure in Hooker's 'Icones Plantarum' Mr. Ford has sent excellent flowering specimens to Kew from which we learn that the inflorescence is furnished with many deciduous bracts." Tingle (1967) lists it only from Hong Kong, as does Hsiao (1980),, listing the vernacular

name, "shih mu" [=stone-wood] in Chinese characters.

Hallier (1918) cites his *no. C.242* from material cultivated in Hong Kong. He comments that "Das von mir gesammelte Exemplar reicht nich aus, um zu entscheiden, ob auch *Balansa no. 3806* von Tonking zu dieser Art gehört". Dop (1915) cites this collection as a cotype of his *G. balansae*, noting that "Cette espèce est voisine du *Gm. chinensis* Bentham; elle s'en distingue par la dimensions des feuilles, les inflorescences et les lobes stigmatiques egaux". The Dop reference is often cited as "1914", but was not actually published until 1915.

The corollas are described as "yellow" on *Chan 1083*, *Hu 10231*, and *Taam 2153*, as well as by Dunn & Tutcher (1912), "bright-yellow" on *Tso 21490*, "orange" on *Chan 1073*, "purple, lower lip orange" on *Hom 186*, and "Blüthen innen prächtig orange, mit purpurner Oberlippe" on *Hallier C,242*.

P'ei (1932) differentiates *G. chinensis* from the other Chinese species known to him as follows:

1. Calyx truncate or shortly toothed, the teeth not over 1.5 mm. long.
   2. Ovary densely pubescent; calyx truncate or with rudimentary teeth; leaves elliptic-ovate.....*G. chinensis*.
   2a. Ovary glabrous or nearly so; calyx dentate; leaves broadly ovate.
      3. Erect trees; leaves large, 10--25 cm. long, 5--18 cm. wide; inflorescence erect.....*G. arborea*.
      3a. Scandent shrubs (at least when young); leaves small, not over 10 cm. long; inflorescence pendulous.....*G. asiatica*.

1a. Calyx distinctly lobed, the lobes to 11 mm. long.
   4. Ovary densely pubescent; calyx with many large glands; leaves large, usually 7--15 cm. long, 5.5--7 cm. wide; inflorescence terminal, dense.....*G. hainanensis*.
   4a. Ovary glabrous; calyx usually with only a few large glands; leaves small, not over 2.5 cm. long; inflorescence terminal, lax.....*G. delavayana*

Material of *G. chinensis* has been misidentified and distributed in some herbaria as *G. arborea* Roxb. On the other hand, the *Pételot 1058 & 1941*, distributed as *G. chinensis*, actually are *G. balansae* Dop, while *Clemens & Clemens 3980* is *G. racemosa* (Lour.) Merr.

Citations: CHINA: Kwangtung: *Chun 3075* (Bz--21266, Bz--21267, N, N, Qu); *Hom 186* (N); *Tso 21490* (N); *Yip 232* (Ac). CHINESE COASTAL ISLANDS: Lantau: *Chan 1073* (Mi), *1083* (Mi); *Hu 10231* (Mi, W--2731167); *Taam 2153* (Ca--82394, Mi, N, W--2072893); *Tsiang 628* (N--photo); *Ying 628* (Ca--358250). HONG KONG: *C. Wright, Wilkes Exped. s.n.* [Hong Kong] (T--isotype, W--44913--isotype). MOUNTED ILLUSTRATIONS: Oliv. in Hook. f., Icon. 19: pl. 1874. 1861 (Ut--73879).

GMELINA DALRYMPLEANA (F. Muell.) H. J. Lam, Verbenac. Malay. Arch. 223--224. 1919.

Synonymy: *Vitex (?) macrophylla* R. Br., Prodr. Fl. Nov. Holl. 1: 512. 1810 [not *Gmelina macrophylla* Anon., 1927, nor Hort., 1940, nor H. J. Lam, 1919]. *Vitex dalrympleana* F. Muell., Fragm. Phyt. Austral. 4: 128, 1858. *Ephielis simplicifolia* Soland. ex Seem., Journ. Bot. Lond. 3: 259. 1865. *Vitex (?) macrophylla* A. Br. ex Seem., Journ.

Bot. Lond. 3: 259 in syn. 1865. *Gmelina macrophylla* (R. Br.) Benth., Fl. Austral. 5: 65. 1870 [not *G. macrophylla* Wall., 1829]. *Gmelina macrophylla* Benth. ex Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1039. 1893. *Ephialis simplicifolia* Soland. ex Mold., Alph. List Inv. Names 24 in syn. 1942. *Ephillis simplicifolia* Solander ex Mold., Alph. List Inv. Names 24 in syn. 1942. *Ephielis simplicifolia* Seem ex Mold., Alph. List Inv. Names 24 in syn. 1942. *Gmelina dalrympliana* (F. Muell.) H. J. Lam ex Mold., Résumé 285. 1959. *Gmelina dalrympleana* F. Muell. ex Fong & al., Lloydia 35: 147. 1972.

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328, 337, 409, & 549. 1980; Mold., Phytologia 51: 391 (1982) and 55: 333, 335, 336, 482, & 493. 1984.

Illustrations: Banks & Soland., Bot. Cook's Voy. 2: pl. 238. 1901.

A small or large bushy tree, to 13 m. tall, often handsomely pyramidal; trunk smooth or rough, with dark bark; branchlets minutely hairy when young, later glabrous; wood close-grained, the outer or sapwood prominently marked, "of a pretty purple colour", the remainder gray; leaves decussate-opposite, clustered at the ends of the branchlets; petioles variable in length, usually 2--3 cm. long, at first minutely hairy, later glabrescent; leaf-blades stiffly coriaceous, broadly ovate or ovate-oblong, 10--27 cm. long, 7--16 cm. wide, but variable in size, especially in width of the base, apically subobtusely acuminate, marginally entire, basally cordate or rounded, glabrous and shiny on both surfaces except for the venation beneath, often wrinkled above, usually paler and more or less gray beneath, with 0--10 (usually 2) large glands (extrafloral nectaries) above or below the first pair of secondaries beneath, the glands convex on the upper and concave on the lower surface; midrib usually very pale to almost white above; secondaries 7 per side; veinlet reticulation very indistinct, the larger venation somewhat hairy beneath with simple hairs; inflorescence terminal, paniculate, 15--21 cm. long, 4--6 cm. wide, many-flowered, minutely hairy but finally glabrescent, the axes slender; cymules in the axils of the leaves or of more or less foliaceous bracts; calyx 5 mm. long, sometimes dark-blue, externally glabrous or glandular-tomentose and with several large glands, internally glabrous, the rim truncate or somewhat sinuate, often irregularly cleft; corolla yellow and pink-veined or bright-blue to purple, varying to lilac or pink, 1.8 cm. long, externally appressed-pubescent except on the lower part of the tube, internally glabrous, the throat somewhat papillose, the limb oblique, the lobes 4 or (usually) 5, 6--8 mm long, apically subacute, the middle one of the lower lip longer; stamens inserted in the lower part of the corolla-tube; filaments flattened, glabrous; anthers 2-lobed, the connective thickened; style stout, with some glanduliferous hairs near the apex; stigma unequally bifid; ovary globose, 5-celled, at first apically hairy but soon glabrescent; fruit drupaceous, 1.3--1.8 cm. long, red or pink to violet or bright-blue, soft, fleshy when ripe, the central cavity large, the carpels involute.

Collectors have found this plant growing on riverbanks and scattered on savannas or quite commonly in rainforests and their edges, at 10--30 m. altitude, in flower from December to March and in fruit from January to March; in both flower and fruit in August. The corollas are described as "purple-pink" on *Brass 5753* and by Beer & Lam (1936) and as "lilac, the lower lip darker blue with a yellow stripe down the center" on *White 1466*; on *Hollrung 651* they are said to have been "white". Bakhuizen (1929) reports them "yellow, tinged pink".

Vernacular names reported for the species are "kawra" and "Queensland beech".

Mueller (1885) cites an unnumbered Stewart collection from Saibai Island and one of Bäuerlen from Fly River. He notes that "The length of the petioles is variable, so the width of the leaves, particular-

ly at their base, and also the degree of paleness underneath."

Junell (1934) discusses the gynoecium morphology of this species on the basis of *Kajewski 1466*. Van Steenis asks, on a sheet of *Brass 5753*, "isn't this a *Faradaya*?" Seemann (1866) comments, in his discussion of *Ephielis*: "Yet the calyx of *Vitex macrophylla* differs from that of all other species of *Vitex* and seems to point to a generic difference."

Schumann & Hollrung (1889), speaking of *Hollrung 651*, say: "Die schönen und stattlichen Exemplare dieser Pflanze zeigen am Grunde des Blattes unmittelbar am Blattstiele zwei grosse Hohlräume, die ich an Exemplaren von Australien nicht finde. Ich möchte sie für extranuptiale Nectarien, die übrigens oberhalb der Hohlräume auch bemerkt werden, halten. Der Eingang in die etwa 5--8 mm langen and 5 mm tiefen Blasen liegt auf der Rückseite des Blattes, so dass sie diese Gebilde genau wie die Ameisenblasen bei *Tococa* über die Oberseite hervorwölben. Es wäre interessant, die physiologische Bedeutung dieser Dinge durch aufmerksame Beobachtungen festzustellen." They continue: the species is "Aus dem tropischen Australien bisher bekannt. In Wallich's Pflanzen findet sich nur Blätter von zwar ähnlicher Gestalt, aber mit dichter Behaarung der Rückseite. Nach seiner Angabe stammt die Pflanze von Amboina; F. v. Mueller hat dieser Art in Neu Guinea bereits nachgewiesen."

Pulle (1911) comments that "Die Exemplare aus Niederländisch Neu-Guinea zeigen, ebenfalls die von Schumann in Flora Kaiser Wilhelmsland p. 120 erwähnten grossen Hohlräume am Grunde des Blattes unmittelbar am Blattstiele." He cites *Branderhorst 23* from West Irian.

The Wallich material to which reference is made by Schumann & Hollrung (above) obviously is what has been called *G. macrophylla* Wall. by some writers, a name which is synonymous with *G. moluccana* (Blume) Backer. The *Vitex macrophylla* Anon. and *V. macrophylla* Hort. are synonyms of *Vitex agnus-castus* f. *latifolia* (Mill.) Rehd., while *V. macrophylla* H. J. Lam is now known as *V. macrofoliata* Mold. *Gmelina ledermanni* H. J. Lam is sometimes regarded as a synonym of *G. dalrympleana*.

Bailey (1901) lists *G. dalrympleana* from the islands of the Torres Straits, Cape Grafton, Cape York, and Rockingham Bay, citing unnumbered collections of Banks & Solander, Daemel, and Dallachy, remarking that the tree furnishes a useful timber for flooring boards and planking, closely resembling that obtained from *G. leichhardtii* (F. Muell.) F. Muell., citing Bailey's Cat. Queensland Woods 298a. Burkill (1966) asserts that the wood of *G. dalrympleana* is "used for boats in eastern Malaysia". Beer & Lam (1936) inform us that the tree bears fruit from January to March.

Mueller (1886) lists *G. dalrympleana* from Saiba Island; Schumann & Lauterbach (1900) report it from northern Australia, Amboina, and New Guinea, citing only *Hollrung 651* from New Guinea, but the Amboina reference, as stated above, is based on a misidentification of *G. moluccana*. Fedde & Schuster (1941) cite *Branderhorst 23*, also from New Guinea.

Bakhuizen regarded his *G. salomonensis* as intermediate between *G. moluccana* and *G. dalrympleana* and "possibly a hybrid between them" --

but the second of these supposed parental species does not occur in either the Solomon or Molucca Islands. Whitmore (1967) says "*G. dalrympleana*.....is a very distinct entity.....It has not been found yet east of mainland New Guinea and none of the Solomons' collections come near to it, including, in my opinion, the type of *G. salomonensis*." Bakhuizen (1929) cites *Brass 959* & *1376* from Papua.

Whitmore (1967) cites the following collections as *G. dalrympleana*: NEW GUINEA: Papua: *Brass 3539, 5753, 7666, 21719. 21915, & 28910; Hoogland 3405; NGF.1298, 3422, & 10374.* Territory of New Guinea: *NGF. 2922 & 9375.* West Irian: *Anta 179 & 250; Branderhorst 23; Van Royen 4891.* NEW GUINEAN ISLANDS: Daru: *Brass 6319.* Fergusson: *Brass 27281.* Normanby: *Brass 25388; NGF.8680.* MOLUCCA ISLANDS: Aroe: *Buwalda 5431.* AUSTRALIA: Queensland: *Kajewski 146; F. Mueller s.n.* [Cape York].

Lam (1919) cites only *Branderhorst 23* from New Guinea, listing the species also from "tropical Australia" on the authority of Bentham and Mueller. He comments that "Its affinity is with *G. macrophylla* [Wall. = *G. moluccana* (Blume) Backer]. The latter.....differs by the texture of its leaves and young parts, the obtuse apex, the subequal corolla-lobes, and the yellow (not blue) corolla.....Schumann u Hollrung.....speak of ant-hollows at the base of the leaves, which should have an opening, but we take them for nothing else but extrafloral nectaries, finding them convex in the upper, and concave in the lower surface of the leaf.....The species as Bentham describes it, seems not to possess the large glands at the base of the leaves; Schumann too, found the leaves of Australian specimens without glands. As, however, their number is much varying in 1 plant, we described no varieties, concerning the presence and absence of the nectaries."

It may be worth noting here that Lam (1919) mis-cites the Brown (1810) reference to this plant (see bibliography, above) as "1827" and the Wallich (1829) reference in the synonymy as "1828". The Mueller (1886) reference is sometimes mis-cited to vol. 6 (1875).

Citations: NEW GUINEA: Papua: *Bluerlen 544* (Mb, N), *s.n.* [Fly River] (Mb); *Brass 5753* (Bz--21274, N, W--1944646); *W. MacGregor s.n.* [Kussa, Mai 1890] (Mb). West Irian: *Brandenhorst 23* (Bz--21277, Bz--21279, Bz--25579, Ut--13813); *Wentholt 179* (Bz--72742), *250* (Bz--72743). NEW GUINEAN ISLANDS: Saibai: *C. Stewart 780* (Mb), *s.n.* [1885] (Mb, Mb). AUSTRALIA: Queensland: *Brass 2185* (B, Bi); *Kajewski 1466* (S); *C. T. White 1466* (N, S).

GMELINA DALRYMPLEANA var. *SCHLECHTERI* (H. J. Lam) Mold., Phytologia 4: 178. 1953.

Synonymy: *Gmelina schlechteri* H. J. Lam, Verbenac. Malay. Arch. 226. 1919.

Bibliography: H. J. Lam, VerbenaC. Malay. Arch. 216, 226--227, & 336. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 65. 1921; H. J. Lam in Lauterb., Engl. Bot. Jahrb. 59: 94. 1924; A. W. Hill, Ind. Kew. Suppl. 6: 92. 1926; Fedde & Schust., Justs Bot. Jahresber. 47 (2): 245 (1927) and 60 (2): 573. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 67 & 93. 1942; H. N. & A. L. Mold., Pl. Life 2: 81. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 149 & 186. 1949; Mold., Biol. Abstr. 27: 2026. 1953; Mold., Phytologia 4: 178. 1953; Mold., Résumé 201--203, 297, & 456. 1959; Mold., Fifth Summ.

1: 333, 336, & 338 (1971) and 2: 524 & 879. 1971; Mold., Phytologia 46: 491. 1980; Mold., Phytol. Mem. 2: 323, 327, 328, & 549. 1980; Mold., Phytologia 51: 391 (1982) and 55: 336. 1984.

A small or medium-sized to tall, handsome canopy tree, 10--25 m. tall, pyramidal in shape; trunk smooth, often centrally hollow; bole 3--15 m. high, 12--60 cm. in diameter at breast height; buttresses to 1.5 m. high and 60 cm. long; branches spreading; bark rough, dark to pale gray-brown, about 3 mm. thick, slightly flaky, longitudinally and reticulately fissured; wood straw-color; branchlets subglabrous; leaves decussate-opposite; petioles subglabrous; leaf-blades firmly chartaceous, oblong or obovate-oblong, shiny or dull-green above, paler beneath, apically acute or shortly acuminate, basally truncate or broadly cuneate, glabrous on both surfaces when mature or the venation subpubescent beneath, with some (usually 2) rather large glands (extra-floral nectaries) below the lowest veins beneath; secondaries 6--8; inflorescence terminal, pyramidal, ferruginous-pubescent, basally foliose, the cymes borne in the axils of foliaceous, lanceolate, 5--10 mm. long bracts; calyx dark purple-green, about 4 mm. long and wide, externally densely appressed-pubescent, sometimes with some rather large glands intermixed, the rim truncate or obsoletely 4- or 5-dentate; corolla yellow, creamy-fawn, or white to pinkish, lavender, purple, or pale purplish-blue, the tube 10--10.5 mm. long, the lower portion externally glabrous, the remainder, as well as the lobes, externally appressed-pubescent, internally glabrous, the limb obliquely bilabiate, 4 lobes subequal and about 7 mm. long, the 5th lobe larger and about 1 cm. long, internally minutely pubescent; stamens exserted; filaments glabrous or with a few glanduliferous hairs; style filiform, with some glanduliferous hairs; stigma unequally bifid; ovary externally glabrous; fruit fleshy, white or greenish-white to pale- or bright-blue, glossy, purple or black when mature.

This variety is based on *Schlechter 17041* [Lam (1924) cites it as "*17043*"] from woods on the Kavi Mountains at 1000 m. altitude, in New Guinea, collected on December 25, 1908. Lam (1919) asserts that it is "A species, well characterized by its obovate-oblong leaves, its truncate, pubescent calyx, and its glabrous ovary". In his key he distinguishes it from typical *G. dalrympleana* (F. Muell.) H. J. Lam by the latter having a "pubescent calyx" [probably a lapsus for "ovary"]. The wood of the variety is said to be used by natives in its native haunts for the manufacture of canoes.

Collectors have encountered this plant in woods, on riverbanks, along brooks in old secondary forests, in disturbed rainforests on hillside slopes, in gallery forests, and "frequent in rainforests on limestone", at altitudes of 10--1150 m., in flower in February, April, May, July, and December, and in fruit in February, April, and May. Vernacular names reported for it are "adoen", "ai", "bauma", "mumuni", "noes", "oedoedoe", and "po'a".

The corollas are described as "yellow" on *Brass 1376*, "yellow tinged pink" on *Brass 959*, "white or pinkish" on *Brass 21915*, "creamy-fawn, the lower lobe mauve with a yellow patch" on *Hoogland & Craven 10167*, "lavender" on *Brass 28910*, "pale purple-blue" on *Womersley 9375*, "purple" on *Buwalda 5431*, and "cream, the lower lip with a pink apical part and a yellow patch in the throat" on *Hoogland 3405*.

Hoogland reports the tree "fairly common in regrowth on relatively shallow gray to brown wet clay soils with much iron gravel" and "very common in juvenile forests on fairly clayey soil with *Dillenia nalagi* as the most important tree".

Material has been misidentified and distributed in some herbaria as *Teijsmanniodendron hollrungii* (Warb.) Kosterm. and as *Faradaya* sp.

Citations: AROE ISLANDS: Kobroör: *Bumalda 297* [Boschproefst. bb. 25330] (Bz--21329). Trangan: *Buwalda 440* [Boschproefst. bb.25474] (Bz--21330), *5431* (Bz--72617, N, Ng--16961, Ng). NEW GUINEA: Territory of New Guinea: *Hollrung 651* (Bz--21278, Mb, Mb, N); *Hoogland & Craven 10167* (W--2896313); *N.G.F.2922* (Ng--6490); *Schlechter 17043* (Ca--226308); *Womersley 9375* (Ng--16945). Papua: *Brass 959* (Bz--21275, N), *1376* (Bz--21276), *21915* (W--2603100), *28910* (W--2409583); *Carr 15748* (N); *Hoogland 3405* (Ng--16839, Ng, W--2213560); *Hoogland & Macdonald 3422* (Ng--16837, W--2213567). West Irian: *Lundquist 52* [Boschproefst. bb.3267;] (Bz--21328), *133* [Boschproefst. bb/32852] (Bz--72965). NEW GUINEAN ISLANDS: Misool: *Pleyte 1094* (Bz--72670).

GMELINA DELAVAYANA Dop, Bull. Soc. Bot. France 61: 321. 1915.

Synonymy: *Gmelina montana* W. W. Smith, Notes Roy. Bot. Gard. Edinb. 9: 107--108. 1916.

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Illustrations: P'ei, Mem. Sci. Soc. China 1 (3): pl. 23. 1932; Raj, Rev. Palaeobot. Palyn. 39: 412, pl. 13, fig. 2. 1983.

A slender, floriferous, sometimes twining, unarmed shrub or subshrub, 1--3 m. tall; branchlets slender, terete, flexuous, at first minutely glandular-pubescent or -puberulent, later glabrescent; bark striate, light-brown; leaves decussate-opposite; petioles slender, 0.5--2 cm. long, minutely glandulose; leaf-blades ovate to subrhomboid or trapezoid, membranous or in drying thinly chartaceous, 2--5 cm. long, 1.5--3.5 cm. wide, apically acute or obscurely acuminate and mucronulate, marginally entire or obscurely sinuate to 3--many-lobulate, basally often inequilateral and obtuse or more or less broadly cuneate, glabrous and green or (in drying) olivaceous-brown above, glaucous and minutely or densely glandulose beneath when mature, sparsely pilosulous on the midrib; secondaries 3 or 4 per side, rather con-

spicuous above, prominent beneath; veinlets whitish and compressed above; cymes 1--7-flowered, forming a remote, narrow, lax, racemiform, terminal, cymose panicle 10--20 cm. long, puberulent; bracts foliaceous, linear or lanceolate, to 1 cm. long; peduncles slender, 1--1.5 cm. long, pilosulous and minutely glandulose or pubescent, apically 2-bracteolate; calyx campanulate, 0.7--1 cm. long, oblique, subbilabiate, externally very sparsely pilosulous and minutely glandulose or eglandular, the rim deeply 5-lobed, the lobes very slightly unequal, ovate or triangular, about 3 mm. long, apically acute or often shortly acuminate; corolla violet or blue-purple, 3--4 cm. long, externally slightly puberulous or pruinose above, the tube yellow, cylindric, almost 2 cm. long, incurved, conspicuously ventricose-ampliate above the calyx, the limb bilabiate, 5-lobed, blue-purple, the lobes rounded, the lower lip galeate, 3-lobed, the middle lobe much larger, oblong, 12--18 mm. long, the upper lip short, entire or very slightly bilobed, 7 mm. long; stamens 4, included or subexserted, the filaments thick, sparsely and minutely capitate-glandulose; style slender, smooth; stigma bilobed, the lobes unequal; ovary externally glabrous; fruit drupaceous, ovoid, 13--15 mm. long.

The species is based on *Delavay 170* and *3595* from Ta-pin-tze and *Ducloux 4698* and *4707* from Pint-chouam, Yünnan, China. Dop (1915) says: "Cette espèce est voisine du *G. asiatica* L.; elle s'en distingue surtout par le calice à lobes nettement developpés". It should be mentioned here that Prain (1921) dates the original publication of the species by Dop as "1914", but the page here involved was not actually effectively published until 1915. P'ei (1932) asserts that the leaves do not exceed "2.5 in length" but Dop's original description says "2--5 cm." long.

Smith (1916) asserts that the species "haec inter congeneres chinenses calycis lobis magnis, corollae tubo flavo, limbo bilabiato caeruleo-purpureo facile dignoscitur". Raj (1983) has studied and illustrated the pollen of this species based on *H. Smith 1815* from Szechuan, China, in the Stockholm herbarium.

The synonymous *Gmelina montana* is based on *Forrest 11662* from open situations among rocks on the western flank of the Tali Range in Yünnan, China, at 25°40' N. lat and 10,000 feet altitude, collected in August. 1913, and deposited in the Edinburgh herbarium. Smith (1916) remarks that the species grows at altitudes which are "remarkable for the genus". P'ei (1932) cites *Forrest 22499* from Szechuan and *Forrest 11662, 15620,* & *22081* from Yünnan. He remarks that "Comparison of authentic material representing both species clearly indicates the identity of *Gmelina montana* W. W. Sm. with *G. delavayana* Dop".

The corollas on *G. delavayana* are described as having been "blue" on *Ten 261*, "violet" on *Ten 109*, "yellowish-purple and reddish" on *Rock 5077*, "ruddy-purple, yellowish at base" on *Forrest 22081*, and "limb purplish-blue, tube yellow" on *Forrest 11662*.

The plant has been encountered at the margins of thickets and by streams on mountainsides, at altitudes of 1700--3400 m., in flower in May, June, and August, and in fruit in September.

Citations: CHINA: Szechuan: *Forrest 22499* (W--1279006); *H. Smith 1815* (S). Yünnan: *Delavay 170* [?] (N--cotype?); *Forrest 11662* (Ca--231016, N--photo), *22081* (Ca--253060, W--1279009); *Rock 5077* (N, W--

1514614); *Ten 109* (W--1058168), *271* (Ca--487586). MOUNTED ILLUSTRATIONS: P'ei, Mem. Sci. Soc. China 1 (3): pl. 23. 1932 (Ld).

GMELINA ELLIPTICA J. E. Sm. in Rees, Cyclop., imp. 1 [London], 16: *Gmelina* 2. 1810.

Synonymy: *Radix deiparae* Rumpf, Herb. Amboin. 2: 124--127, pl. 39. 1741. *Radix deiparae spuria* Rumpf, Herb. Amboin. 2: 127--129, pl. 40. 1741. *Gmelina villosa* Roxb., Hort. Beng., imp. 1, 46, nom. nud. 1814; Fl. Indica, ed. 2, imp. 1, 3: 86. 1832. *Radix deipara* Rumpf apud Roxb., Fl. Indica, ed. 2, imp. 1, 3: 87. 1832. *Gmelinae* sp. W. Griff., Notul. Pl. Asiat. 4: 179--180. 1854. *Gmelina grandiflora* Bocq., Adansonia, ser. 1, 2: 157. 1862. *Gmelina* [sp.] Blanco ex Fern.-Vilar in Blanco, Fl. Filip., ed. 3, Nov. App. 159 in syn. 1880. *Gmelina asiatica* Wall. apud C. B. Clarke in Hook. f., Fl. Brit. India 4: 582 in syn. 1885 [not *G. asiatica* L., 1753, nor Lour., 1953, nor Schau., 1918). *Gmelina sp. n. ?* W. Griff. ex C. B. Clarke in Hook. fl., Fl. Brit. India 4: 582 in syn. 1885. *Gmelina asiatica* Kurz apud Koord. & Valet., Meded. Lands Plant. 42: 197 in syn. 1900. *Gmelina integrifolia* Hunter ex Ridl., Journ. Roy. Asiat. Soc. Straits 53: 101 in syn. 1909. *Gmelina asiatica* Auct. ex Heyne, Nutt. Pl. Ned. Ind., ed. 1, 4: 118 in syn. 1917. *Gmelina villosa* Blume ex H. Hallier, Meded. Rijks Herb. Leid. 37: 58 in syn. 1918. *Gmelina asiatica* Burm. ex Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 70 in syn. 1921. *Gmelina asiatica* var. *villosa* (Roxb.) Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 70. 1921. *Gmelina asiatica* Burm. ex Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 70 in syn. 1921. *Gmelina* spec. Griff. ex Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 70 in syn. 1921. *Radix deiparae spuriae* "Lowara Rumph." apud Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 70 in syn. 1921. *Gmelina asiatica* var. *villosa* Bakh. apud E. D. Merr., Enum. Philip. Flow. Pl. 3: 399 in syn. 1923. *Gmelina elliptica* Blume ex Mold., Suppl. List Inv. Names 3 in syn. 1941. *Gmelina asiatica* var. *villosa* Heyne ex Mold., Alph. List Inv. Names Suppl. 1: 10 in syn. 1947. *Radix disparae spuria* Rumpf ex Mold., Résumé 341 in syn. 1959. *Gmelina vestita* Blume ex Mold., Fifth Summ. 2: 524 in syn. 1971 [not *G. vestita* Wall., 1829]. *Gmelina grandiflora* Rich. ex Mold., Fifth Summ. 2: 523 in syn. 1971. *Gmelina asiatica* Wall (in part) ex Mold., Phytologia 23: 432 in syn. 1972. *Gmelina elliptica* J. C. Sm. ex Mold., Phytol. Mem. 2: 408 in syn. 1980. *Gmelina asiatica* var. *villosa* Roxb., in herb.

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Names 3--5, 10, 11, 13, 16, 17, 19, & 24. 1940; Mold., Suppl. List Inv. Names 3. 1941; Mold., Alph. List Inv. Names 25 & 39. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 26, 54, 55, 60, 62--67, 73, & 93. 1942; Mold., Phytologia 2: 103--104. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1039 & 1040. 1946; Mold., Alph. List Inv. Names Suppl. 1: 10. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 46, 123, 127, 136, 137, 139, 141, 143--148, 160, & 186. 1949; R. O. Williams, Usef. Ornam. Pl. Zanzib. 277. 1949; Corner, Wayside Trees, ed. 2, 702 & 703. 1952; Janssonius, Key Javan. Woods 53--54 & 213, fig. 294. 1952; Saint John, Pacif. Sci. 10: 101. 1956; Sastri, Wealth India 4: 156. 1956; Anon., Kew Bull. Gen. Ind. 134. 1959; Mold., Résumé 55, 142, 157, 163, 166, 176, 178, 180, 184, 186--193, 195--197, 199, 218, 296, 297, 341, & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1039 & 1040. 1960; Hundley & Ko in Lace, List Trees Shrubs Burma, ed. 3, 202. 1961; Mold., Résumé Suppl. 3: 21--24, 28, & 32 (1962) and 4: 7. 1962; Backer & Bakh., Fl. Java 2: 606. 1965; Mold., Résumé Suppl. 12: 8. 1965; Neal, In Gard. Haw., ed. 2, 730. 1965; Sen & Naskar, Bull. Bot. Surv. India 7: 46. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 1: 1105--1107. 1966; Mold., Résume Suppl. 13: 6 (1966) and 16: 22. 1968; Chan & Teo, Chem. Pharm. Bull. Tokyo 17: 1284--1286. 1969; R. N. & I. C. Chopra & Varma, Suppl. Gloss. Indian Med. Pl. 33. 1969; Corner & Watanabe, Illustr. Guide Trop. Pl. 761. 1969; Mold., Résumé Suppl. 18: 7. 1969; Farnsworth, Pharmacog. Titles 5 (4): vi & item 4119. 1970; Brandis, Indian Trees, imp. 5, 509. 1971; Farnsworth, Pharmacog. Titles 5, Cumul. Fen. Ind. 1971; Menon, Mal. For. Rec. 27: 26, 40, 42, & 103, fig. 36, 37, 80, & 84. 1971; Mold., Fifth Summ. 1: 100, 230, 264, 276, 283, 296, 301, 305, 317, 320, 325, 330, 332, 334, & 363 (1971) and 2: 523, 524, 615, & 880. 1971; Roxb., Fl. Indica, ed. 2, imp. 3, 486--487. 1971; Gamble, Man. Indian Timb., ed. 2, imp. 3, 537 & 778. 1972; Mold., Phytologia 23: 423, 424, & 432. 1972; A. L. Mold., Phytologia 23: 319. 1972; Mold., Phytologia 26: 366 (1973) and 28: 449. 1974; L. H. & E. Z. Bailey, Hortus Third 516. 1976; Mold., Phytologia 34: 265, 266, & 269. 1976; Chin, Gard. Bull. Singapore 30: 195. 1977; Jack, Malay. Misc., imp. 2, 1 (1): [Descrip. Malay. Pl.] 17--18 & opp. A. 1977; Mold., Phytologia 36: 43. 1977; Fosberg, Sachet, & Oliv., Micronesica 15: 235. 1979; Fosberg, Otobed, Oliv., Powell, & Canfield, Vasc. Pl. Palau 38. 1980; Mold., Phytol. Mem. 2: 93, 200, 253, 263, 273, 275, 286, 289, 293, 296, 298, 307, 311, 315, 320, 322, 324, 354, 408, 549, & 627. 1980; Roxb., Hort. Beng., imp. 2, 46. 1980; Mold., Phytologia 50: 252, 253, & 261 (1982) and 54: 240. 1983; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 397 & 401. 1983; Mold.,Phytologia 55: 334, 468, 480, 482--485, 489--492, 494, 496, & 497. 1984.

Illustrations: Rumpf, Herb. Amboin. 2: pl. 39 & 40. 1743; Koord. & Valet., Atl. Baumart Java pl. 278. 1914; Janssonius, Mikrogr. Holz. Java 805, fig. 294. 1926; Corner, Wayside Trees, ed. 2, 703, fig. 257. 1952; Janssonius, Key Javan Woods 213, fig. 294. 1952; Corner & Watanabe, Illustr. Guide Trop. Pl. 761. 1969; Menon, Mal. For. Rec. 27: 26, 40, & 42, fig. 36, 37, 80, & 84. 1971.

A shrubby, spreading, several-stemmed, small tree with a crown as wide as the height, or a scrambling, untidy, often evergreen, arborescent shrub, 2--8 m. tall, sometimes a thorny vine or liana to 10 m.

long; stems usually several from the same root cluster or branched from the base and freely re-branched, often spiny; bole to 1 m. long, straight, to 25 cm. in girth and 15 cm. in diameter; branches short or to 4 m. long, numerous, usually wide-spreading, often arching to the ground, they and the puberulous or villosulous branchlets often beset with sharp, rigid spines (aborted twigs) 0.5--5 cm. long, the young shoots terete, tawny-villous; outer bark white, light-gray, or grayish to yellowish-gray, pale-brown, brown, or olivaceous, thin, lenticellate, smooth or becoming slightly fissured; inner bark whitish or light-gray to greenish-white, moderately hard and heavy, very tough, brown toward the center, slightly bitter to taste; sapwood white or gray; medullary rays 1--7-[mostly 4-] seriate or wider, simple or compound; vessels often arranged in longer and shorter tangential rows; innermost part of the growth layers formed by a wood parenchyma lamella 4--7 cells thick, in this lamella the vessels are usually more numerous and strikingly wider than elsewhere; wood splinters burn for a long period of time; cambium purplish-brown; buds brown-hairy: leaves exstipulate, decussate-opposite, anisophyllous, conspicuously unequally petiolate; petioles slender, 0.5--4 cm. long, villous; leaf-blades somewhat leathery, flat, held in a horizontal or descending position, rather tough but flexible, elliptic, ovate-elliptic, or ovate to subrhomboid-elliptic, obovate, or trapezoid, 1--10.3 cm. long, 1--7 cm. wide, sometimes quite small and tending to be rhomboid, apically subacute to acute or obtuse, marginally usually entire when mature, basally acute or cuneate, dark- or deep dull-green and hairy (when young) or glabrous (when mature) above, much lighter or even yellowish or yellowish-green beneath, usually densely villous or woolly-tomentose to tomentellous (with simple hairs) beneath but sometimes only slightly pilose, with minute green glands at the base; secondaries usually 4 per side, almost straight, prominent beneath; inflorescence tawny-villous, racemiform and simple or paniculate; panicles terminal, few- to rather many-flowered, 2--7.5 cm. long, tomentose; bracts green, foliaceous, rather large, lanceolate or broadly lanceolate to oblong-ovate, 0.5--3.5 cm. long, 1--12 mm. wide, apically acute or acuminate to cuspidate, densely pubescent on both surfaces, falling after the flowers expand; flower-buds sooty-brown and silky; single cymes 1--3- [rarely 5-] flowered; flowers rather large, 2.5--3.5 cm. long, about 1.8 cm. wide, opposite, pendent, pedicellate, odorless; calyx obovate, green, 4--6 mm. long, apically truncate or obliquely and often obscurely minutely 4-denticulate, externally tomentose and with 3--7 flat, green, glabrous, permanent glands on one side; corolla mostly yellow or dull-yellow, bilabiate, large, 2.5--5.3 cm. long, externally densely pubescent, basally tubular, the tube itself basally very narrow, curvate, the throat obliquely gibbous and campanulate, the limb 4-lobed, the lower lip larger than the upper and entire, the upper lip (being a prolongation of the side of the throat) 3-lobed, the outer surface often rufous-villosulous or ferruginous-pubescent; stamens 4, didynamous, 2 reduced in size, yellow, the filaments curvate; anthers 2-celled; pollen white; style as long as the longer pair of filaments; stigma bilobed, the lobes very unequal and apically acute; ovary 4-celled, 4-ovulate,

externally with a tuft of tawny hairs at the apex, otherwise glabrous; ovules apically attached; fruit drupaceous, subglobose or globose to ellipsoid, ovoid, or obovoid, "resembling a cherry or small plum", at first greenish or green, later yellowish-green or yellow, 1.8--2.5 cm. long and wide, fleshy and watery when mature, pendent, 1- or 2-seeded, the pyrene obovate, obscurely 4-lobed, externally smooth, perforated by a conic cavity more or less on one side of the center (depending on the number of fertile cells); seeds hard and woody, oblong-obovate, about 1.3 cm. long and 0.8 cm. wide, smooth, slightly compressed, the integument single, brown, spongy; pericarp absent; embryo erect; cotyledons obcordate, conforming to the seed in size and shape; plumule 2-lobed; radicle inferior, minute.

Smith's original (1810) description of this species is: "Leaves elliptical, undivided, obtuse, downy beneath. Thorns none. -- Native, we presume, of the East Indies, confounded in the Linnaean herbarium with the foregoing [*G. asiatica*], from which it differs in having rather larger leaves, which are exactly elliptical and blunt, more densely downy beneath, and not lobed. There are no traces of thorns. The inflorescence is rather more compound, but the remarkable glandular calyx is the same. If a variety it is a very extraordinary one." His type specimen is deposited in the Linnean Herbarium. His emphasis on the non-thorny character is doubtless due to his having seen only the small tip of a flowering branchlet.

Roxburgh's *Gmelina villosa* was based by him on a collection made in the Botanic Garden at Calcutta, the plant said to have come originally from Penang ["Pulo Pinang"] in Malaya and "from thence introduced by Dr. W. Hunter, into the Botanic garden at Calcutta, in 1802. In six years, the seedling plants had reached the size of small trees, and are in flower and fruit all the year round". His original description is detailed and excellent (far better than that of Smith) and well worth repeating here: "Trunk, in our young trees, straight, as thick as a man's leg. Bark olive-coloured. Branches numerous, spreading, and drooping in every direction; young shoots round, and villous. Leaves opposite, petioled, trapeziform, with the margins entire, except that the rounded side angles sometimes project into lobes, and the apex is generally acute, smooth on the upper side, pale and downy on the under one, from one to four inches long, and from one to two broad. Stipules none. Racemes terminal, simple, downy. Flowers opposite, pedicelled, drooping, and scarcely so large as in *G. asiatica*, dull yellow, on account of their being clothed with ferruginous pubescence. Bractes large, lanceolate, cuspidate, continuing until the flowers expand. Calyx small, obscurely four-toothed, with some large glands on the under side, as in *G. asiatica*, but larger and more numerous, permanent. Corol with a narrow, curved, cylindric tube, and oblique gibbous-campanulate throat. Border four-parted, of which the lower one is much larger, and is a continuation of the protruded side of the throat. Filaments curved, one of the pairs much longer. Anthers bifid. Germ round, smooth, 4-celled, with one seed in each, attached to the top

of the axis. Style as long as the long pair of filaments. Stigma of two, very unequal, acute lobes. Drupe spherical, size of a large cherry, fleshy, smooth, when ripe yellow, one-celled. Nut obovate, obscurely four-lobed, smooth, four-celled, perforated by a conic cavity with its wide end downwards. The perforation is more or less on one side of the centre, according to the number of fertile cells, which is generally one or two only. Seed solitary, obovate-oblong, a little compressed. Integument single, brown, spongy. Perisperm none. Embryo erect. Cotyledons conform to the seed, obcordate. Plumula two-lobed. Radicle minute, inferior."

Fernandez-Villar (1880) regarded *G. inermis* Blanco (1837) as a synonym of *G. villosa* Roxb. (and therefor of what we now call *G. elliptica*), but Merrill (1918) has pointed out that there is no justification for this reduction -- Blanco was merely referring to a thornless form of the common Philippine species, *G. philippensis* Cham.

Merrill (1917), citing *C. B. Robinson, Pl. Rumph. Amb. 306* from Amboina, comments that "This is certainly *Radix deiparae* Rumph. and is equally certainly *Gmelina villosa* Roxb. Roxburgh's description was based on specimens from Penang, but he also cites *Radix deiparae* Rumph.....as representing his species. *Radix deiparae spuria*, which Rumphius thought distinct from his *R. deiparae*, undoubtedly is also referable to *Gmelina villosa* Roxb., although by many authors it has been referred to *Gmelina asiatica* Linn. The former was erroneously reduced by Linnaeus to *Gmelina asiatica* Linn.....while the latter also has been very generally referred to the same species. It is to be noted that in the Herbarium Amboinense t. 40 of Volumes I and II have been transposed."

The Baileys (1976) reduce *G. elliptica* to synonymy under *G. asiatica* and, indeed, the two taxa are certainly closely related.

Jack (1822) describes what he calls *G. villosa* as "spinosa, foliis rhomboideis subtus villosis....." Kanehira (1933) distinguishes the species from *G. palawensis* H. J. Lam in that it is a scandent shrub, the leaves elliptic and 10 cm. long, while in *G. palawensis* the plant is a tall tree, the leaves obovate or broadly elliptic and 10--15 cm. long.

Collectors have found *G. elliptica* growing on mountain-slopes, in mixed deciduous dipterocarp forests, along streams and among rocks, in sandy soil of beaches and secondary forests, in open forests and open grasslands, on overgrazed land and riverbanks, near streams in secondary forests, in brownish and limestone soil, overhanging streambanks, along roadsides and roadcuts, on hillsides, in and at the margins of secondgrowth, in woods, primary forests, and thickets, deciduous bamboo forests, the edges of seasonal ponds, in rocky soil and dry compact soil near the coast, at altitudes of sealevel to 170 m. They have found it in flower from September to July and in fruit from September to April, as well as in July.

Backer & Bakhuizen (1965) report that in Java it inhabits brushwood, village greens, light forests, and forest borders, at altitudes of 1--500 m. Corner (1952) found it common in villages and open country in Malaysia, especially by the sea, and frequently grown as an irregular hedge -- "In shape and general appearance it resembles

....*Zizyphus*.....which is also thorny and has yellow flowers." Ridley (1911) lists the species from Burma, Thailand, Malaya, and the Nicobar Islands. It is said to be common in secondary growth on Basilan island in the Philippines. Tatamatsu refers to it as rare in sandy fields on the Palau Islands, but Canfield describes it as an abundant weedy tree in open areas along roadsides in volcanic clay soil along with *Cymbopogon* in these same islands. Sinclair reports it common on roadsides near the seashore in Singapore, while Smitinand found it "sporadic in scrub jungle" in Thailand.

Janssonius (1926) gives a very detailed description of the macroscopic characters of the wood. The wood anatomy is also discussed and illustrated by Menon (1971), including the semi-ring-porous wood, the ray tissue (which is of heterogeneous type III), and the acicular cellular crystals. A wood sample accompanies *Toroes 1120* & *2541* in the University of Michigan herbarium.

It is worth mentioning here that *Lörzing 3726* exhibits two leaves that are shallowly lobed exactly like those seen in the type specimen of *G. asiatica* in the Linnean herbarium. *Larsen & al. 31806* has the leaf-blades only slightly pilose beneath. *Yates 817* exhibits a fungal infection on the leaves. The label accompanying *Kanehira 198* indicates that the plant from which the material was taken had been introduced (on Corol Island). The unnumbered Vermoesen collection, cited below, does not have any indication on its accompanying label that it was taken from cultivated material, but I am assuming that it was.
Corner (1952, 1956) refers to the leaf-blades as "white-hoary" beneath, but I have never seen any that would fit such a description.

The corollas are described as having been "yellow" on *Buwalda 7331*, *Canfield 402*, *Franco s.n.*, *Geesink & Santisuk 5223*, *Groff 6142*, *Niyomdham & al. 241*, *Ramos & Edano 48950*, *Shearard & Spence 82*, *Smitinand 575*, *Villamil 315*, *Williams 3041*, and *Yates 817* & *856*, *Bangham & Bangham 667*, *Beusekom & Phengkhlai 498*, *Chin 927*, *Docters van Leeuwen 1750*, *Elmer 9646*, *Gillis 11029*, *Larsen & Larsen 34046*, *Maxwell 75-318*, *Rajab 550*, *Santos 6148*, *Soepadmo 9138*, and *Stone 6908* & *9343*, "yellowish" on *Ahmin G. SAN.95465*, *Jumatin & Toyok SAN.92461*, *Medani 35034*, "bright-yellow" on *Chin 793*, *Stone 6170*, and by Nairne (1894), "light-yellow" on *Elmer 12013*, "golden-yellow" by Hallier (1918), "cadmium-yellow" on *Sheehan R.33*, and "pure clear yellow" on *Bangham & Bangham 628*.

The plant is described as a "tree" on *Toroes 2546*, "small tree" on *Bangham & Bangham 628*, "vine 30 feet long" on *Groff 6142*, "climber" on *Ahmin G. SAN.95465*, and "liana" on *Buwalda 7331*.

Gmelina elliptica, either under this name or that of a synonym, is listed by Roxburgh (1814) from Prince of Wales island on the basis of a Hunter collection; Jack (1843) lists it from Sumatra and Malacca. Voigt (1845) knew the species from Penang, Madura, and the Molucca Islands, asserting that in Calcutta and vicinity it flowers throughout the year.

Schauer (1847) cites the Roxburgh collection, originally from Penang, and *Zollinger 565* from Java, commenting: "Flores nutantes, iis *Gmel. Asiaticae* omnino similes, nonnihil minores, obscure lutescentes, ferrugineo puberuli. Drupa carnosa, cerasi mole, lutea. Proxima certo *G. Asiaticae*, sin modo foliis subtus tomentosis, ramis pedulis

diversa". Miquel (1858) lists it from Sumatra, Java, Malacca, Celebes, and Bali, noting: "Arbuscula humanae altitudinis, ramis numerosis pendulis et foliis subtus tomentosis a *G. Asiatica* differt."

Clarke (1885) cites unnumbered collections of Wallich from Penang, Griffith and Maingay from Malacca, Thomson from Singapore, and Kurz from the Nicobar Islands. Koorders (1898) lists the species from Celebes and Java. Merrill (1903) cites *Ahern 331* & *618* from Mindanao, listing the species also from "southern Asia and the Malayan region". Brandis (1906) gives its distribution as "Pegu, Martaban, the Nicobar islands, the Malay Peninsula, and the Malay Archipelago".

Gamble (1908) cites *Curtis s.n.* from Langkawi, *Curtis 454*, *King s.n.*, *Phillips s.n.*, and *Wallich 1816* from Penang, *Scortechini 740* and *Wray 734* from Perak, *Griffith 6057* and *Maingay 1189* from Malacca, *Anderson s.n.*, *Deschamps s.n.*, *Kunstler 103*, *Kurz s.n.*, and *Thomson s.n.* from Singapore, *Kurz s.n.* from Burma and the Nicobar Islands, and *Forbes 1576* & *2642* from Sumatra.

Koorders (1912) says that *Gmelina elliptica* occurs throughout Java "im Djati walde und im sehr lichten Regenwalde häufig zerstreut oder gruppen weise" from sealevel to 600 m. altitude.

Hallier (1918) cites the following collections: Penang: *Galathea Exped s.n.* Sumatra: *Elbert s.n.* Borneo: *Korthals s.n.*, *Winkler 2270*. Lombok: *Elbert 750*. Sumbawa: *Colfs 126* & *212*, *Elbert 3676* & *Grllndler in Elbert 3909*. Salajar: *Weber s.n.* Buton: *Elbert 2619*. Celebes: *Elbert 3001*, *3038*, & *3058* and *Forsten s.n.* Amboina: *Forsten s.n.* Basilan: *Hallier 3515*. Java (cultivated): *Hallier C.125*. He reports the species also from the Philippine islands of Malamawi and Mindanao, as well as from Burma, the Nicobar Islands, Malay Archipelago, Singapore, Thailand, Java, Bali, Negros, and Luzon.

Lam (1919) cites *Buitendijk HLB.914.324-226*, *Elbert HLB.908.308-433*, and *Forbes 1576* & *2342* from Sumatra, *Elbert 464* & *465*, *Junghuhn 524*, and *Zollinger 565* & *696* from Java, *Elbert 750* from Lombok, *Colfs 126* & *212* and *Elbert 3676* & *3909* from Sumbawa, *Elbert 2619*, *3001*, *3038*, & *3058*, *Forsten HLB.908.267-844* , & *Weber HLB.898.112-522* from Celebes, *Winkler 2270* from Borneo, *Elmer 9646* and *Whitford 11809* from the Philippines, and *Ledermann 14164a* and *Raymundus 44* from Korror in the Palau Islands.

Bakhuizen (1921) gives the species' natural distribution as Burma, Thailand, Malacca, Nicobar Islands, Pulu Pinang, Malaya, Philippines, and Indonesia; Lam (1924) adds the Palau Islands, citing the same two Ledermann and Raymundus collections cited in his 1919 work. Merrill (1921) cites *Villamil 315* and *Yates 30* from Papua and *Winkler 2270* from West Irian, giving the overall distribution, in his opinion, as "Burma to Malaya, the Philippines and the Moluccas". In his 1923 work he lists the following Philippine islands: Basilan, Bohol, Bongao, Cebu, Guimaras, Luzon, Masbate, Mindanao, Mindoro, Negros, and Panay, where, he says, the species is "Common in thickets and secondary forests at low altitudes". He records it also from "Burma, through Malaya to the Moluccas and the Palau Islands."

Ridley (1923) asserts that the species is common near the sea and in low woodlands inland in Singapore, Pahang, Malacca, Perak, Penang, Kelantan, Perlis, Langkawi, and the Nicobar Islands.

Dop (1935) cites unnumbered collections of Balansa from Tonkin, of

Pierre from Cochinchina, and of Couderc and Pierre from Cambodia, listing it also from Burma, the Malay Archipelago, and the Philippines. Fletcher (1938) cites the following collections from Thailand: *Bourke s.n., Collins 934 & 2065, Kerr 2991, 10577, 10666, 10740, 14171, & 17330, Lakshnakara 358, Marcan 153, 914. & 1207, Put 74, Teijsmann 5941, Vanpruk 1013,* and *Winit 411,* as well as an unnumbered Curtis collection from the Langkawi Archipelago. He lists the species from Burma, Indochina, Malaya, and the Philippines, and notes that "The above collections may contain more than one species. *Kerr 10740, 10577, Put 74, Marcan 914,* all have the ovary tufted with tawny hairs and a strongly tapering leaf base, whereas the true *villosa* has a glabrous ovary and a cuneate leaf base. The material, however, is so scanty that separation is not justified."

Burkill (1966) describes the species as "A shrub or small tree found throughout most of Malaysia; in the [Malay] Peninsula it is common." Chopra & al. (1969) encountered it in the Nicobar Islands. Voigt (1845) lists it as cultivated in the Calcutta area; in 1949 Williams found it cultivated in Zanzibar, while Sen & Naskar (1965) list it as cultivated in India. Loudon (1830) and Sweet (1830) assert that it was introduced into cultivation in England in 1818 from the "E. Indies".

Common and vernacular names reported for *Gmelina elliptica* include the following: bangana, bañgana, baster St.Marias-wortel, batoe mera, bĕlongeh, bidara, b'longoh, boea krandjaag, boelangan, boengango, boewah, boewah kerandjang, bohol, bulang, bulang gajah, bulangan, bulanggan, bulang hutan, bulang kechil, bulang kĕchil, bulbuol, bulongan, common bulang, dadiangas, danhañgas, daun kranjang, gangabard, găn tu hu, kabia lu'ang, kajoe barijang, kajoe garijang, kajoe marijang, kalngebard, kalugebard, kalúñgun, kananga woeba, kananga wuba, kang mao, kang mão, karanjam, kayo briang, kelanjan, kemandiang, kĕmandiang, kĕmandiang warèng, kerandjang, keranjang, kilanjang, kranjang, loewarang, lowarra, nóm mêo, ponranga, puhúng, pukang mata hari, radix deiparae, radix deiparae spuria, radix desparae spuria, rais Madre de Deos, saonad, sarogang salaki, St. Mariaas wortel, talauan, talūn, talúñgud, talúñgun, talungund, tanlúñgun, thawng maew, thong-maauw, tulungun, tuñgólnol, villous gmelina, waren, wareng, warèng, warèng kĕtan, wĕroeñganga, wewenganga, and wĕwĕnganga.

Heyne (1917) lists the known economic uses of the species -- its roots, wood, leaves, and fruit -- in Indonesia. Rumpf (1741) asserts that it provides the "Radix deiparae" or "Rais madre de Deos" of the Portuguese. Loureiro (1790) says of it: "Valent in doloribus articulorum, et effectibus nervorum, radix interne sumpta; folia externa applicata." It is employed in popular medicine in Cambodia. Maxwell (1906) suggests that it may have also been used as medicine for elephants. Sastri (1956) tells us that the plant is used in making poultices to treat swellings or headaches. Burkill (1966) affirms that in Malaya the plant is used to make good hedges and is also much emplcyed in native medicines, mostly as poultices, the expressed juice of the roots, applied to the head, is believed to stop the loss of hair. The drupes, when pulped and mixed with garlic and lime, are rubbed on the

body in the treatment of dropsy and rheumatism.

The leaves are boiled and rubbed on the gums to cure toothache by acting as a counter-irritant, and the fruits are employed in the same manner for the same purpose. The juice of both the roots and the leaves is applied externally to wounds. The fruit is inedible and has a bittersweet taste; the juice is made into a mucilage or paste used in making a syrup used in cases of consumption and for coughs. In some areas the skins of the fruit are made into a tasty sweetmeat.. The roasted fruit is applied to itching feet caused by prolonged standing in stagnant water. An infusion of the slightly crushed fruit is used as an eye lotion. The juice of the fruit and/or the leaves is dropped into the ear to alleviate earache and rubbed on the body in treating rheumatism.

Chopra & al. (1969) also tells us that "The plant is applied to the head to prevent loss of hair." The juice of the leaves and fruits is employed to make a cooling drink to alleviate thirst in fevers and after a miscarriage. The leaf juice is also reported to be cathartic.

König (1894) reports that in native practice the roots of this plant, in order to obtain medicinal properties, must be dug according to the direction of the compass, only those growing in a northward direction would be beneficial, the others would actually have deleterious effect! Thw Portuguese in Goa, in times past, shredded the roots with a grater or a piece of shark skin, mixed this with the urine of very small children, and rubbed it on the forehead and temples to cure headache, as well as for skin eruptions and rheumatism. In Malaya is was mixed with lime to treat swellings, and as a rubifacient to cure anemia. The wood is said to have no economic use.

Among numerous errors and inaccuracies in the literature of this species may be mentioned the following: the Lam (1924) reference in the bibliography (above) is sometimes cited as "1925", but this later date is only the titlepage date for the volume -- the page reference which concerns us here was actually published in 1924. Koorders & Valeton (1900) cite the Clarke (1885) reference to page "583", but it actually should be p. 582. They also describe the flowers as "25--35 M." long, obviously a misprint for 25--35 mm.. Clarke (1885) and Jackson (1893) cite a "*Gmelina asiatica* Wall." to Wallich's "Numerical List", no. 1818 (1831), but Wallich there definitely credits the binomial to Linnaeus.

The Fernandez-Villar (1880) reference is often cited as "Naves, Fl. Filip. 4: 159"; the S. Moore (1925) reference is sometimes credited to "Rendle" or "S. Moore in Rendle".

It is of interest to note that Beusekom & Phengkhlai encountered *Gmelina elliptica* "in poor deciduous forests and bamboo jungles in limestone areas" in Thailand, and Robinson, in Amboina, describes the species as a "tree, shrub, or woody vine, 3 m. x 8 cm., common everywhere". Also, it should be pointed out that *Gillis 11029* is said to have been collected from a plant grown from seed of *Fairchild & Dorsett 2969* from Guyana, but the latter is *G. asiatica* L., as can be seen from the *Fennell 1003* sheet, also said to have originated from the same collection.

Material of *Gmelina elliptica* has been misidentified and distrib-

uted in some herbaria as *G. asiatica* L., *G. philippensis* Cham., *G. speciosissima* G. Don, and even as *Scrophulariaceae*. On the other hand, *Lambert & Brunson 26* and *Merrill 918* are *G. elliptica* f. *lobata* (Gaertn.) Mold., *Achmad 239*, *Bakhuizen 1649*, *Clemens 286*, *Leeuwen 3124*, and *Lörsing 12957b* are mixtures of the typical form of the species and f. *lobata*, and *Gansau SAN.47802* and *Keng & al. K.6210* [field no. 142] are not verbenaceous.

Citations: JAMAICA: *Harris & Britton 10784* (N); *Kidder s.n.* [9. Mch. '85] (Ca--10749). ZAIRE: *Vermoesen s.n.* (Br). INDIA: State undetermined: *Blackburn s.n.* (T); *Kamohövener 202* [Galathea Exped. 2011/2022] (Cp, Cp, E--photo, Ld--photo, N--photo); *Roxburgh s.n.* (Br, Br); *Richard s.n.* (P); *Wallich 1816* (Cp, Cp). THAILAND: *Beusekom & Phengkhlai 498* (Ac, Ac); *Charoenmayu 415* [Herb. Roy. For. Dept. 5484] (A); *Charoelphol, Larsen, & Warncke 3428* (Ac), *4093* (Ac); *Congdon 241* (Ac); *Geesink & Santisuk 5223* (Ac); *G. W. Groff 6142* (Ca--992343, N); *Kostermans 1191* (W--2039873); *Larsen & Larsen 34046* (Ac, Ld); *Larsen, Larsen, Nielsen, & Santisuk 31806* (Ac, Ld); *Maxwell 71-312* (Ac), *75-318* (Ac), *76-470* (Ac); *Niyomdham & al. 241* (Ac); *Put 74* (Ed); *Smitinand 575* [Herb. Roy. For. Dept. 11919] (Ld); *Teijsmann 5941* (Bz--21261, Bz--21262). CAMBODIA: *B. C. Stone 9343* (Kl--12615). VIETNAM: Cochinchina: *Pierre s.n.* [Bien Loe, 2/1877] (B), *s.n.* (B, Ca--53768). State undetermined: *G. W. Groff 5694* (Ca--300177, Gg--31097). MALAYA: Johore: *M. R. Henderson 18209* (Bz--21269). Malacca: *W. Griffith s.n.* [1845] (Br). Penang: *B. C. Stone 6170* (Kl--5907). Perak: *Chin 793* (Kl--19926), *927* (Kl--19927); *Spare 36731* (Bz--21348). Selangor: *Kassim 550* (Kl--1550, Ne--33497). Singapore: *T. Anderson 134* (Pd); *Sinclair 6414* (W--2913198). Trengganu: *Soepadmo & Mahmud KLU.9138* (Kl--12933, Ne--29985). MALAYAN ISLANDS: Langkawi: *B. C. Stone 6908* (Kl--7775, Kl). Prince of Wales: *Hunter s.n.* [Herb. Roxburgh] (F--photo, Ld--photo, N--photo, Si--photo). Tioman: *B. C. Stone 11868* (Kl--19951). PHILIPPINE ISLANDS: Basilan: *DeVore & Hoover 2* (W--449552); *Salaudin, Herb. Philip. For. Bur. 31384* (N). Bohol: *R. C. McGregor, Herb. Philip. Bur. Sci. 1220* (W--439202). Bongao: *Yates, Herb. Philip. Bur. Sci. 36303* (Bz--21208). Cebu: *R. C. McGregor, Herb. Philip. Bur. Sci. 1704* (Bz--21218, N, W--439269]. Guimaras: *J. W. Ritchie, Herb. Philip. For. Bur. 38* (Bz--21212, N, W--625713). Jolo: *Kienholz s,n,*[June 1923] (Ca--262821); *Kondo & Edaño 8871* [Philip. Nat. Herb. 38839] (Bi). Luzon: *J. V. Santos 6148* (W--2246858). Masbate: *W. W. Clark, Herb. Philip. For. Bur. 1003* (N, W--627141). Mindanao: *Ahern 331* [31] (Bz--21213, W--445673), *6187* (Bz--21214); *M. S. Clemens 286* in part (Bz--21215, Mu--4100); *DeVore & Hoover 136* (W--449629); *Elmer 12013* (Bi, Bz--21216, E--118643, N, Vt, W--712136); *Escritor, Herb. Philip. Bur. Sci 21403* (W--900902); *Fénix, Herb. Philip. Bur. Sci. 15809* (Cm), *26124* (W--1293484); *Franco, Herb. Philip. For. Bur. 31523* (N); *Jacquinot s.n.* [1841] (B); *Mearns 169* (W--447506), *s.n.* [Surigao, April 20, 1904] (W--447610, W--447611); *Pascua, Herb. Philip. For. Bur. 30231* (Bz--21211, Ca--320988, N, S); *Ramos & Edano, Herb. Philip. Bur. Sci. 36850* (Bz--21209, W--1264733), *48950* (Ca--324252); *C. B. Robinson, Herb. Philip. Bur. Sci. 6692* (Bi); *C. M. Weber 1028* (Cm, W--712258); *Wilkes, U. S. Expl. Exped. s.n.* [Mindanao] (T); *R. S. Williams 3041* (N, N, Qu). Mindoro: *E. D. Merrill 914* (E--118649, N, W--435883);

Merritt, Herb. Philip. For. Bur. 9798 (Br, E--118646). Negros: *Elmer 9646* (Bz--21217, E--118647, N, W--705400); *W. D. Pierce P.280* (W--1599594). Panay: *Ramos & Edaño, Herb. Philip. Bur. Sci. 31488* (Bz--21210). Sulu: *C. Wright, Wilkes Exped. s.n.* [Sulu Archipelago] (W--40647). PALAU ISLANDS: Babeldaob: *Canfield 402* (W--2839219). Koror: *Kanehira 2068*(N). Palau: *Kanehira 2068* (W--1967159); *Shearard & Spence 82* (W--2985374). CAROLINE ISLANDS: Arekalong: *Takamatsu 1646* (N, W--2643582). Corol: *Kanehira 198*(N). GREATER SUNDA ISLANDS: Anambas: *M. R. Henderson 20147* (Ca--203934). Banguey: *Castro 35* [Castro & Melegrito 1334] (Ca--241483). Bintan: *Bünnemeijer 6532* (Bz--21256). Bohay Dulang: *Jumatin & Toyok SAN.92461* (Ld). Celebes: *Adjunct-Veearts & Gorontalo s.n.* (Bz--21227); *Boschproefst. 24* (Bz--21223); *Docters van Leeuwen 884* (Bz--21128, Bz--21129), *1750* (Ut--70620), *s.n.* (Bz--21137); *Kjellberg 18* (Bz--21235, S); *Koorders 110* [19527b] (Bz--21232), *19525b* (Bz--21234), *19526b* (Bz--21233); *Lam 2462* (Bz--21221); *Noerkas 112* (Bz--21225, Bz--21226, Ut--58006); *Pesik 24* (Bz--21222); *Posthumus 2266* (Bz--21220); *Rachmat 255* (Bz--21228); *Rensch 1441* (Bz--212001); *Teijsmann 11885* (Bz--21225, Bz--21226), *14156* (Bz--21224). Java: *Backer 1380* (Bz--21152), *2279* (Bz--21123), *3379* (Bz--21126), *4383* (Bz--21114), *7919* (Bz--21155), *11317* (Bz--21134, Bz--21135), *13971* (Bz--21111), *17206* (Bz--21112, Bz--21113), *17563* (Bz--21121), *17909* (Bz--21156, Bz--21157), *18835* (Bz--21133), *23367* (Bz--21151), *24576* (Bz--21158), *25490* (Bz--21150), *26506* (Bz--21122), *34141* (Bz--21074, Bz--21075), *34142* (Bz--21076), *34143* (Bz--21077), *34144* (Bz--21078), *34146* (Bz--21079), *34147* (Bz--21080); *Bakhuizen 391* (Bz--21072), *1116* (Bz--21104), *1188* (Bz--21095), *1649* in part (Bz--21117, Bz--21118, Ca--235322, Ca--265957, Ut--24902A); *Beumée 1731* (Bz--21199), *1880* (Bz--21089), *3473* (Bz--21094), *3486* (Bz--21140, Bz--21141), *3888* (Bz--21142), *4767* (Bz--21116), *5061* (Bz--21131), *s.n.* [1/11/1924] (Bz--21124, Bz--21125); *Boerlage s.n.* [16 Mrt. 1897] (Bz--21119); *Bruinier* (?) *208* (Bz--21130); *Buijsman 200* (Ut--11492); *Buwalda 7331* (Bz--72918); *Edeling 62* (Mi), *s.n.* (Bz--21105); *Franck 116* (Bz--21088); *Hallier 46* (Bz--21143), *s.n.* (Bz--21100); *Herb. Bot. Stockh. s.n.* (S); *Hoogerwerf 38* (Bz--21087); *Koorders 272** [28172b] (Bz--21177), *363* [9734b] (Bz--21159), *497** [25213b] (Bz--21174, Bz--25575), *894** [30361b] (Bz--21161), *1149** [20655b] (Bz--21180), *1751** [31099b] (Bz--21160), *1864** [30220b] (Bz--21181), *9735* (Bz--21172), *9736* (Bz--21173), *9737b* (Bz--21169), *11681b* [1785m] (Bz--21168), *11682b* (Bz--21170), *13491b* (Bz--21171), *14816b* (Bz--21162, Bz--21163), *21323b* (Bz--21181), *25213b* (Pd), *25502b* [426d] (Bz--21175, Bz--21176, Bz--25576), *27584b* (Bz--21164), *27601b* (Bz--21165, Bz--21166), *36772b* (Bz--21167); *Kostermans 4009* (Bz--72917); *Kuntze 4961* (N), *5304* (N); *Lörzing 667* (Bz--21128), *972* (Bz--21127), *3361* (Bz--21251), *3726* (Bz--21252); *Mascamp 35* (Bz--21073); *Mousset 443* (Bz--21153); *Noltée 4009* (Bz--21091, Bz--21092); *Reinwardt s.n.* (S); *Siebold s.n.* [Java] (Mu--740); *Slooten 231* (Bz--21101, Bz--21115); *Soegandiredjo 267* (Bz--21146, Bz--21147); *Thorenaar 188* [9] (Bz--21102, Bz--21103); *Ultée 4* (Bz--21154); *Valeton s.n.*[2 Mrt. 1905] (Bz--21120); *Wanman s.n.* (S). Kalimantan: *Kostermans 21273* (E--1830233, N); *Winkler 2270* (Bz--21064). Kangean: *Backer 26769* (Bz--21192), *27937* (Bz--21183); *Dommers 25* (Bz--21193), *210* (Bz--21184). Lingga: *Bünnemeijer 6982* (Bz--21255). [to be continued]

CHROMOSOME COUNTS FROM NEW MEXICO AND MEXICO

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The counts reported here are the result of general collecting in New Mexico and in northern Chihuahua, Mexico (see also Ward 1983a and 1983b). Most agree with previously published counts, but a few are unique and may provide clues suggesting intraspecific chromosomal variation, and the majority of them expand the cytogeographical knowledge into this area. Cytological techniques are the same as in Ward, 1983b. Vouchers are deposited at NMC with duplicates of some also in NY, TEX, MO, or UNM. The following codes for collectors are used in the listing: RJS = Robert Soreng, RWS = Richard Spellenberg and W = Darrell Ward. All collections are from New Mexico unless otherwise stated.

ACANTHACEAE Carlowrightia linearifolia (Torr.) Gray. n=18. Luna Co., Cooke Range, S of Rattlesnake Canyon. RJS & W 1764.
Elytraria imbricata (Vahl) Pers. n=11. Hidalgo Co., Skeleton Canyon, 2.5 km E of Arizona border. RWS 6303.

AIZOACEAE Trianthema portulacastrum L. n=28. Doña Ana Co., yard weed in southern Las Cruces. RWS 6233.

AMARANTHACEAE Amaranthus hybridus L. n=16. San Juan Co., roadside of NM-17, 25 km N of Farmington. RWS & W 6189.
Tidestromia lanuginosa (Nutt.) Standl. var. lanuginosa. n=10. Doña Ana Co., southern Las Cruces. W 83-025. (Possible first count for the genus.)

ASTERACEAE Artemisia frigida Willd. n=9. San Juan Co., 5 km E of NM-17, 8 km N of La Plata. RWS, W & Collyer 6168.
Aster frondosus (Nutt.) Torr. & Gray. n=8. San Juan Co., 1.5 km S of Fruitland, Navajo Coal Mine. RWS & W 7570.
Aster hesperius Gray var. hesperius. n=36. San Juan Co., southern edge of Fruitland. RWS & W 7599.
Baileya multiradiata Harv. & Gray. n=16. Doña Ana Co., NMSU campus, Las Cruces. W 80-066.
Brickellia scabra (Gray) A. Nels. n=9. San Juan Co., 16 km SE of Shiprock. RWS & W 6093.
Engelmannia pinnatifida Torr. & Gray. n=9. Guadalupe Co., northern Santa Rosa. W, RWS & RJS 81-214.
Erigeron bellidiastrum Nutt. var. bellidiastrum. n=18. San Juan Co., 8 km N of La Plata. RWS, W & Collyer 6176.

Erigeron flagellaris Gray. n=9. Sierra Co., Black Range, Diamond Creek, 18 km W of Chloride. W & Todsen 81-178.
Erigeron neomexicanum Gray. n=9. Hidalgo Co., Peloncillo Mtns., Skeleton Canyon, 2.5 km E of Arizona border. RWS 6317.
Gaillardia pinnatifida Torr. var. pinnatifida. n=17. Lincoln Co., US-54 roadside, 19 km S of Corona. W, RWS & RJS 81-273.
Gutierrezia glutinosa (Schauer) Sch. Bip. n=8. Lincoln Co., US-54 roadside, 19 km S of Corona. W, RWS & RJS 81-282.
Heterotheca horrida (Rydb.) Harms. n=18. San Juan Co., E side of hogback, 16 km SE of Shiprock. RWS & W 6096.
Heterotheca villosa (Pursh) Shinners var. villosa. n=9. Doña Ana Co., Organ Mtns., Aguirre Springs Recreation Area. W & Arsuffi 81-156.
Hymenopappus tenuifolius Pursh. n=17. Guadalupe Co., along US-54, 1 km N of Vaughn. W, RWS & RJS 81-213; and Harding Co., NM-120 roadside, 6 km W of Roy. W, RWS & RJS 81-266a.
Hymenoxys argentea (Gray) Parker. n=15. Lincoln Co., US-54 roadside, 19 km S of Corona. W, RWS & RJS 81-283.
Machaeranthera canescens (Pursh) Gray. n=4. San Juan Co., 1.5 km S of Fruitland, Navajo Coal Mine. RWS & W 7577.
Machaeranthera tephrodes (Gray) Greene. n=4. Hidalgo Co., Peloncillo Mtns., Skeleton Canyon, 3 km E of Arizona border. RWS 6323.
Malacothrix fendleri Gray. n=7. Doña Ana Co., Faulkner Canyon, 19 km NW of Las Cruces. W & RJS 83-011.
Platyschkuhria integrifolia (Gray) Rydb. var. oblongifolia (Gray) Ellison. n=12. San Juan Co., Navajo Reservation, Navajo Coal Mine, 16 km SW of Fruitland. RWS & W 7598.
Ratibida columnifera (Nutt.) W. & S. n=14. Harding Co., Kiowa National Grasslands, 13 km W of Mills. W 81-221a.
Senecio neomexicanus Gray var. mutabilis (Greene) Barkeley. n=46. Hidalgo Co., Peloncillo Mtns., Clanton Draw. RWS 5962.
Senecio riddellii Torr. & Gray. n=20. San Juan Co., 6.5 km N of La Plata. RWS, W & Collyer 6183.
Townsendia annua Beaman. n=9. Doña Ana Co., 10 km W of Las Cruces. W & Forbes 82-005.
Townsendia formosa Greene. n=9. Otero Co., Sacramento Mtns., 8 km NE of Cloudcroft. RJS, RWS & W 2031.
Viguiera longifolia (Robins. & Greenm.) Blake. n=8. Hidalgo Co., Peloncillo Mtns., Skeleton Canyon, 2.5 km E of Arizona border. RWS 6315.

BIGNONIACEAE Tecoma stans (L.) Juss. var. angustata Rehd. n=18. MEXICO, Chihuahua, 4 km W of MEX-45, 70 km S of Cd. Juarez. W & RWS 81-326b.

BRASSICACEAE Erysimum capitatum (Dougl.) Greene. n=18. Doña Ana Co., Organ Mtns., Aguirre Springs Recreation Area. RJS & W 2111.
Nerisyrenia linearifolia (Wats.) Greene. n=8. Lincoln Co., US-54 roadside, 19 km S of Corona. W, RWS & RJS 81-285.

Thelypodium integrifolium (Nutt.) Endl. var. gracilipes Robins. n=13. San Juan Co., 6 km N of La Plata, 3.5 km E of NM-17. RWS, W & Collyer 6131.
Thelypodium integrifolium (Nutt.) Endl. var. integrifolium. n=13. Harding Co., 8 km W of Mills. W 81-261.

CACTACEAE Opuntia leptocaulis DC. n= ca. 22. MEXICO, Chihuahua, 4 km W of MEX-45, 70 km S of Cd. Juarez. W & RWS 81-328
Opuntia violacea Engelm. var. violacea. n=22. Doña Ana Co., Tortugas Mtn., 3 mi E of Las Cruces. W & RWS 82-002.

COMMELINACEAE Commelina erecta L. var. angustifolia (Michx.) Fern. n=30. MEXICO, Chihuahua, 4 km W of MEX-45, 70 km S of Cd. Juarez. W & RWS 81-329.

CONVOLVULACEAE Convolvulus incanus Vahl. n=12. Harding Co., Canon Blanco, 13 km W of Roy. W, Fisher & Limerick 81-241.
Cuscuta campestris Yuncker. n=28. San Juan Co., 6 km N of La Plata along NM-17. RWS & W 6143.
Cuscuta suaveolens Seringe. n=14. Doña Ana Co., Las Cruces. W & RWS 81-167.
Ipomaea coccinea L. var. coccinea. n=15. Hidalgo Co., Peloncillo Mtns., Skeleton Canyon. RWS 6342.

CUCURBITACEAE Apodanthera undulata Gray. n=14. MEXICO, Chihuahua, 4 km W of MEX-45, 70 km S of Cd. Juarez. W & RWS 81-330. (Possible first count for the genus.)

CYPERACEAE Carex foenea Willd. n=40. Lincoln Co., White Mtns., Eagle Creek Canyon, 5.6 air km WNW of Alto. W & Arsuffi 81-092.
Eleocharis macrostachya Britt. & Small. n=8. San Juan Co., 6 km N of La Plata. RWS & W 6146.
Hemicarpha micrantha (Vahl.) Britt. var drummondii (Nees) Friedl. n=27. Hidalgo Co., Peloncillo Mtns., Skeleton Canyon, 2.5 km E of Arizona border. RWS 6302.

EUPHORBIACEAE Croton dioicus Cav. n=14. MEXICO, Chihuahua, 2 km E of MEX-45, 3 km NE of Samalayuca. W & RWS 81-321.
Euphorbia chamaesula Boiss. n=13. Sierra Co., Black Range, Taylor Canyon beside USFS-226. W & Todsen 81-190.
Euphorbia glyptosperma Engelm. n=11. San Juan Co., Navajo Reservation, Navajo Coal Mine, Cottonwood Arroyo. RWS & W 7595.
Euphorbia marginata Pursh. n=28. Harding Co., Canon Blanco, 13 km W of Roy. W, Fisher & Limerick 81-241.
Euphorbia missurica Raf. var. intermedia (Engelm.) Whlr. n=12. San Juan Co., 6 km E of NM-17, 8 km N of La Plata. RWS, W & Collyer 6172.

FABACEAE Acacia constricta Gray. n=13. MEXICO, Chihuahua, 4 km W of MEX-45, 70 km S of Cd. Juarez. W & RWS 81-327a.

Acacia neovernicosa Isley. n=13. MEXICO, Chihuahua, E of MEX-45, 8 km N of Moctezuma. W & RWS 81-332.

Acacia schaffneri (S. Wats.) Herm. var. bravoensis Isley. n=13. MEXICO, Chihuahua, E of MEX-45, 8 km N of Moctezuma. W & RWS 81-335.

Astragalus hallii Gray var. fallax (Wats.) Barneby. n=11. Grant Co., Mogollon Mtns., USFS-147, 11 km NNW of Buckhorn. RJS & W 2142.

Astragalus praelongus Sheld. var. praelongus. n=11. Mora Co., NM-120 roadside, 10 km E of Wagon Mound. W, RWS & RJS 81-270.

Cassia roemeriana Scheele. n=14. Guadalupe Co., 15 km N of Cuervo. W, RWS & RJS 81-217.

Dalea jamesii (Torr.) Torr. & Gray. n=7. Grant Co., Mogollon Mtns., USFS-147, 11 km NNW of Buckhorn. RJS & W 2139.

Lotus humistratus Greene. n=7. Grant Co., Mogollon Mtns., Little Dry Creek, 16 km SE of Glenwood. RJS & W 2136.

Lupinus laetus W. & S. n=24. Lincoln Co., 13 km SSW of Cloudcroft along USFS-64. W & Weems 83-021

Rhynchosia texana Torr. & Gray. n=ca. 11. Catron Co., Mogollon Mtns., Sheridan Gulch, 10 km SE of Glenwood. RJS & W 2127. All meiotic chromosomes sets seen had extreme stickiness.

Vicia exigua Nutt. ex Torr. & Gray. n=7. Doña Ana Co., Organ Mtns., 18 km E of Las Cruces. W & RJS 82-008a.

GENTIANACEAE Centaurium texense (Griseb.) Fernald. n=21. Otero Co., White Sands National Monument. RJS & RWS 2107

GERANIACEAE Geranium caespitosum Jones. n=26. Doña Ana Co., Organ Mtns., Aguirre Springs Recreation Area. W & Arsuffi 81-157.

HYDROPHYLLACEAE Eucrypta micrantha (Torr.) Heller. n=6. Doña Ana Co., Robledo Mtn., 17 km NNW of Las Cruces. W & RJS 83-002.

Nama hispidum Gray var. mentzelii Brand. n=7. MEXICO, Chihuahua, 65 km N of Cd. Chihuahua. W & RWS 81-343.

Phacelia bombycina W. & S. n=11. Grant Co., Mangas Springs, 23 km NW of Silver City. W & Salazar 82-011.

LAMIACEAE Monarda menthaefolia Graham. n=18. Lincoln Co., White Mtns., 5 km WNW of Alto. W, RWS & RJS 82-036.

Salvia henryi Gray. n=14. NM, Doña Ana Co., N end of Robledo Mtn., 18 km NW of Las Cruces. RWS & RJS 7007.

LILIACEAE Allium cernuum Roth var. obtusum Cocke. n=7. Lincoln Co., White Mtns.., 5 km WNW of Alto. W, RWS & RJS 82-037.

Allium macropetalum Rydb. n=7. Doña Ana Co., Organ Mtns., 21 km E of Las Cruces. RWS & Singer 5956.

LINACEAE Linum aristatum Engelm. n=15. MEXICO, Chihuahua, 1 km E of MEX-45, 3 km NE of Samalayuca. W & RWS 81-323.

Linum puberulum (Engelm.) Heller. n=16. San Juan Co., 8 km N of La Plata. RWS, W & Collyer 6171.

LOASACEAE Mentzelia pumila (Nutt.) Torr. & Gray. var. pumila. n=9. Lincoln Co., US-54 roadside, 19 km S of Corona. W, RWS & RJS 81-285.

MALVACEAE Abutilon sonorae Gray. n=7. Hidalgo Co., Peloncillo Mtns., Skeleton Canyon, 2.5 km E of Arizona border. RWS 6294.

Sida abutifolia Müller. n=7. MEXICO, Chihuahua, just E of MEX-45, 5 km N of El Sueco. W & RWS 81-339; and Doña Ana Co., US-70 roadside, 1 km W of Organ. RWS & RJS 6200. (This second report is a correction (brought to attention by P. Fryxell, personal communication) of information listed as Sida filicaulis in Ward, 1983b. Chromosomal stickiness made determination uncertain.)

Sphaeralcea coccinea (Pursh) Rydb. var. elata (Baker f.) Kearney. n=10. Grant Co., Mangas Springs, 29 km NW of Silver City beside US-180. RJS & W 2115.

Sphaeralcea digitata (Greene) Rydb. var. digitata. n=5. Doña Ana Co., northern end of Robledo Mtn., 18 km NW of Las Cruces. RWS & RJS 7010.

Sphaeralcea laxa W. & S. n=10. Catron Co., Mogollon Mtns., 10 km SE of Glenwood. RJS & W 2122.

Sphaeralcea leptophylla (Gray) Rydb. n=10. Grant Co., City of Rocks State Park, 30 km NW of Deming. RJS & W 2154.

OROBANCHACEAE Conopholis mexicana Gray. n=20. Lincoln Co., White Mtns., northern Ruidoso. W 82-034.

PLANTAGINACEAE Plantago purshii R. & S. var. picta (Morris) Pilg. n=6. Hidalgo Co., Peloncillo Mtns., Geronimo Trail road 2.5 km W of junction with NM-338. RWS 5961.

POLEMONIACEAE Gilia ophthalmoides Brand var. australis A. & V. Grant. n=18. Doña Ana Co., Lookout Peak, 17 km N of Las Cruces. RWS & RJS 7008; and 18 km NNW of Las Cruces. W & RJS 83-004.

Gilia subnuda Torr. ssp. subnuda. n=9. San Juan Co., 6.5 km N of La Plata, 1 km W of NM-17. RWS, W & Collyer 6137.

Ipomopsis longiflora (Torr.) V. Grant. n=7. Lincoln Co., US-54 roadside, 34 km S of Carrizozo. W, RWS & RJS 81-209; and San Juan Co., 6 km N of La Plata. RWS & W 6155.

Polemonium foliosissimum Gray var. foliosissimum (Gray) Anway. n=9. Lincoln Co., White Mtns., Eagle Creek Canyon, 5.5 km WNW of Alto. W et al. 81-204.

POLYGONACEAE Eriogonum hookeri S. Watson. n=20. San Juan Co., Navajo Reservation, Navajo Coal Mine, Cottonwood Arroyo. RWS & W 7596.

Eriogonum scabrellum Reveal. n=20. San Juan Co., Navajo Reservation, Navajo Coal Mine. RWS & W 7594.

RHAMNACEAE Condalia warnockii Johnston. n=24. MEXICO, Chihuahua, 3 km S of Samalayuca, 1 km E of MEX-45. W & RWS 81-324.

RUBIACEAE Hedyotis nigricans (Lam.) Fosb. var. rigidiuscula (Gray) Shinners. n=11. Guadalupe Co., 1 km N of Vaughn. RWS, RJS & W 6076; and W, RWS & RJS 81-212.

RUTACEAE Thamnosma texana (Gray) Torr. n=9. Doña Ana Co., Robledo Mtn., 18 km NNW of Las Cruces. W & RJS 83-019. (Possible first count for the genus.)

SAXIFRAGACEAE Fendlerella utahensis (Wats.) Heller. n=13. MEXICO, Chihuahua, N end of Sierras de las Candelarias, 70 km S of Cd. Juarez. RWS 6089.

SCROPHULARIACEAE Castilleja integra Gray. n=24. Hidalgo Co., Peloncillo Mtns., Clanton Canyon, 4 km E of NM-AZ border. W & Salazar 82-026.

Castilleja mexicana Hemsl. n=12. MEXICO, Chihuahua, 50 km N of Cd. Chihuahua, just W of MEX-45. W & Worthington 81-347.

Maurandya wislizenii Engelm. n=12. MEXICO, Chihuahua, 2 km E of MEX-45, 3 km NE of Samalayuca. W & RWS 81-320.

Mimulus glabratus H.B.K. n=30. Grant Co., Mangas Spring, 27 km NW of Silver City. W and Salazar 82-013.

Mimulus guttatus D.C. n=14. Doña Ana Co., Organ Mtns, 18 km E of Las Cruces. W & RJS 82-008.

Penstemon ambiguus Torr. n=8. Luna Co., US-70 roadside, 2 km E of Akela. RWS 6350.

Penstemon barbatus (Cav.) Roth ssp. torreyi (Benth.) Keck. n=8. Harding Co., grasslands, 8 km W of Mills. W et al. 81-255.

VALERIANACEAE Valeriana arizonica Gray. n=8. Lincoln Co., Eagle Creek Canyon, 6.4 km WNW of Alto. W et al. 81-028.

Valeriana edulis Nutt. n=32. Lincoln Co., White Mtns., Eagle Creek Canyon, 11 km NW of Ruidoso. RJS, RWS & W 2029, and Karr Canyon, 10 km SW of Cloudcroft. W & Weems 83-022.

VERBENACEAE Verbena bracteata Lag. & Rodr. n=7. Guadalupe Co., limestone bluffs, 0.8 km N of Vaughn. W, RWS & RJS 81-210.

Verbena perennis Wooton. n=7. Guadalupe Co., limestone bluffs, 0.8 km N of Vaughn. RWS, RJS & W 6077.

ZYGOPHYLLACEAE Peganum mexicanum Gray. n=12. MEXICO, Chihuahua, justE of MEX-45,16 km S of Villa Ahumada. W & RWS 81-331.

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Ward, D. 1983a. IN Löve, A. IOPB Chromosome Number Reports - LXXX. Taxon 32(3): 510-511.

Ward, D. 1983b. Chromosome counts from New Mexico and southern Colorado. Phytologia 54: 302-308.

BOOK REVIEWS

Alma L. Moldenke

"TEXAS WILDFLOWERS - A Field Guide" by Campbell & Lynn Loughmiller, xiii & 271 pp., 381 color photo., 13 multi-fig. glossary & text & 1 map. University of Texas Press, P. O. Box 7819, Austin, Texas 78712. 1984. $19.95 clothbound, $10.95 paperbound.

For over three decades this photographer-naturalist-author couple has dedicatedly and exquisitely photographed thousands of the wild flowers of their state. Over 300 mostly herbs along with a few shrubs, woody vines and trees have been arranged alphabetically by family and within each by scientific name. Common names, descriptive text and beautiful photographs are provided. The authors add "the area where each flower was photographed" and the general range "to show approximate boundaries within which a species grows". There purposely is no key, but repeated page-thumbing is a gratifying experience. The Texas lantana is now known as *L. urticoides* as the plant to which the name *L. horrida*, used in the book, is more truly applied, with is very spiny and densely white-hirsute stems, grows naturally only south of our border. Part of the sales proceeds of this fine book will go to help support the new Natural Wildflower Research Center in Austin.

"THE BLACK WIDOW SPIDER" by Raymond W. Thorp & Weldon D. Woodson, xii & 222 pp., 22 b/w photo. & 1 draw. Dover Publications Inc., New York, N. Y. 10014. 1976. $3.50 paperbound.

This is an unabridged, many times replicated copy of "Black Widow; America's Most Poisonous Spider" from the University of North Carolina Press, 1945. It surveys the legend and lore of poisonous spiders including this *Latrodectus mactans*, its scientific classification, life cycle, diet, web-building and home sites, world-wide distribution, control, and the varying effects on the humans it bites. The amount of venom voluntarily injected and the victim's health determine the intensity of the adverse symptoms up to and including death. Drop for drop its venom is much more poisonous than that of the rattlesnake or cobra. Since the original publication of this book some progress has been made in antivenin production and in the destruction of some favorite habitats by the replacement of the outhouse by modern indoor bathrooms. The book reads easily and interestingly.

"GORILLAS IN THE MIST" by Dian Fossey, xxiii & 326 pp., 24 color photo., 75 b/w photo., 57 fig., 4 tab. & 4 maps. Houghton Mifflin, Boston, Massachusetts 02108. 1983. $19.95.

Some of these meticulously related life stories of the mountain gorilla are known to most of our readers from reports in the National Geographic, television programs and illustrated nature and travel lectures. They should be extra appreciative of this very reasonably priced book covering the thirteen years of field observations by the fine scientist-author. The "mist" is on the Virunga mountains: first on Mt. Mikeno where George Schaller did his studies and second on Mt. Visoke after political upheaval made work there too adventurously perilous. There are many fine illustrations as well as end-cover drawings of several known ape faces with their distinctive noseprints. Informative appendices list the plants utilized by the gorilla study groups, the census findings, the mapped ranges of the study groups, their vocalizations, autopsy findings and parasitology research. There are only 242 of these animals left at the last count and none surviving in zoos. This is half the number reported by Schaller earlier in the century.

"THE FACTS ON FILE DICTIONARY OF ARCHAEOLOGY", edited by Ruth D. Whitehouse, v & 597 pp., 43 b/w fig.. & 9 tab. Facts on File Publications, New York, N. Y. 10016. 1983. $24.95.

"Archaeology today is both a popular subject.....and a flourishing professional discipline.....Because the subject editors and other contributors are all professional archaeologists at the front of their respective fields, the Dictionary incorporates a body [over 3500 entries] of up-to-date information which should be useful to students and to scholars in areas outside their own specializations. However, because the language is where possible non-technical, this information is accessible also to the non-specialist." Truly, the language is lucid with one of the clearest explanations of the nature and use of carbon dating that I have seen in print. There is considerable cross-referencing. The scope is worldwide..

"THE PHYSICIANS' AND PHARMACISTS' GUIDE TO YOUR MEDICINES" compiled by the United States Pharmacopeial Convention, Inc., xx & 521 pp. Ballantine Books of Random House, New York, N. Y. 10022. 1982. $9.95 paperbound.

Since the readers of this journal have both an aroused curiosity about almost all things biological and since probably most of them, their family members, or friends, are on medication of one sort or another, perusing this publication will probably prove most interesting and may provide helpful amplification of their doctor's directions. The information herein presented has been prepared by the same organization that "sets the official standards of strength, quality, purity, packaging, and labeling for medical products used in the United

States." For the hundreds of medications included there are given generic, brand names, forms, manner(s) of administration, proper uses, precautions and possible side effects. The material is all logically presented and makes a handy home reference.

"VEGETATIONSÖKOLOGISCHE GRUNDLAGEN DER VIEHWIRTSCHAFT IN DEN ÜBERSCHWEMMUNGS-SAVANNEN DES RIO YACUMA (Departamento Beni, Bolivien)" by Stephan Beck in DISSERTATIONES BOTANICAE, Band 80, ix & 214 pp., 44 tab., 33 fig., 12 b/w photo. & 4 maps. J. Cramer Verlag, FL-9490 Vaduz, West Germany. 1983.

Brief abstracts in English, Spanish and German report a phyto-sociological classification of the more than 30 herbaceous and shrub-by vegetation types found on a large lowland Bolivian cattle ranch. Exclusive of gallery forest vegetation (not of interest to the cattle), over 400 plant species were identified, typed and noted as to grazing potential, human use, fire susceptibility, soil texture and drainage control (60--90% of the land is annually inundated). The botanical studies herein reported are very carefully done. The illustrative materials are helpful additions and the many tables organize the information effectively. The author gives his Bolivian headquarters address as Instituto de Ecologia, Convenio UMSA-Göttingen, Cajon Postal 20127, La Paz, as another source for the procurement of this publication.

"GUIDE TO THE PRICES OF ANTIQUARIAN AND SECONDHAND BOOKS 1979--1982 Flowering Plants" compiled by L. Vogelenzang, xiv & 760 pp. Boerhaave Press, P. O. Box 1051, 2302 Leiden, Netherlands. 1983. Dfl. 85.

This valuable and unique publication shall surely prove of great assistance to college and university botany departments, to libraries of botanical institutions and research stations and to botanists who enjoy collecting or need access to certain publications not locally available. Over 8,000 titles of books, monographs, reprints, floras and fine illustrated botanical and natural history works are herein catalogued from over 70 secondhand and antiquarian listed dealers from all over the world except Russia. Bibliographic details are recorded for each publication, such as author(s), edition, pages, figures, and plates. The I.S.B.N. listing for this publication is 90 70153 17 3. Prices are given in Deutschmarks and U. S. dollars. What a tremendous job this librarian of the Rijksherbarium in Leiden has performed in preparing this book!

"DIAGNOSIS OF MINERAL DISORDERS IN PLANTS Volume I Principles" by C. Bould (deceased), E. J. Hewitt & P. Needham, 174 pp., 94 color pl., 9 b/w pl., 14 tab. & 26 fig. Chemical Publishing Co., Inc., New York, N. Y. 10011. 1984. $50.00.

This study owes much to Dr. T. Wallace, his followers at the Long Ashton Research Station of the University of Bristol and the editions of his "Diagnosis of Mineral Deficiencies in Plants by Visual Symptoms". This new book is "aimed to inform at an appropriate level, advisers, final year students, graduates with an interest in plant nutrition and well informed farmers and growers.....how nutrient deficiencies can give rise to characteristic visual symptoms, methods of diagnosing mineral deficiencies and the treatment of mineral disorders in the field." The text is carefully prepared and reads well. The many color illustrations of plants with a great range or single and combined mineral deficiencies more than supplement the text. The last chapter provides treatment for these mineral deficiencies in the field.

"DIAGNOSIS OF MINERAL DISORDERS IN PLANTS Volume 2 Vegetables" by Alan Scaife & Mary Turner, 96 pp., 230 color photo., 7 b/w photo., 3 tab. & 3 fig. Chemical Publishing Co., Inc., New York, N. Y. 10011. 1984. $62.50.

This volume is obviously devoted to field vegetables; future volumes will cover glasshouse crops, fruits and forage crops. Many of the excellent, clear photographs that contrast healthy with minerally deprived plants or their parts were provided by Philip Wood of the National Vegetable Research Station in Wellesbourne. They and the associated text provide valuable source material for identification and treatment purposes for the advanced student, research worker and farmer. This is surely going to be a highly important set of publications.

"FUNDAMENTALS OF PLANT PATHOLOGY" Second Edition by Daniel A. Roberts & Carl W. Boothroyd, xvi & 432 pp., 90 b/w photo., 32 fig. & 22 tab. W. H. Freeman & Co., New York, N. Y. 10010. 1984. $29.95,

Over a decade ago I evaluated the first edition as "definitely one of the better phytopathology texts" and I do the same for this new edition with its increased coverage of control of causative agents and of epidemiology and with its good new illustrations, fine new tables and updated references. I especially appreciate its helpful logical organizational plan of presenting basic principles first and then the grouped specific diseases illustrative of these principles, emphasizing the diseased plant à la McNew rather than the specific symptoms. I believe that this is the most effective way for organizing at least the first course in this field. A couple of words are misspelled. Dr. Dodge, of *Neurospora* fame, is given a wrong initial, and bacteria are given both their modern classification in Kingdom *Protokaryotae* and a few pages later as plants.

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DIAGNOSES OF SOME NEW TAXA OF HEPATICAE

Rudolf M. Schuster
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In several recent papers dealing with classification of the Hepaticae (Schuster, 1979, 1984) a number of new taxa of liverworts are dealt with at several distinct levels -- in most cases only in outline classifications or in synopses of groups. No opportunity existed in these cases to validate new taxa; the following Latin diagnoses are intended to provide the needed validation.

The conceptual bases for these groups are dealt with here rather briefly. They will be treated in more detail in the forthcoming treatment of the Hepaticae for Engler & Prantl, Die Natürlichen Pflanzenfamilien. In some instances only the barest minimum Latin diagnosis is given; fuller diagnoses, in English, will appear elsewhere.

1. METZGERIALES:

Pallaviciniineae Schust., subord. n. Subordo similis Blasiineis et Metzgeriineis capsulis ovoideis ad cylindricas; a Blasiineis differens ut squamae lamellatae ventrales nullae et capsula 2 valvas habet; a Metzgeriineis differens ut gametangia dorsalia et per squamas laciniaeve protecta. Type. Pallaviciniaceae.

The Pallaviciniineae appear to be sharply defined by the combination of (a) ellipsoidal to cylindrical capsules, typically opening by 2 slits, the valves coherent at the apices; (b) gametophyte often vascularized; (c) an elaterophore usually not distinct.

In addition to the type family Pallaviciniaceae, two small families appear to belong here: Sandeothallaceae (Schust.) Schust. (with only Sandeothallus) and Makinoaceae Nakai (with Makinoa Miyaki and, probably, Verdoornia Schust.).

Subfam. Podomitrioideae Schust., subf. n. Subfamilia ab aliis subfamiliis Pallaviciniacearum distincta (a) ramis gametangialibus abbreviatis, et ♂ et ♀ ramis longitudine determinatis, distincta etiam gynoeciis acrogynosis. Type. Podomitrium Mitt., an austral genus with only 2 or 3 species.

The Podomitrioideae differ from all other Pallaviciniaceae in the highly reduced latero-ventral, intercalary, gametangial branches. The ♀ branch exhibits a radial or nearly radial organization and an acrogynous condition; even if there is no fertilization, the gynoecium remains terminal. The ♂ branch is also determinate in length and the antheridia occur in 2 rows, somewhat sunken in dorsal alveoli; no discernible lamelliform scales are developed (cf. Schuster, 1984, fig. 42).

Makinoaceae subf. Verdoornioideae Schust., subf. n. Subfamilia a subf. Makinoaceis differens ut (a) antheridia dispersa, in thallo singulatim depressa, differens etiam (b) guttae olei magnae, paucae in cellula. Type. Verdoornia Schust. (Schuster, 1964).

The sessile, short archegonia, with many cell rows in the highly abbreviated and hardly distinct neck are an unusual feature of Verdoornia. By contrast, in Makinoa archegonia are "normal," flask-shaped, with, typically, 5 cell rows in the elongated neck (cf. Renzaglia, 1982, figs. 325, 329-31; Schuster, 1984a, fig. 28:8). This suggests that perhaps a familial segregation between the two genera is appropriate. However, in order to avoid too many monogeneric families in the Metzgeriales, this procedure is, for the moment at least, not adopted.

The subfamily name Verdoornioideae first appears in Schuster (1966).

Subord. Blasiineae Schust., subord. n. Subordo a subordinibus propinquis Metzgeriineis et Pallaviciniineis differens ut (a) duae series squamarum ventralium planarum, etiam (b) gemmae pluricellulares praesentes, etiam (c) organa sexualia dorsalia et in cavis thalli depressa. Type Family. Blasiaceae Klinggr.

The Blasiineae, with the single family Blasiaceae, are strikingly isolated from other Metzgeriales -- including in the ulstrastructure of the antherozoid. Both known genera are unique in the presence of specialized auriculate ventral appendages, domatia, which shield colonies of Cyanophyta.

Subord. Hymenophytineae Schust., subord. n. Subordo Metzgeriineis similis(et a omnibus subordinibus Metzgerialium insignis) ut rami gametangiales determinati reductique; a Metzgeriineis indignis ut fila ducentia thalli distincta, insignis necnon ut divisio distincta inter systema geotropicum organorum rhizoideorum et frondes dichotomas erectas. Type Family. Hymenophytaceae Schust. (1964). Type. Hymenophytum Dumort., the only genus, with 2 species.

The Hymenophytineae represent a unique end point in evolution in the Metzgeriales, the creeping, rhizoidous and "root"-bearing rhizomes plus erect, stipitate, megaphyll-like "fronds" simulating small Hymenophyllum spp. Although the reduced gametangial branches + vascularized thallus suggest the Podomitrioideae, the capsule and its anatomy (cf. fig. 48:1-2, 5 in Schuster, 1984) preclude any close affinity to the Pallaviciniaceae.

2. JUNGERMANNIALES:

Grolleaceae (Solari) Schust., fam. n. Familia Trichocoleaceis s. lat. atque (?)Antheliaceis cognata praecipue isophyllia; ab utraque familia insignis per (a) inopiam totam perianthii coelocaulisque, et

(b) inopiam totam ramorum terminalium ullius generis. Type. Grollea Schust.

Although sometimes placed, by others, in the Antheliaceae, Grollea is fundamentally distinct from this family in (a) lack of terminal branches; (b) lack of any trace of perianth or coelocaule; (c) the anatomy of the capsule wall; (d) apparently 6-seriate neck of the archegonium.

Gymnomitriaceae subf. Eremonotoideae Schust., subf. n. Familia ab aliis subfamiliis Gymnomitriacearum insignis per perianthium distinctum, emergens, plus minusve compressum, et per cellulas in foliis valde dimorphicas. Type. Eremonotus Kaal. ex Pears.

Eremonotus is a unique monotype. Its affinities to the other Gymnomitriaceae are indicated chiefly by: (a) presence of a larger-celled, unistratose, cortical layer of the axis; (b) dimorphic cells, which, much as in Prasanthus, consist of some lacking oil-bodies, while others bear 1(2) large oil-bodies.

Gymnomitriaceae subf. Stephanielloideae Schust., subf. n. Subfamilia ab aliis subfamiliis Gymnomitracearum insignis (a) per folia anticaliter assurgentia, echlophyllosa; et (b) per faciem anticalem axis numerosa paraphyllia chlorophyllosa habentem. Type. Stephaniella Jack.

The position of Stephaniella in Gymnomitriaceae is indicated chiefly by the fact that lateral merophytes interlock along the dorsal stem midline. In other respects the genus is totally isolated. The sporophyte, and its anatomy, need investigation.

Scapaniaceae subf. Douinioideae Schust., subf. n. Subfamilia a subf. Scapanioideis distincta (a) elateribus in una spira apparentibus, et (b) foliis cuticula ceracea obtectis, et (c) foliis obtuse complicatis, numquam carinatis. Type. Douinia (Jens.) Buch.

The Douinioideae include a single species whose position has been, and remains, controversial. It has been placed into both "Sphenolobus" (Lophozioideae) or into Diplophyllum (Scapaniaceae). The leaf form is relatively primitive; elaters are specialized. Consequently the genus does not stand in a linear relationship to any other. It is, i.a., ecologically different from Diplophyllum, none of whose species are ever epiphytic -- the normal mode of occurrence of Douinia.

Blepharidophyllaceae Schust.

Clandarium (Grolle) Schust., gen. n. [Basionym. Blepharidophyllum subg. Clandarium Grolle, J. Hattori Bot. Lab. 28:65, 1965]. Type. Clandarium clandestinum (Mont.) Schust. [Basionym. Plagiochila clandestina Mont., Ann. Sci. Nat., Bot., Ser. 2,19:247, 1843]. Also here are C. xiphophyllum (Grolle) Schust., comb. n. [Basionym. Blepharidophyllum xiphophyllum Grolle, J. Hattori Bot. Lab. 28:65, 1965] and C. gottscheanum (Grolle) Schust., comb. n. [Basionym. B. gottscheanum Grolle, ibid. 28:69, 1965].

Clandarium is strongly distinct from Blepharidophyllum s. str. in (a) the nonspathulate, carinate leaves, much more deeply (to 0.65-0.8 bifid) lobed; cells evenly thick-walled; (b) plants reproducing by gemmae, the gemmiparous shoots erect, developing underleaves.

Balantiopsidaceae subf. Isotachidoideae Schust. subf. n. Subfamilia a subf. Balantiopsidoideis insignis (a) foliis noncomplicatis, (b) perianthia, aut eius vestigiis, ad apicem perigynii erecti, plus minusve distincti sito. Type. Isotachis Mitt.

The Isotachis complex was first recognized as a family by Schuster (1957) and later by Hatcher (1960-61), but is better treated as a mere subfamily of Balantiopsidaceae Nakai.

Mastigophoraceae Schust. The single genus Mastigophora Nees is divisible into two distinct subgenera, Mastigophora s. str. and:

Eomastigophora Schust., subg. n. Subgenus a subg. Mastigophora distinctum ut (a) folia subtransverse orientia, plus minusve symmetrice 4-lobata tamquam in Chandonanthus subg. Tetralophozia reperta, atque (b) amphigastria semper bifida tamquam in C. subg. Tetralophozia. Type. M. caledonica Steph.

Eomastigophora shows some primitive traits (mature leaves in large part subsymmetrically, deeply quadrifid) linked with one advanced feature (underleaves only about half the size of lateral leaves, always bifid). The only extant illustration of the taxon is in Schuster (1984, fig. 73:1-4).

Jubulopsidaceae (Hamlin) Schust., fam. n. Familia Lepidolaenaceis capsulis rostratis cognata, distincta, autem, ut (a) elateres 1-spirales, (b) amphigastria plana, numquam sacca aquaria efficientia, atque (c) cellulae epidermales membranae capsulae incrassationes ad angulos nodulosos, Frullania-formes praebentes. Type. Lepidolaenaceae subf. Jubulopsidoideae Hamlin, J. Hattori Bot. Lab. 37:173. Type. Jubulopsis Schust.

Anatomy of the capsule wall is much more like that of Frullania

than of any other taxon in the Lepidolaenineae and seems to confirm the relationships drawn (Schuster, 1966, 1970) between Porellineae and Lepidolaenineae.

Radulaceae (Dum.) K. Müll.

The family includes a single genus Radula Dum., which is divisible into four subgenera, of which Metaradula Schust. (Schuster, 1980b) is new; it has not been validated; the validation follows:

Radula subg. Metaradula Schust., subg. n. Subgenus subg. Odontoradulae cognatum praesentia perigynii tubularis, pinguis, rigidi, stipitormis, typi Isotachis sub perianthium siti; ab Odontoradula distinctum lobis foliarum rotundatis atque unico pari ♀ bractarum. Type. Radula buccinifera (Tayl.) Tayl.

In subg. Metaradula we find exactly the same kind of stalked paragynoecial "apparatus" as in Radula subg. Odontoradula: a fleshy, terete, stalklike base + a basally tubular, distally compressed, narrow perianth (cf. fig. 79 in Schuster, 1984). The fleshy base, derived from axial tissue, constitutes an Isotachis-type perigynium.

Lepidoziaceae Limpr.

This large, complex family is divided into 5-6 families (Fulford, 1968), which are inadequately based. In Schuster (1984, pp. 1023-26) 8 subfamilies are accepted, which, conceptually have nothing in common with the Fulford families. Two of the subfamilies are new:

Drucelloideae (Bosen) Schust., subf. n.[Basionym. Lepidozioideae tribe Drucelleae Bosen, Lindbergia 8:78, 1982]. Type. Drucella Hodgs. Bosen (l.c.) has added one relevant fact to the earlier detailed account in Schuster (1980a): the epidermal capsule wall cells bear nodular thickenings of all longitudinal walls, hence have a "one-phase" ontogeny. The Bosen illustration (fig. 7:4) unfortunately fails to show any trace of cell walls, hence the dimensions and form of the epidermal cells cannot be deduced. The genus, formerly assigned, albeit with a question mark, to the Lepidozioideae (Schuster, 1969, p. 11), seems distinct from this in the (a) one-phase development of epidermal cells of the capsule wall; (b) incubous leaves with insertion leaving 2 cell rows free, dorsally; (c) lack of terminal branches; (d) presence of mere oil-droplets, as distinct from oil-bodies, in leaf cells.

Neogrolleoideae Schust., subf. n. Subfamilia Lembidioideis similis ut folia ± transversa, ad apicas vadose lobulata, non profunde lobata; distincta (a) praesentia pigmentorum ferrugineorum in membrana, atque (b) trigonis nodosis, atque (c) androeciis antheridia in bracteolis habentibus. Type. Neogrollea Hodgs.

Although placed in the Lembidioideae in Schuster (1972), because of its isolation Neogrollea was emphasized as being a "puzzling" and "relict" monotype, without clear affinities to other genera. As such, its isolation is best expressed by placing it into its own subfamily, allied to but distinct from the Lembidioideae.

Neogrollea was recollected in 1984. Living plants clearly show that there are a few, very large, botryoidal oil-bodies per cell. This feature is a significant additional criterion separating Neogrollea from all genera of the Lembidioideae.

Lejeuneaceae Cavers

The ca. 75 genera of this family remain, in many cases, inadequately investigated. Infrageneric classification of many taxa remains a puzzle. The following covers only a few of the extant problems:

Stictolejeunea (Spr.) Schiffn. Although including only some 6-7 species, the genus is very heterogeneous and is divisible into two subgenera, one with two sections, as follows:

Subg. Stictolejeunea
Sectio Stictolejeunea. Type. S. squammata.
Sectio Macrocellaria Schust., sect. n. Sectio a sect. Stictolejeunea differens ut (a) cellulae leptodermatae, trigonis grossis, autem, praeditae, et magnae (cellula media ca. 18 x 18-25 μ); (b) ocelli permagni, dimorphici; duo basales ad 25 x 45 μ bini, laminis solum ca. 4-6 ocellos sparsos habentibus; ocelli defuncti fusco-brunnei. Type. S. herzogii Buchloh.

Subg. Leptostictolejeunea Schust., subg. n. Differta a subg. Stictolejeunea (a) papilla lobulorum marginalis; (b) cellulae corticalis 12-seriatibus; (c) rami nonsexualis Lejeunea-typus. Type. S. iwatsukii Mizutani; here also S. richardsii Herz. and S. africana V. Berghen.

Differing from subg. Stictolejeunea in (a) lobular hyaline papilla inserted marginally, at base of apical tooth; (b) cortical cells in only ca. 12 rows, not in 2-3 strata, the stem only 5-6 cells high; (c) lobules of leaves ovoid, with orifice turned toward lobe apex; (d) vegetative branches all Lejeunea type.

Leptolejeunea (Spr.) Schiffn. In addition to the typical subg. Leptolejeunea, two other subgenera appear necessary for highly deviant species, as follows:

Subg. Leptosticta Schust., subg. n. Subgenus a subg. Leptolejeunea differens ut (a) ocelli per lobum dorsalem sparsi (saepe etiam 1-2 in cellulis marginalibus) saepe, autem, 2-3 in basi lobi aggregati; alii ocelli in lobula amphiastriisque sparsi; ocelli, in plantis siccatis

brunnei-rubri ad atrorubros, (b) plantae rigidae, arcte adnatae dum siccatae aut madidae, atque (c) cellulae ubique leptodermaticae sine trigonis. Type. L. amphiophthalma Zwickel (Ann. Bryol. 6:117, 1933); a synonym of L. picta Herz., Flora 35:430, 1942.

All true species of Leptolejeunea (e.g., subg. Leptolejeunea) have colorless ocelli; these are confined to dorsal lobes of leaves (and ♀ bracts). In Leptosticta ocelli are often dull red-brown to rust-red, much as in the unrelated Pictolejeunea Grolle; they occur not only in the lobes, but also in lobules and underleaves, much as in Lepidolejeunea Schust., to which there is also no clear affinity. Perhaps deserving of treatment as an autonomous genus.

Subg. Asticta Schust., subg. n. Subgenus a subg. Leptolejeunea differens ut (a) ocelli nulli, (b) lobi amphigastriorum biseriati in ca. 3 stratis basalibus, uniseriati solum disaliter, ca. 6 cellulis longi, atque (c) plantae siccatae virides, arcte appressi colentes. Type. L. anophthalma Zwickel (Ann. Bryol. 6:116, 1933).

Like subg. Leptosticta, subg. Asticta forms an anomalous element within Leptolejeunea. I once believed that perhaps this entity fitted better into Rhaphidolejeunea Herz., but the species of that genus have, at the least, one conspicuous basal ocellus, lobules with a distinct, often hooked, 1-celled apical tooth, and relatively evenly thick-walled leaf cells. In Asticta, however, no ocelli at all appear distinct; lobules -- as in subg. Leptolejeunea -- have a low, blunt apical tooth (compare, e.g., fig. 3:i in Zwickel, 1933 with Schuster, 1980, fig. 752:1); leaf cells have strong, nodulose trigones and intermediate thickenings, although toward the leaf bases these tend to be confluent. Unfortunately known only sterile; when fertile material is discovered Asticta may need to be elevated to generic rank.

3. MARCHANTIALES:

Marchantiaceae (Bisch.) Endl. The family was divided into two subfamilies in an outline classification in Schuster (1979, p. 78); additional study suggests that a division into three subfamilies would be better, as follows:

Subf. Marchantioideae: Marchantia Marchant f., Preissia Cda.

Subf. Dumortieroideae Schust., subf. n. Subfamilia Marchantioideis similis ut et ♂ et ♀ receptacula stipitata, stipibus, autem, semper satis brevibus; distincta ut (a) filamenta chlorophyllosa, si adsunt, ad vestigia ex 1(2) cellulis composita, reducta; (b) vesiculae reductae aut vestigialia aut nullae atque (c) seta sporophyti perspicue longior facta, ut in Lunularia. Type. Dumortiera Nees.

The phylogenetic position of this group remains a matter of controversy; it has been regarded, on biochemical bases, as closer to the Conocephalaceae subf. Wiesnerelloideae (Wiesnerellaceae), but

differs from this group in the stalked ♂ receptacles.

Subf. Bucegioideae Schust., subf. n. Subfamilia a subf. Marchantioideis distincta ut filamenta chlorophyllosa in vesiculis nulla. Type. Bucegia Radian; Neohodgsonia Perss. probably also here.

Ricciaceae Dum. The family is commonly held to include only two genera, Riccia L. and Ricciocarpus Corda. However, recognition of a third genus seems necessary:

Pteroriccia Schust., gen. n. Genus a Riccia s. str. distinctum ut (a) superficies dorsalis thalli velutina ob filamenta cellulae erecta isolata atque (b) squamae ventrales ingenter, usque ad 1.5 mm long.; erectae (siccatae super thallum incurvatae), apicibus eorum serratis. Type. Riccia villosa Steph.; monotypic.

Pteroriccia is at least as distinct from Riccia as is Ricciocarpus -- the last universally recognized as a valid genus. The figures in Arnell (1963, p. 20), although not good, show the characteristic cross section, with the large, imbricate ventral scales erect and projecting far beyond (and far above) the thallus margins. Serrate ventral scales do not occur in Riccia, but do occur in the water forms of Ricciocarpus, to which there is, however, no close affinity.

Riccia (Mich.) L. Three subgenera are usually recognized: subg. Ricciella, subg. Riccia, and subg. Thallocarpus. A fourth subgenus is needed for R. membranacea Gottsche & Lindenb.:

Riccia subg. Leptoriccia Schust. Subgenus subg. Thallocarpus similis ut (a) thalli spongiosi, vesiculis magnis praediti, atque (b) sporae papillis disiunctioribus, potius quam reticulo obtectae. A Thallocarpus differens ut sporae numquam quaternae se cohaerentes. Type. R. membranacea Gottsche & Lindenb.

As far as known, subg. Leptoriccia is monotypic. I know of no species except R. membranacea that clearly fits here. The thalli simulate fern gametophytes -- they are thin and translucent, with very little ventral tissue developed.

4. On an anomalous new species of Radula Dum.

One of the "classic" genera of Hepaticae is Metzgeriopsis Goebel (Lejeuneaceae) in which the vegetative gametophyte is reduced to a radiately expanded monostromatic thallus; only the sexual branches, which are very short, bear complicate-bilobed leaves, in two ranks. Closely, if superficially, similar is the following species of Radula:

Radula yanoella Schust., sp. n. Species subg. Metaradulae, sectionis Epiphyllarum ab omnibus aliis Epiphyllis differens thallo persistente, radiatim expanso, monostromatico e cuius marginibus rami determinati, breves, foliacei, atque plerumque simplices enascuntur. Type. Serra Curicuriari, Brazil (RMS 80-1691).

This unique plant consists of a closely furcate, radiately expanded, rosette-like, monostromatic thallus, growing by means of apical cells with 2 cutting faces. Eventually some or all thallus segments show a transition from such apical growth to tetrahedral apical cells and, abruptly, leafy shoots are cut off (cf. Schuster, 1984a, fig. 11 on p. 799). Aside from this, the weak axes, formed of few cell rows, clearly suggest that a species of sect. Epiphyllae is at hand. Evidently reduction in this Radula has occurred parallel with that which has occurred in Metzgeriopsis.

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THE ALGAE OF NEW JERSEY (U.S.A.)
VII. CHLOROPHYTA (GREEN ALGAE)
B. ULVALES, CLADOPHORALES AND OEDOGONALES

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This is the seventh paper in a series which examines the distribution of the algae in the State of New Jersey.

The genera are listed alphabetically within each order and the collection dates chronologically within them.

DIVISION CHLOROPHYTA — GREEN ALGAE

ULVALES

Chaetomorpha aerea
Beesley's Point, N.Y. harbor (2); Barnegat Bay (12); Raritan Bay (1)

Chaetomorpha linum Farlow
Atlantic City (9); Beesley's Point and Longport (2); Barnegat Bay (12); Great Bay (8); Corsons Inlet, Ludlam Bay (10)

Chaetomorpha melagonium (Web.& Mohr.) Kutz.
Atlantic City (2); state (3)

Chaetomorpha piquistiana (Mont.) Kutz.
Communipaw, Monmouth, Long Branch, Atlantic City (2); Atlantic City (9)

Enteromorpha biflagellata
Barnegat Bay (12)

Enteromorpha clathrata (Roth) Grev.
Cape May Harbor, Great Egg River, Forked River (10; Raritan Bay (1); Great Bay, Mullica River (8); Barnegat Bay (12)

Enteromorpha compressa (L.) Grev.
state (3); coast (5); Raritan Bay (1); Great Bay, Mullica River (8)

Enteromorpha crinita (Roth) J.G. Ag.
common in marine waters (3)

Enteromorpha intestinalis (L.) Link
coast (10); Raritan Bay (1); Mullica River, Great Bay (8); Barnegat Bay (8 and 12)

Enteromorpha linza (L.) J. Ag.
Raritan Bay (1, 11); Great Bay (8); Barnegat Bay (12, 8)

Enteromorpha marginata J.G. Ag.
not common, occuring mostly on stems and roots of Spartina (3); Raritan Bay (1); Great Bay, Mullica River (8); Barnegat Bay (12)

Enteromorpha minima Nag.
Raritan Bay (1); Mullica River (8)

Enteromorpha percursa (Ag.) J.G. Ag.
common species, forming masses in upper tide pools and ditches in marshes, etc (3)

Enteromorpha plumosa Kutz.
inlets (10); Raritan Bay (1); Mullica River, Great Bay (8); Barnegat Bay (12, 6)

Enteromorpha prolifera (Mull.) J. Ag.
Raritan Bay (1); Great Bay, Mullica River (8); Barnegat Bay (12, 8, 6)
Monostroma blytti (Aresch.) Wittr.
on woodwork exposed to waves, Atlantic City (2)
Monostroma crepidinum Farlow
on wharf pilings, Atlantic City (9, 2, 3)
Monostroma grevillei (Thuret) Wittr.
early spring plant (3)
Monostroma oxyspermum (Kutz.) Doty
Raritan Bay (1); Great Bay, Mullica River (8); Barnegat Bay (10); Oyster Creek, Forked River (5)
Schizomeris leibleinii Kutz.
in quiet fresh water (3)
Spongomorpha lanosa
Raritan Bay (1)
Spongomorpha arcta (Dillw.) Kutz.
common (3); Mullica River (8)
Ulva aureola Ag.
not uncommon on woodwork, Atlantic City (9,2)
Ulva clathrata Ag.
common, Atlantic City (9); Beesley's Point, Atlantic City, Longport, Ocean Grove, New York Bay (2)
Ulva clathrata var. crinita Hauck
Atlantic City (2)
Ulva clathrata var. erecta LeJolis
Atlantic City (9,2)
Ulva clathrata var. prostrata LeJolis
Atlantic City (2)
Ulva clathrata var. ramulosa LeJolis
common, Atlantic City (9)
Ulva clathrata var. uncinata LeJolis
Atlantic City (2)
Ulva enteromorpha LeJolis
common, Atlantic City (9); bays along coast (2)
Ulva enteromorpha var. compressa (L.) LeJolis
Atlantic City (9); abundant (2)
Ulva enteromorpha var. intestinalis (L) LeJolis
common, Atlantic City (9); common along entire coast (2)
Ulva enteromorpha var. lanceolata (Kutz.) LeJolis
common, Atlantic City (9); Atlantic City, Longport, Cape May (2)
Ulva hopkirkii (McCalla) Harv.
not very common, Atlantic City (9); on old shells (2)
Ulva lactuca L.
Atlantic City (9); all inlets, deep ocean (10); Raritan Bay (1); Great Bay, Mullica River (8); Barnegat Bay (8,12,6)
Ulva lactuca var. lactuca LeJolis
Atlantic City, Longport (2)
Ulva lactuca var. latissima LeJolis
Atlantic City (9); bays along coast (2)
Ulva lactuca var. rigida (Ag.) LeJolis
Atlantic City (9,2)

Ulva marginata (J. Ag.) LeJolis
Atlantic City (9,2)
Ulva percursa Ag.
rather common in tide pools, Atlantic City (9,2)

CLADOPHORALES

Cladophora albida (Huds.) Kutz.
Atlantic City (9); Beesleys Point, Atlantic City, Communipaw (2); Raritan Bay (1); Great Bay, Mullica River (8); Barnegat Bay (12)
Cladophora albida var. refracta (Wyatt) Thuret.
state (3); Barnegat Bay (12)
Cladophora arcta (Dillw.) Farlow
New York Bay (2)
Cladophora collicoma Kutz.
Princeton (3)
Cladophora crispata (Roth) Kutz.
Beesleys Point, Atlantic City, Key East, New York Bay (2); Johnson Park Pond, New Brunswick (7)
Cladophora crystallina (Roth) Kutz.
Barnegat Bay (12, 6)
Cladophora expansa (Mert.) Kutz.
Atlantic City (9, 2); marsh pools and lagoons (3); Raritan Bay (1); Great Bay (8); Barnegat Bay (12)
Cladophora falcata Harv.
Little Bay, Communipaw (2)
Cladophora flavescens
shores, pools of brackish water (13); Barnegat Bay (12)
Cladophora flexuosa (Dillw.) Harv.
Atlantic City (9, 2); Great Bay (8); Barnegat Bay (12)
Cladophora glaucescens (Griff.) Harv.
Atlantic City (2); Beesleys Point, Communipaw, Atlantic City (2); Raritan Bay (1); Great Bay (8); Barnegat Bay (12)
Cladophora glomerata (L.) Kutz.
running water (2); New Brunswick stream (7); Raritan and Millstone Rivers (4)
Cladophora gracilis (Griff.) Kutz.
Atlantic City (9); Beesleys Point, Atlantic City, Longport, Asbury Park, New York Bay (2); Raritan Bay (1); Great Bay, Mullica River (8); Barnegat Bay (8,12)
Cladophora gracilis var. expansa Farlow
Atlantic City (2); Barnegat Bay (12)
Cladophora gracilis forma tenuis
Barnegat Bay (12)
Cladophora gracilis var. vadorum (Aresch.) Collins
loose, floating masses in sublitoral zone (3)
Cladophora hutchinsiae (Dillw.) Kutz.
Longport (9); state (3); Atlantic City (2)
Cladophora hutchinsiae var. distans (Ag.) Kutz.
state (3)
Cladophora lactiverens (Dillw.) Harv.
Beesleys Point, Communipaw, New York Bay (2)
Cladophora refracta (Roth) Aresch.
state (3); Newark Bay, Atlantic City (2); Barnegat Bay (12)

Cladophora rudolphiana (Ag.) Harv.
upper sublitoral zone (3); Communipaw, Pleasure Bay (2); Barnegat Bay (12)
Cladophora rupestris (L.) Kutz.
Communipaw (2); Raritan Bay (1)
Pithophora oedogonia (Mont.) Wittr.
state (3); Plainfield (2)
Rhizoclonium crispum Kutz.
state (3)
Rhizoclonium fluitans Kutz.
rapid streams, mill dams (13); Bound Brook (2)
Rhizoclonium fontanum Kutz.
Johnson Park Pond, New Brunswick (7)
Rhizoclonium fontinali Kutz.
in springs and flowing waters (2)
Rhizoclonium hieroglyphicum (Ag.) Kutz.
on moist or wet ground (2); New Brunswick stream (7); Millstone and Raritan Rivers (4)
Rhizoclonium kochianum Kutz.
on Zostera, Atlantic City and Somers Point (2)
Rhizoclonium major Wolle
wooden structures, Atlantic City (13); Perth Amboy (2)
Rhizoclonium riparium (Roth) Harvey
common, Atlantic City (9); Cape May (10); Raritan Bay (1); Mullica River, Great Bay (8); Barnegat Bay (12)
Rhizoclonium riparium var. implexum (Dillw.) Rosenvinge
forming thin fleece on muc (3)
Rhizoclonium salinum (Scheich.) Kutz.
Absecon, Perth Amboy, low ground (13); Atlantic City (2)
Rhizoclonium tortuosum Kutz.
Mullica River and Great Bay (8)
Urospora pencilliformis (Roth) Aresch.
Great Bay and Mullica River (8)

OEDOGONIALES

Bulbochaete brebissonii Kutz.
Hammonton (13, 2)
Bulbochaete crenulata Prings.
state (13); frequent in ponds and sluggish water (2)
Bulbochaete insignis Prings.
Lake Hopatcong (13,2); state (3)
Bulbochaete intermedia DeBy.
common in ponds and sluggish water (2)
Bulbochaete minor A. Br.
ponds in state (13, 2, 3)
Bulbochaete mirabilis Wittr.
state (2,3)
Bulbochaete monile Wittr. & Lund
state (3)
Bulbochaete nana Wittr.
ponds (13,2)

Bulbochaete rectangularis Wittr.
not rare in ponds (2)
Bulbochaete repanda Wittr.
state (3); Lake Hopatcong (13, 2)
Bulbochaete setigera (Roth) Ag.
state (3); Hammonton, August 1879 (13); pine barrens (2)
Oedogonium acrosporum DeBy.
common (13,2,3)
Oedogonium aereschoughii Wittr.
ponds in Morris County (13,2,3)
Oedogonium borisianum Wittr.
frequent in ponds (2)
Oedogonium boscii (LeCl.) Wittr.
state (13,2)
Oedogonium braunii Kutz.
state (13,2,3)
Oedogonium capillare (L.) Kutz.
common in ponds (2)
Oedogonium capilliforme Kutz.
Lake Hopatcong (2)
Oedogonium ciliatum (Hass) Prings.
Atsion (13,2)
Oedogonium concatenatum (Hass) Wittr.
state (13,3); Plainfield (2)
Oedogonium crassiusculum Wittr.
not infrequent (13); pond at Branchville (2)
Oedogonium cryptoporum Wittr.
pond in Perth Amboy (2)
Oedogonium cryptoporum var. vulgare Wittr.
state (2,3)
Oedogonium decipiens Wittr.
state (13,3); Lake Hopatcong (2)
Oedogonium delicatulum Kutz.
frequent in ponds (2)
Oedogonium echinospermum A. Br.
state, frequent (13,2,3)
Oedogonium fonticolum A. Br.
frequent in stagnant or sluggish water (2)
Oedogonium franklinianum Wittr.
state (3); Franklin (2)
Oedogonium idioandrosporum (Nordt. & Wittr.) Tiffany
state (3)
Oedogonium londiense Wittr.
state (13,3); Lake Hopatcong (2)
Oedogonium pachyandrium Wittr.
state, stagnant waters and ditches (13,2,3)
Oedogonium paludosum (Hass.) Wittr.
Perth Amboy (2)
Oedogonium platygynum Wittr.
state ponds (13,3); Atsion (2)
Oedogonium plusiosporum Wittr.
state (13,2,3)

Oedogonium polymorphum Wittr. & Lund
Browns Mill and Bound Brook (13,2)
Oedogonium pyriforme Wittr.
Branchville (13,2,3)
Oedogonium sexangulare Cleve
Lake Hopatcong (2)
Oedogonium stagnale Kutz.
Bound Brook (2)
Oedogonium varians Wittr. & Lund
state (3)
Oedogonium wolleanum Wittr.
state (13,2,3)
Oedogonium wolleanum forma insigna (Nordt) Hern.
state (3)

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TAXONOMY OF THE GENUS *APHANOSTEPHUS* (Asteraceae-Astereae)

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Abstract

Aphanostephus, a wholly North America genus largely confined to the southwestern United States and adjacent Mexico, is treated taxonomically. Four species are recognized: three annuals (*A. skirrhobasis*, with a chromosome number of $2n=6$; *A. ramosissimus*, with $2n=8$; and *A. pilosus* with $2n=8$); and one perennial (*A. riddellii*, with $2n=10$ or $2n=20$). *Aphanostephus skirrhobasis* has three intergrading infraspecific taxa: var. *skirrhobasis*, var. *thalassius* and var. *kidderi*. The most widespread, variable, species, *A. ramosissimus* also includes three intergrading infraspecific taxa: var. *ramosissimus*, var. *humilis* and var. *ramosus*. Keys to the taxa and distributional maps are provided and a complete update on chromosome numbers is presented. The ancestral base chromosome number is believed to be $x=5$ which perhaps gave rise to the lower numbers by descending aneuploidy.

The late L. H. Shinners once confided to me that, of the several genera to come under his taxonomic scrutiny, the most difficult was *Aphanostephus*. This was so, he said, because the species are exceedingly plastic, both as to habit and head size (there being vernal and autumnal forms); in addition, he surmized that the various taxa tended to form hybrids so as to obscure specific boundaries.

This confession is attested to in Shinners (1946) revision of the genus where he states, "Casual examination of an assortment of herbarium specimens assigned to several species may give the impression that an incoherent jumble has been divided at random into several equally incoherent jumbles, with no distinctions that hold good." Nevertheless, he did provide a very thorough, largely reliable, account of the genus for the United States, mostly by sorting sheets according to head size, foliage characteristics and habit. He was clearly not satisfied with his treatment of the Mexican material at his disposition, noting that "the untangling of the variations among the Mexican species has been frought with much uncertainty, and has depended a great deal upon analogy with what is better known of the species in the United States." Indeed, some of the Mexican taxa recognized by Shinners would be difficult, if not impossible, to distinguish from their more Northern counterparts, as will be noted below.

I became interested in *Aphanostephus* in 1954, shortly after my

arrival at the University of Texas, largely because several of the species are among the more abundant roadside weeds of Central Texas and because preliminary examination showed them to possess very low chromosome numbers ($2n$=6, 8 or 10).

I worked on the genus for several years, but unlike Shinners, I soon found the Texas species to be relatively easily recognized, both in the field and in the herbarium. This was largely due to my use of chromosomal and micromorphic features, characters which Shinners largely, if not entirely, ignored. Indeed, what appeared upon superficial examination to be "incoherent jumbles" were soon resolved into coherent assemblages. In fact, I was never able to discern a single instance of interspecific hybridization, even when three or more species of Aphanostephus were found cohabitating the same general area (e.g., within several hundred meters of each other, or sometimes growing intermixed, as often occurs with populations of A. skirrhobasis and A. ramosissimus).

The taxonomic simplicity of the group was neatly revealed by chromosomal studies in which the largely, more eastern species of sandy soils, Aphanostephus skirrhobasis, was found to be consistently diploid with $2n$=6 chromosomes; the largely more western species of silty-clay, drier soils, A. ramosissimus, was found to be consistently diploid with $2n$=8 chromosomes; while the widespread, but less common species of shallow calcareous soils, A. riddellii, was found to be diploid or tetraploid with $2n$=10 or $2n$=20 chromosomes. Further, it soon became clear as a result of much field work that the eastern A. ramosissimus ($2n$=8) graded into a more robust, larger headed western phase which Shinners (following A. Gray) recognized as A. arizonicus. Field work in southern Texas also revealed that A. skirrhobasis ($2n$=6) graded into what Shinners took to be a very distinct taxon, A. kidderi ($2n$=6).

Ignoring the very distinct, relatively localized species, Aphanostephus pilosus with $2n$=8, F_1 hybrids between the widespread, often sympatric, species mentioned above should be readily recognized since each has different chromosome numbers. In the numerous sites where I have found two (or sometimes three) of these species growing together, and in which I thought I detected putative hybrids (as detected by head size, habit and habitat), examination of meiotic chromosomes proved me wrong: such "hybrids" were invariably normal-pairing diploids with $2n$=3, 4 or 5 chromosomal pairs.

In the process of examining these various meiotic squashes a simple observation became apparent: one could predict the chromosome number of any given collection by the kinds of hairs borne upon the minute ovaries. If on the ovaries why not the mature achene? Ah yes, there too! If Shinners had examined the achenes at whatever stage of development he could have readily identified all of the specimens to species by their hairs alone.

The achenal hairs of Aphanostephus are comprised of two tiers of cells, as is usual for most taxa of the Astereae. In the three taxa concerned the achenal hairs assume three forms: straight hairs in A. ramosissimus (x=4); coiled hairs in A. skirrhobasis (x=3); and barbed hairs in A. riddellii (x=5). This is readily seen under magnifications of X30 in a good stereomicroscope and may be sketched as follows:

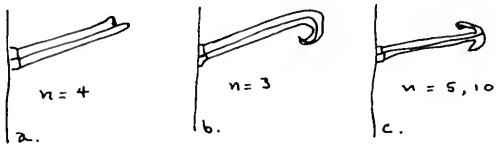


Fig. 1. Achenal hairs in Aphanostephus as correlated with chromosome numbers.

Thus it was that the Aphanostephus "complex" within the confines of the United States became a fairly comprehensable group; there are four well-defined specific taxa as follows:

1. A. pilosus - a quite distinctive species with n=4 pairs; endemic to north-central Texas and adjacent Oklahoma.

2. A. skirrhobasis - n=3 pairs; widespread weedy species of mostly central and eastern Texas but readily adventive elsewhwere. This includes A. kidderi.

3. A. ramosissimus - n=4 pairs; widespred weedy species of more western regions, principally in calcareous or mixed calcareous soils. This includes A. arizonicus and most of the Mexican populations.

4. A. riddellii - n=5 or 10 pairs; widespread but infrequent perennial species of rocky or shallow, well-drained calcareous soils.

After several years work, then, I was content that the species of the United States posed no great taxonomic problems and that Shinners' treatment, except as to the nomenclatural rank accorded the intergrading taxa (A. arizonicus and A. kidderi, mentioned above), was basically sound.

Nevertheless, it was clear that the Mexican material was poorly known, much as Shinners indicated, and attempts to identify plants from this region using Shinners "Outline of the Mexican Species" proved unreliable, inconsistent and at odds with what seemed to be good biological judgment (i.e., some of the Mexican taxa seemed morphological indistinguishable from Texas taxa). No doubt much of

this inadequacy was occasioned by the limited material available to Shinners, to say nothing of his unfamiliarity with their populational variability in the field.

After working out what seemed to be a sound biological treatment, I felt that the genus might be an expedient taxon for detailed biosystematic study, especially if one were willing to undertake synthetic crosses so as to ascertain if the aneuploidy detected in the group was descending or ascending. To this end I assigned the genus to Mr. Arnold Birdsong for a doctoral problem, hoping that his studies might ultimately resolve the populational problems in Mexico. He worked on the genus for several years but never put together a treatment of the group and ultimately opted to pursue a career in the Medical Sciences. I am pleased to note that he now has his M.D. and is practicing his profession.

Before abandoning his project Mr. Birdsong personally annotated several thousand sheets from numerous herbaria but, unfortunately, he never prepared a formal draft of his views on the relationships of the various taxa. Because of this I have felt some compulsion to provide at least an overview of both his work and my own. In this I hope my taxonomic views are not radically different from those which Arnold might have come to. Whatever the case, I take full responsibility for the interpretations rendered and the nomenclature accorded.

Because of the careful and thorough descriptions of the genus and subordinate taxa rendered by Shinners (1946) these are not reiterated here. His treatment of the Mexican taxa, as noted, was based upon very limited material and no field work. Recent collections and much field observation has led me to believe that all of the Mexican material, except for A. riddelli and A. skirrhobasis, belong to but a single widespread, variable species, A. ramosissimus. Thus all of the Mexican names proposed for the latter by Gray (A. arizonicus, A. humilus and A. ramosus) and those proposed by Shinners (A. potosinus and A. jaliscensis) are either treated as but regional intergrading populations deserving of varietal rank only, or else reduced to synonymy among these infraspecific taxa.

Chromosome Counts

Jackson (1957) published the first chromosome number for Aphanostephus, reporting n=4 pairs for A. arizonicus (=A. ramosissimus var. humilis). Since that time 100 or more chromosome counts have been reported for the genus (Table 1), including reports for all of the described taxa. Most of these have been made by the present author or by Dr. Arnold Birdsong, beginning about 1957, and have largely gone unreported.

Table 1. Chromosome numbers in Aphanostephus.

Species	Voucher* or Reference	2n - number (prs.)
A. riddellii	Texas. Bexar Co.: Turner 4546; 4548B.	5 II
	Texas. Coke Co.: Raven 19280.	5 II
	Texas. Glasscock Co.: Turner 4955.	5 II
	Texas. Travis Co.: Turner 4421.	5 II
	Texas. Uvalde Co.: Turner 5009.	5 II
	Texas. Val Verde Co.: Thompson 210.	5 II
	Texas. Val Verde Co.: Tomb 216.	5 II
	Mexico. Coahuila: Powell & Powell (1978).	5 II
A. pilosus	Turner and Crammer (1964).	4 II
A. ramosissimus var. ramosissimus	Oklahoma. Woodward Co.: Keil 10738.	4 II[c]
	Texas. Bee Co.: Turner 4464.	4 II
	Texas. Bexar Co.: Turner 4396; 4548A.	4 II
	Texas. Dimmit Co.: Turner 4998.	4 II
	Texas. Frio Co.: Turner 4992.	4 II
	Texas. Hidalgo Co.: Turner 4483.	4 II
	Texas. Jim Wells Co.: Thompson 179	4 II
	Texas. Kent Co.: Turner 4709.	4 II
	Texas. Hardemon Co.: Flyr 1319.	4 II
	Texas. Menard Co.: Raven 19261	4 II[a]
	Texas. Real Co.: Turner 38.	4 II
	Texas. Starr Co.: Turner 4500; 4511.	4 II
	Texas. Terrell Co.: Raven 19197.	4 II[a]
	Texas. Travis Co.: Turner 4428.	4 II
	Texas. Uvalde Co.: Turner 4427.	4 II
	Texas. Webb Co.: Turner 4510.	4 II
	Mexico. Tamaulipas: Whalen 274.	4 II
A. ramosissimus var. humilis	Ariz. Darlington (1957).	4 II
	Ariz. Pima Co.: Raven et al. (1960).	4 II (2n=8)
	N. Mex. Bernalillo Co.: Jackson (1960).	4 II
	N. Mex. Dona Ana Co.: Turner 5749.	4 II
	N. Mex. Lincoln Co.: Raven 19139.	4 II[a]
	N. Mex. Socorro Co.: Keil 10738.	4 II[c]

	Texas. El Paso Co.: Turner 6138.	4 II (2n=8)
	Mexico. Chihuahua: DeJong & Longpre (1963).	4 II
	Mexico. Chihuahua: Keil 8263A.	4 II[d]
	Mexico. Chihuahua: Powell & Powell (1978).	4 II
	Mexico. Chihuahua: Stuessy 1097.	4 II
	Mexico. Chihuahua: Sikes 404.	4 II
	Mexico. Durango: King 3752.	4 II
	Mexico. Durango: DeJong & Longpre (1963).	4 II
	Mexico. Nuevo Leon: Rock M-272.	4 II
	Mexico. Nuevo Leon: Johnston 4204B.	4 II
	Mexico. San Luis Potosi: Breedlove 14355.	4 II[b]
A. ramosissimus var. ramosus	Mexico. Hidalgo: Powell 1112.	4 II
	Mexico. Hidalgo: Johnston 4760.	4 II
	Mexico. Michoacan: DeJong D758.	4 II
	Mexico. Michoacan: King 3606.	4 II
	Mexico. Michoacan: Powell 815.	4 II
	Mexico. Michoacan: Strother 1079.	4 II
	Mexico. Puebla: Beaman 3614; 3621	4 II
	Mexico. Puebla: Powell 633.	4 II
A. skirrhobasis var. kidderi	Texas. Frio Co.: Turner 4565; 4986; 4991.	3 II
	Texas. Zavala Co.: Sullivan 20; 21.	3 II
	Texas. Zavala Co.: Turner 5004.	3 II
A. skirrhobasis var. skirrhobasis	Oklahoma. Blaine C.: Tomb 155.	3 II
	Oklahoma. Harmon Co.: Flyr 1318.	3 II
	Oklahoma. Pontotoc Co.: Tomb 157A, B.	3 II
	Oklahoma. Woodward Co.: Keil 10891.	3 II[c]
	Texas. Atascosa Co.: Turner 4554.	3 II
	Texas. Bastrop Co.: Brown 6106.	3 II
	Texas. Burnett Co.: Semple (1980).	3 II
	Texas. Burnett Co.: Turner 4420.	3 II
	Texas. Caldwell Co.: Thompson 26.	3 II
	Texas. Coke Co.: Raven 19282.	3 II[a]
	Texas. Colorado Co.: Thompson 88.	3 II
	Texas. Ector Co.: Tomb 140.	3 II
	Texas. Frio Co.: Irwin 1398.	3 II
	Texas. Gonzales Co.: Thompson 23; 86.	3 II
	Texas. Jim Hogg Co.: Thompson 178.	3 II
	Texas. Kleberg Co.: Turner 4318.	3 II

	Texas. Llano Co.: Turner 4391; 4392; 4393.	3 II
	Texas. Mitchell Co.: Raven 19285.	3 II[a]
	Texas. Palo Pinto Co.: Turner 5042.	3 II
	Texas. Wharton Co.: Smith and Johnson (1964).	3 II[e]
	Texas. Wilson Co.: Turner 4422.	3 II
A. skirrhobasis var. thalassius	Texas. Galveston Co.: Turner 4415; 4418.	3 II
	Texas. Galveston Co.: Raven 19419.	3 II[a]
	Texas. Galveston Co.: Semple (1980).	3 II

[a]Data from Solbrig et al. (1969).
[b]Data from Anderson et al. (1974).
[c]Data from Keil and Pinkava (1976).
[d]Data from Keil & Stuessy (1975).
[e]Plus 4 microchromosomes.
*On file at TEX.

It is clear that Aphanostephus is mostly diploid with n numbers of 5, 4 and 3. Fedorov (1969) lists a count of n=7 for A. skirrhobasis, crediting this to Smith and Johnson (1964), but the latter authors clearly note the count concerned to be n=3, there being 4 additional, dividing, chromatin bodies which they describe as "microchromosomes". We never observed such bodies in our own numerous meiotic preparations of this taxon, although occasional accessory or B-type chromosomes were noted.

The only tetraploid counts found to date have been those for A. riddellii, which is largely diploid with n=5 pairs, but occasional populations from southcentral Texas are tetraploid with n=10 pairs.

Whether the numbers represent a descending series from a base chromosome number of x=5 or an ascending series on a base of x=3 is anybody's guess. Smith and Johnson (1964) thought that n=3 was derived from a taxon with n=4, and it might be that the latter number gave rise to both n=3 and n=5 by descending and ascending aneuploidy respectively. It should prove meaningful to obtain crosses between these several chromosomal groups, but all attempts to obtain such combinations failed (perhaps this aspect of the study was not pursued with enough vigor by the present author, but it seems notable that hybrids were never found in nature, even when the several taxa concerned grew in close proximity).

One thing does seem clear, however: the ancestral base chromosome number for Aphanostephus was probably not x=9, as might be championed by earlier workers on the tribe Astereae (Solbrig, 1977). The genus is not easily related to any North American member of the Astereae, what with its conical receptacles, columnar achenes and sometimes paleaceous pappus. Superficially the species of Aphanostephus look like Erigerons or Asters but the genus is so different in its floral and fruit characters as to suggest a very remote relationship with these two genera.

Generic Relationships

Shinners (1946) relates the genus to Dichaetophora (x=3) and Astranthium (x=4); he is probably correct in this assumption. These two genera, however, are themselves quite remote from Aphanostephus, to judge from their floral and fruiting structures, which strengthens my belief that these several chromosomal lines are ancestral relicts from some low base chromosome number for the tribe Astereae as a whole, either x=4 or 5, much as I have (Turner, 1977) postulated for Heterotheca (x=5, 4 and 9, sensu lati), Aster (x=5, 8 and 9) and Machaeranthera (x=5, 4 and 9), relatively remote genera, all belonging to the tribe Astereae. And if one wishes to consider the large genus Haplopappus, as treated by Hall (1928), to be a monophyletic assemblage, one cannot help but note that Hall himself considered the section Osbertia to be the primitive element within

Haplopappus , and that too has a base number of x=5 or 4 (Turner, unpubl.).

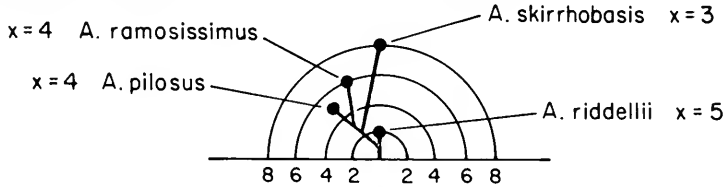
That Aphanostephus is a relatively unspecialized, indeed remote, member of the tribe Astereae may be inferred from Bentham's remark (1873, p. 409) that Bellis itself (the genus to which he relates Aphanostephus) "may be said to approach some Anthemideae in the Old World, and in the New World, through Aphanostephus, to pass into Egletes and the more tropical Grangea type". Bentham goes on to emphasis tht the Grangea group links the tribe Astereae with the tribe Anthemideae, this based primarily on achenal structure, most of the taxa possessing non-flattened achenes, much as does Aphanostephus.

Bentham's conjecture that Aphanostephus or, indeed, Grangea might link the tribe Astereae to the Anthemideae, is not borne out by palynological studies, for both Aphanostephus and Grangea have pollen typical of the tribe Astereae while that of the tribe Anthemideae is radically different (Turner, 1977).

Species Relationships

Blake (1937) recognized two subgenera under Aphanostephus: subgen. Pappophanus containing those taxa with a pappus of scales (A. pilosus, A. skirrhobasis and A. kidderi); and subgen. Aphanostephus containing A. ramosissimus, A. riddelli, and related taxa with a pappus of minute cilia. Shinners, however, reduced both subgenera to sectional rank, using the name Pappopecus for the subgenus Aphanostephus, contrary to the present Code.

Unlike Blake or Shinners, I can see little need, to recognize infrageneric categories for the relatively few taxa concerned. As noted below, A. skirrhobasis (n=3) was probably derived from a species with n=4, presumably a taxon ancestral to both A. pilosus and A. ramosissimus as noted in the following:



The hypothetical phyletic relationships shown above assumes that the perennial Aphanostephus riddellii, with a base chromosome number of x=5, has retained more primitive features than has the other species. Primitive vs advanced features are judged as follows:

	primitive (0)	advanced (1)	very advanced (2)
1.	chromosome base, x=5	x=4	x=3
2.	habit perennial	annual	___
3.	disk corolla-tube not inflated	inflated and indurate	
4.	achenal hairs straight	coiled or barbed	___
5.	pappus of scales	pappus of cilia	pappus of indurate crown or fused scales
6.	ray florets numerous (50+)	ray florets 8-34	___

By assigning values of 0, 1 and 2 to each of the above states it can be surmized that A. riddellii with a numerical value 2 is less advanced than the other species, while A. pilosus, A. ramosissimus and A. skirrhobasis are more advanced, possessing scores of 6, 5-6 and 7-9 respectively, depending upon the variety under consideration.

Of course this tabulation is highly biased. Other characters could have been chosen for such polarizations but I would have had little confidence in their validity. Those few chosen seem adequate and better than none. More rigorous cladistic analysis would have been preferred but, as noted above, it is difficult to find an out-group against which to assess the characters, Aphanostephus seemingly being a transitory genus between this or that. In short, out-group selection, depending upon the choice, would, in this instance, prove more whimsical for systematic purposes than the simplistic approach selected here.

TAXONOMIC TREATMENT

Key to Species of Aphanostephus

1. Hairs on achene coiled (Fig. 1a); pappus uneven and scaly or rarely composed of 5-10 acute to awn-tipped scales, 0.2-2.0 mm long; chromosome numbers, 2n=6 ----------3. A. skirrhobasis

1. Hairs on achene straight or very minute and each cell abruptly reflexed near apex forming a prong-shaped structure; pappus a ring of very short, nearly equal, cilia, 0.1-0.25 mm long; chromosome numbers, 2n=8, 10 or 20.

2. Achenal hairs minute, pronged (Fig. 1c.); perennials; chromosome numbers 2n=10 or 20----------4. A.riddellii

2. Achenal hairs straight, not minute and pronged

(Fig. 1b); annuals; chromosome numbers 2n=8.

3. Plant coarsely hispid with jointed, translucent hairs, those of the stem 0.6-2.4 mm long, spreading at right angles; ray florets 13-21; north-central Texas and adjacent Oklahoma----------2. A. pilosus

3. Plant softly pubescent, the hairs mostly adpressed, 0.2-0.8 mm long; rays 34 or more (except rarely on depauperate or autumnal forms); widespread species----------1. A. ramosissimus

1. APHANOSTEPHUS RAMOSISSIMUS DC., Prod. 5:310. 1836.

The following intergrading varieties are recognized and each are discussed in more detail below:

1. Involucres 3.2-4.8 mm high; pappus a cupuliform or raised crown, 0.15-0.30 mm high; achenes 1.2-1.4 mm long; plants of northeastern Mexico (eastern Coahuila, northern Nuevo Leon and Tamaulipas) and adjacent United States----------1a. var. ramosissimus

1. Involucres 4.7-7.5 mm high; pappus crown absent or nearly so; achenes 1.4-1.6 mm long; plants of southwestern United States and northcentral Mexico southward to Mexico City area [2].

2. Upper leaves mostly not clasping; stems usually erect, arising from a lignescent, usually unswollen, tap-root; plants from highland plateau regions of central Mexico (Guajuato-San Luis Potosi) northward to southwestern United States---------1b. var. humilis

2. Upper leaves mostly clasping; stems usually prostrate or recumbent, arising from a swollen tap-root; plants of trans-volcanic montane regions of south-central Mexico (Veracruz-Guerrero)----------1c. var. ramosus

1a. A. RAMOSISSIMUS DC. var. RAMOSISSIMUS

My interpretation of this taxon is essentially the same as Shinners' (1946). The type, as noted by him, was collected by Berlandier, presumably near San Antonio, Texas in Bexar County. Shinners thought that this taxon hybridized with A. skirrhobasis but, as noted above, hybridization between these taxa was never observed by the present author. Shinners also suggested that A. ramosissimus might hybridize with "A. arizonicus"; I treat the

latter taxon as a regional variety of the present species (var. humilis, cf. below) and emphasize the fact that intergrades between these taxa can be found across a broad front in northcentral Mexico and western Texas (Fig. 2). This intergradation is gradual and does not appear to be due to in situ gene exchange between distinct entities.

Aphanostephus potosinus (type from Minas de San Rafael, San Luis Potosi, Mexico) is said to possess a combination of quantitative characters which serve to distinguish this from both A. arizonicus and A humilis but I find nothing of substance to justify specific recognition. The several plants cited by Shinners are mostly from central and southeastern San Luis Potosi and appear to be subtle regional intergradiants between var. humilis, var. ramosissimus and var. ramosus, these several taxa converging, geographically, in this area (Fig. 2).

1b. APHANOSTEPHUS RAMOSISSIMUS DC. var. HUMILIS (Benth.) Turner and Birdsong, Phytologia 45: 501. 1980.

Aphanostephus humilis (Benth.) A. Gray, 1880.
Aphanostephus arizonicus A. Gray, 1880.
Aphanostephus potosinus Shinners, 1946.
[See Shinners, 1946, for additional synonymy.]

Shinners treated Aphanostephus humilis (type from Guanajuato, Leon, Mexico) as distinct from A. arizonicus (type from Gila Valley, Arizona, U.S.A.) noting that the latter "has generally passed" as the former. He constructed a tedious and difficult key to distinguish between these but the only definitive "character" appears to be that of geography; that is, plants of northern Mexico and adjacent U.S.A. belong to A. arizonicus and those of central Mexico belong to A. humilis. The large suite of specimens from northern Mexico which I examined show nothing in the way of character states to justify varietal status, much less specific status.

Shinners also speaks of "intermediates" between Aphanostephus skirrhobasis and A. ramosissimus which "are difficult to distinguish from A. arizonicus" but, as noted above, natural hybridization between these very distinct taxa probably does not occur and it is doubtful that any F_1 hybrids would take on the characters of Shinners' A. arizonicus.

1c. APHANOSTEPHUS RAMOSISSIMUS var. RAMOSUS (DC.) Turner and Birdsong, Phytologia 45: 501. 1980.

Aphanostephus ramosus (DC.) A. Gray, 1880.
Type from Michoacan.
Aphanostephus jaliscensis Shinners, 1946. Type from Jalisco.

Aphanostephus pachyrrhizus Shinners, 1946. Type from Puebla. [See Shinners, 1946, for additional synonymy.]

This taxon forms fairly uniform populations in the volcanic highlands of southcentral Mexico, especially in disturbed ashy soils from 2000-3000 meters. Plants are characteristically prostrate or procumbent, possess mostly clasping upper leaves and have swollen, annual or biennial (?), tap roots. I have, however, observed considerable variation in these characters under field conditions, suggesting that their expression is under relatively weak genetic control. In any case, intergrades between var. ramosus and var. humilis occur northward and, probably, were names not already available for each of these, I might have recognized but a single taxon, so much alike they are in floral and fruit characters.

2. APHANOSTEPHUS PILOSUS Buckley
My interpretation of this species is the same as Shinners (1946).

3. APHANOSTEPHUS SKIRRHOBASIS (DC.) Trel., 1891.

My interpretation of this species is essentially the same as Shinners (1946) except that I would recognize 3 intergrading regional infraspecific taxa (reducing his A. kidderi to varietal status) instead of two, as follows:

1. Plants low, bushy and much-branched from the base; leaves thickened and densely, almost felty, gray-pubescent; plants of active or stable sand dunes along the GulfCoastalRegions----------1b. var. thalassius

1. Plants erect, usually sparsely-branch below; leaves not particularly thickened and not almost felty gray-pubescent beneath; interior populations on sandy soils.

2. Pappus of 5 or 10 acute or awn-tipped scales, mostly 0.4-2.0 mm long; plants of southcentral Texas and adjacent Mexico----------1c. var. kidderi

2. Pappus an uneven, often awn-tipped, or ciliate scaly crown mostly 0.2-1.8 mm long; widespread taxon----------1a. var. skirrhobasis

3a. APHANOSTEPHUS SKIRRHOBASIS (DC.) Trel. var. SKIRRHOBASIS
Synonymy as listed by Shinners (1946).

Shinners thought that "certain puzzling variations" of this taxon were due to interspecific hybridization but, as I have noted above, this is unlikely. My own field experience over a 30 year period with numerous populations leads me to believe that the

variety is exceptionally plastic with respect to habit, leaf shape and head size. Since these were the primary characters employed by Shinners, along with pappus size (also very variable), it is not surprizing that perplexing plants might be found. Shinners also described two new forma, f. quasigigantiusculus and f. incisifolius, the former a depauperate form of typical var. skirrhobasis, the latter a leaf form.

This variety intergrades with var. thalassius over a broad region along the Gulf Coast and in such areas populations vary within and among themselves with regard to the characters used to distinguish between these. The same is true for the var. kidderi, but intergrades between the latter occur in a more localized region.

3b. APHANOSTEPHUS SKIRRHOBASIS var. THALASSIUS Shinners, Wrightia 1: 106. 1946. TYPE. TEXAS: Galveton Co.: seashore S of High Island, 15 May 1945, L. H. Shinners 7718 (holotype SMU).

My evaluation of this taxon is essentially the same as Shinners. He notes that occasional plants of var. skirrhobasis are hard to separate from var. thalassius, "but the latter shows such uniformity and is so characteristic in appearance that it deserves nomenclatorial (sic) recognition." I ascribe to this view but believe that the intergradation, especially in southern Texas, is much more apparant than he suggested.

As indicated in Fig. 4, var. thalassius occurs on stabilized and active dune sands along the Gulf Coastal Regions from northeastern Mexico to Louisiana. The disjunct populations in Flordia (cited by Shinners, 1946) also occur in dune sand and perhaps represent relatively recent introductions (i.e., over the last 100 years or so).

Shinners cites but a single collection from Mexico (Runyon 442, C, US) where it occurs on dune sand south of Matamoras, Tamaulipas. No doubt additional sorties along the coastal dunesof northeastern Mexico will reveal its presence elsewhere in this poorly collected region.

3c. APHANOSTEPHUS SKIRRHOBASIS var. KIDDERI (Blake) B. L. Turner, comb. nov. - Based upon Aphanostephus kidderi Blake, Contr. Gray Herb. 53: 23. 1918.

My interpretation of this taxon is about the same as Shinners except that I do not ascribe to his view that "it apparently hybridizes" with Aphanostephus ramosissimus, although the two often grow together.

Shinners also does not mention the obvious intergradation of var. skirrhobasis with var. kidderi in southcentral Texas as noted

in my Fig. 5 . Careful collection of several populations across a small region in this area revealed populational intergradation, some plants in any one populational referrable to one taxon or the other. Away from the region of intergradation the diagnostic characters become stabilized. I take this to be regional intergradation due to primary divergence, and not that of secondary intergradation where allopatric hybridization is a factor (cf. Flake, Turner and Urbatsch, 1978).

Shinners cited a number of collections of this taxon, all from Texas. I would like to place on record the following collections from MEXICO: Tamaulipas: 2 km SW Nuevo Laredo, Dominguez & McCart 8297 (TEX); 24 km S Nuevo Laredo, Dominguez & McCart 8222 (TEX); 18 mi S Nuevo Laredo, Escalante 43 (TEX); 1 mi E Nuevo Laredo, Ibarra 112 (TEX); 12 mi S Nuevo Laredo, Saenz 55 (TEX).

4. APHANOSTEPHUS RIDDELLII T. & G. 1842.
A. perennis W. & S., 1913.

My interpretation of this species is the same as Shinners. He rightly notes that it is easily recognized, often grows with the other species of Aphanostephus and does not form intermediates with these.

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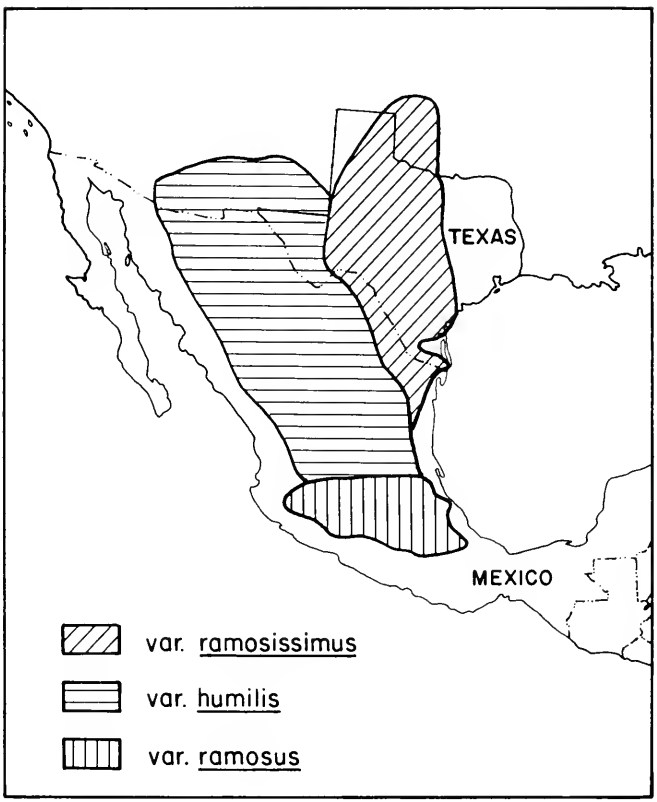

Fig. 2. Distribution of varieties of A. ramosissimus.

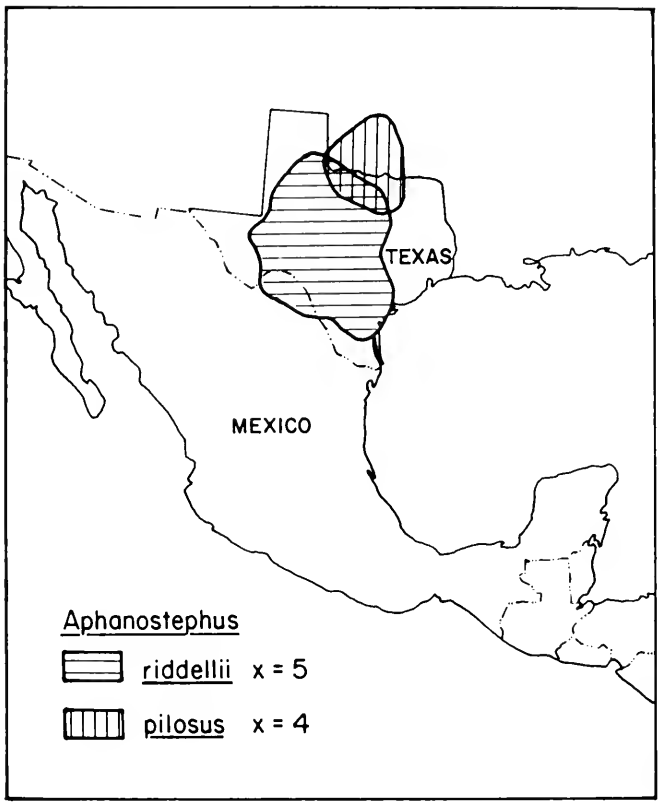

Fig. 3. Distribution of A. pilosus and A. riddellii.

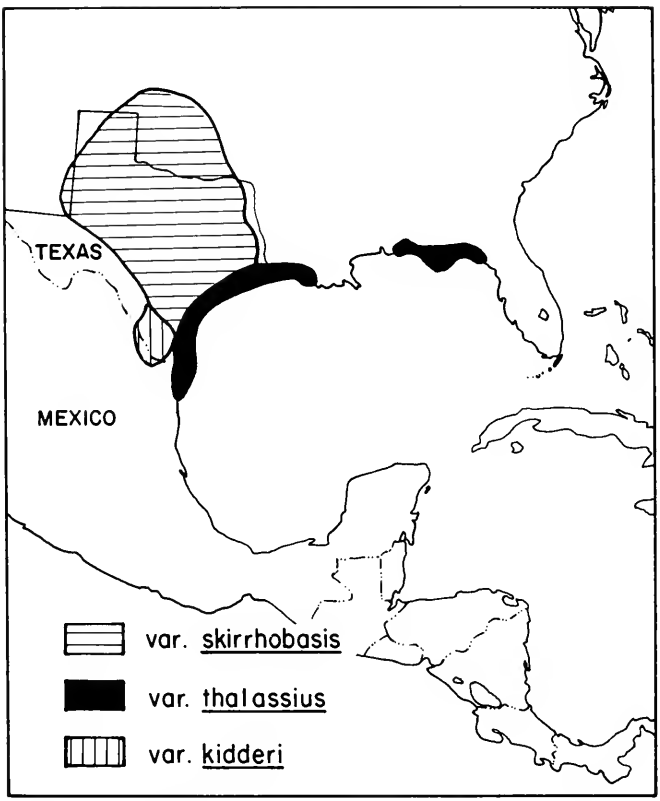

Fig. 4. Distribution of varieties of A. skirrhobasis.

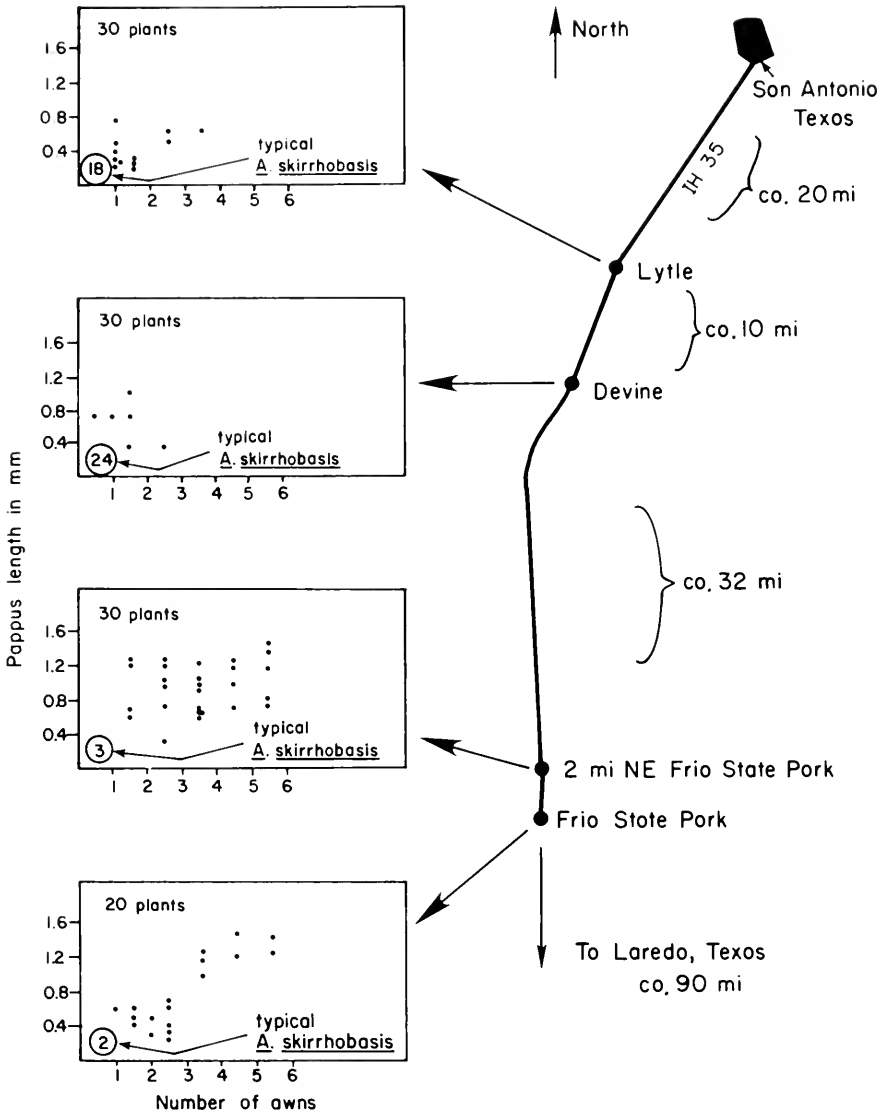

Fig. 5. Poppus voriation in 4 populotions of Aphonostephus skirrhobosis.

ADDITIONAL NOTES ON THE GENUS *GMELINA*. IV

Harold N. Moldenke

GMELINA L.

Additional bibliography: Memmler, Gartenwelt 16: 606. 1912; Mold., Phytologia 56: 32--54. 1984.

GMELINA ARBOREA Roxb.

Additional bibliography: Mold., Phytologia 56: 32 & 35. 1984.

Peh (1964) summarizes pulping studies carried out on trial plantations of this species established in Malaya in 1931, 1932, and 1949, although nursery trees were first grown in Malaya in 1928. He asserts that the wood is a light hardwood with a mean basic specific gravity of 0.403. The "Freshly cut wood is creamy white. The chemical composition of individual woods showed little variation except that the older trees had a higher ash content than that of the younger [Ones]. Good yields of unbleached and bleached sulphate pulps were obtained. The strength properties of the unbleached and bleached pulps were found to be better than those of the Australian commercial eucalypt sulphate pulp. The yields of soda pulp were of the same order of magnitude as those of the sulphate. The strength characteristics were inferior to the sulphate pulp, but were improved by bleaching. Cooks of the neutral sulphite semichemical process gave satisfactory yields. The strength properties were comparable to those of the soda pulp if beaten to the same Williams freeness. A high chlorine consumption was needed to bleach the pulp."

GMELINA ASIATICA L.

Additional bibliography: Mold., Phytologia 56: 32, 35, 42, 43, 47--50, 52, & 53. 1984.

The *Caum s.n.* [Aug. 20, 1934], *Herb. Hort. Bot. Jav. s.n.*, *Schubert & Winters 278*, and *W. Griffith s.n.* [Malacca, 1845], distributed as *G. asiatica*, are all actually *G. elliptica* J. E. Sm, while *Niyomdham & al. 241* is *G. philippensis* Cham.

GMELINA ELLIPTICA J. E. Sm.

Additional bibliography: Mold., Phytologia 56: 43--54. 1984.

Additional citations: GREATER SUNDA ISLANDS: Madura: *Backer 19027* (Bz--21196); *Bremekamp s.n.* (Bz--21194). Paliat: *Backer 29479* (Bz--21186). Sabah: *Amin G. SAN.95465* (Ld); *For. Dept. N. Borneo SAN.15304* (Ld); *Gibot SAN.31278* (Ld); *Madani 35034* (Ld); *Puasa 22* [D. D. Wood 1274] (Ca--239872); *Saikah & Aban SAN.82322* (Sn--49668); *Villamil 315* (Ld--photo, N--photo, Ph, W--1291529). Sepandjang: *Backer 28805* (Bz--21187), *29051* (Bz--21188, Bz--21189, Bz--25574). Simalur: *Achmad 239* in part (Bz--21257, Bz--21258). Sumatra: *Ajoeb 72* (Bz--21249); *Asdat 25* (Bz--72624), *159* (Bz--72623), *191* (Bz--72622); *Bangham & Bangham 627* (N), *628* (N); *Bouman-Houtman 4* (Bz--21244); *Bruinier 122* (Bz--21246); *Docters van Leeuwen-Reijnvaan*

3124 in part (Bz--21247, Bz--21248); *Forbes 1576* (N, Vu); *Gusdorf 214* (Bz--21250); *Krukoff 4422* (Mi, N), *4450* (Br, Bz--21269, Mi, N); *Lörzing 8822* (Bz--21245), *9277* (Bz--21243), *11123* (Bz--21241), *12957a* (B); *Maradja 442* (A); *Posthumus 862* (Bz--21238, Bz--21239, Ut--97474); *Toroes 1120* (Mi, Mi), *1440* (Mi, N), *2541* (Ca--531108, Mi, N, W--1868076), *2546* (Mi, Mi, N, W--1861081), *3351* (Mi, N, W--1681222), *3603* (Mi, N, Qu, W--1675869), *3694a* [U. S. G. S. pollen 1872] (N, W--1675915), *3962* (Mi, N, W--1680595), *5357* (Mi, N); *Van Steenis 9315* (Bz--72808); *Yates 817* (Ca--226103), *856* (Ca--225865, Mi); *Zom 2* [Boschproefst. bb123] (Bz--21240). LESSER SUNDA ISLANDS: Banka: *Blnnemeijer 1372* (Bz--21253), *1560* (Bz--21254). Salajar: *Docters van Leeuwen 1750* (Bz--21237); *Teijsmann 13845* (Bz--21236). MOLUCCA ISLANDS: Amboina: *Boerlage 243* (Bz--21206); *Dollerchal 26* (V), *135* (V); *Kornassi 1079* (Bz--21204, Ca--234909, Ut--81000); *Rant 339* (Bz--21201); *C. B. Robinson 306* (W--654624); *Treub 408* (Bz--21205). Ceram: *Rutten 1667* (Bz--21207, Ut--80999). CULTIVATED: Belgium: *Herb. Martius s.n.* [H. B.] (Br). China: *Chow 80202* (N). Florida: *Gillis 11029* [Pl. Introd. 97933-M.5668] (Ba, Ld); *Sheehan R.33* (Ba). Hawaiian Islands: *Caum s.n.* [Aug. 20, 1934] (Bi); *Yuncker 3587* (Dp). India: *Herb. Hort. Bot. Calcutt. s.n.* (Mu--739, T). Java: *Herb. Hort. Bot. Bogor. 12014* (Bz--21066), *H.B.75* (Bz--21259), *X.F.14* (Bz--21263, Bz--21264, Bz--21265, Bz--25572), *X.F.16* (Bz--21067, Bz--21068, Bz--25573), *X.F.17* in part (Bz--21069, Bz--25585), *X.F.17a* (Bz--21070), *XV.F.5* (Bz--21297, Bz--21298, N), *XV.F.6* (Bz--26299, Bz--26300, Bz, N), *XV.F.7* (Bz--26301), *s.n.* (Bz--21065, Pd). Mauritius: *Bouton s.n.* [Pamplemousses, 1835] (Br). Mozambique: *Balsinhas & Macuácua 578* (Ul). Puerto Rico: *Schubert & Winters 278* (N). Tahiti: *Barrau 2* (Bi). Zaire: *Vermoesen s.n.* [Eala, 15-12-14] (Br). LOCALITY OF COLLECTION UNDETERMINED: *Herb. Linnaeus 780/1* (Ld--photo of type, Ls--type, N--photo of type); *Herb. Osbeck s.n.* (S); *Scortechini 740* (N).

GMELINA ELLIPTICA f. juv. *LOBATA* (Gaertn.) Mold.,Phytologia 4:178.1953.

Synonymy: *Jambosa silvestris parvifolia* Rumpf, Herb. Amboin. 1: 129, pl. 40. 1741. *Gmelina lobata* Gaertn., Fruct. Sem. Pl. 1: 268, pl. 56, fig. 5. 1788. *Jambusa sylvestris parvifolia* Rumpf apud J. E. Sm. in Rees, Cyclop., imp. 1 [London], 16: *Gmelina* 1. 1810. *Jambusa sylvestris parviflora* Rumpf ex Watt., Dict. Econ. Prod. India 3: 516 in syn. 1889. *Jambosa sylvestris* Rumpf ex Mold., Phytol. Mem. 2: 412 in syn. 1980. *Jambosa sylvestris parvifolia* Rumpf ex Mold., Phytol. Mem. 2: 412 in syn. 1980.

Bibliography: Rumpf, Herb. Amboin. 1: 129, pl. 40. 1741; Gaertn., Fruct. Sem. Pl. 1: 268, pl. 56, fig. 5. 1788; J. E. Sm. in Rees, Cyclop., imp. 1 [London], 16: *Gmelina* 1 (1810) and imp. 2 [Philad.], 17: *Gmelina* 1. 1820; Schau. in A. DC., Prodr. 11: 679. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 200. 1858; Watt, Dict. Econ. Prod. India 3: 516. 1889; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1039. 1893; Stapf, Ind. Lond. 3: 299. 1930; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1074. 1932; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1039. 1946; Mold., Biol. Abstr. 27: 2026. 1953; Pételot, Pl. Med. Camb. Laos Vietn. 2: 252 (1954) and 4: 119. 1954;

Mold., Resume 184, 187--190, 195, 196, 199, 218, 297, 423, & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1039. 1960; Mold., Résumé Suppl. 12: 8 (1965) and 18: 7. 1969; Mold., Fifth Summ. 1: 317, 325, 332, & 363 (1971) and 2: 524, 791, & 880. 1971; Mold., Phytologia 34: 269. 1976; Mold., Phytol. Mem. 2: 307, 315, 322, 354, 412, 435, & 549. 1980; Mold., Phytologia 55: 334 & 494 (1984) and 56: 53. 1984.

Illustrations: Rumpf, Herb. Amboin. 1: pl. 40. 1741; Gaertn., Fruct. Sem. Pl. 1: pl. 56, fig. 5. 1788.

This apparently juvenile form, without taxonomic significance, differs in its plainly 2--7-lobed leaves. It sometimes occurs on turions or watersprouts and occasionally even on mature specimens in flower and/or fruit. It appears to be identical to *G. asiatica* f. juv. *lobata* Mold. except that its leaf-blades are conspicuously pubescent beneath, while in the latter they are glabrous.

It should be noted that Gaertner's name, *Gmelina lobata*,, may actually have been proposed by him merely as a substitute (and in his view, a more appropriate) name for Linnaeus' *G. asiatica*. Gaertner does not describe the leaves. My description is based on a specimen in the Leiden herbarium so labeled whose leaves are conspicuously pubescent beneath.

Collectors describe *G. elliptica* f. juv. *lobata* as a small thorny shrub, 2--4 m. tall. with yellow corollas (*Occhioni s.n.*). They have encountered it in old clearings at elevations of sealevel to 25 m., in anthesis in March (*Occhioni s.n.*).

Some collections cited below (viz., *Achmat 239*, *Bakhuizen 1649*, *Clemens 286*, *Docters van Leeuwen 3124*, *Herb. Hort. Bot. Bogor. X.F.17*, and *Lörzing 12957*) are in part typical *G. elliptica* J. E. Sm. and in part f. juv. *lobata*, but it is not stated on the accompanying labels if the branchlets with unlobed leaves and those with lobed leaves did or did not actually come from the same individual plant, but it is assumed that they did. Anwari Dilmy, in a letter to me dated November 15, 1957, has this to say of the photographed here reproduced; "The photo shows a watersprout cut into 5 sections with lobed leaves and a branch from the upper part of the shoot, cultivated in Hort. Bogor as plant XVF.6 under the name of *G. asiatica* var. *villosa*". He continues: "When making a botanical trip in SE. Java Mr. Jacobs collected on the Blambangan Peninsula material of *Gmelina elliptica* J. E. Sm. The shrub was irregularly branched, and produced peculiar watersprouts, one of which he secured. A comparison with material in the Herbarium Bogoriense, by you identified and labelled, learned that the normal twigs were identical with *G. elliptica*, but that the thorny watersprout with lobed leaves was with *G. elliptica* f. *lobata* (Gaertn.) Moldenke. To make things more certain, he examined living shrubs in the Hortus Bogoriensis, where they are cultivated under the name *G. asiatica* L, var. *villosa* Bakh., garden numbers XV F 6, 7, and 19, he found that the twigs in the upper part of the shrub are thornless and bearing simple leaves, and that the watersprouts, with their branches in the lower part of the shrub are thorned and bearing smaller, lobed leaves."

Rant 747, from Amboina, exhibits very tiny, apparently mature,

leaves and very spiny branches and his *no. 214* has even smaller leaves borne on *Junellia*-like branches. These collections seem to represent a small-leaved form of *G. elliptica* strongly reminiscent of the so-called *G. parvifolia* Roxb. Schauer (1847), in fact, recognized *G. parvifolia* as a valid and distinct species and reduced *G. lobata* Gaertn to its synonymy. Possibly the form is worthy of formal designation.

Burger 412 represents a very immature seedling of *G. elliptica* f. juv. *lobata* and the vernacular name, "cafe mera", has been reported for it. Material has been identified and distributed in some herbaria as typical *G. elliptica* J. E. Sm., as well as *G. asiatica* L., *G. hystrix* Kurz, *G. parviflora* Pers., *G. philippensis* Cham., *G. villosa* Blume, and even *Vangueria spinosa* Roxb.

Citations: PHILIPPINE ISLANDS: Cebu: *M. Ramos, Herb. Philip. Bur. Sci. 11088* (Bz--21219). Mindanao: *M. S. Clemens 286* in part (Bz--21215); *E. B. Copeland 346* (N, W--850365); *Mearns 170* (W--447507); *Wilkes s.n.* [Caldera] (W--40646). Mindoro: *E. D. Merrill 918* (W--435887). Tawi-tawi: *S. Olsen 822* (Cp, Ld). Visayas: *Lambert & Brunson 26* (W--1863684). GREATER SUNDA ISLANDS: Celebes: *Rachmat 699* (Bz--21229). Java: *Backer 4582* (Bz--21132), *16579* (Bz--21136), *21385* (Bz--21119), *34145* (Bz--21148); *Bakhuizen 1188* (Bz--21096), *1649* in part (Bz--21117, Bz--21118), *3479* (Bz--21084, Bz--21085), *4263* (Bz--21086); *Edeling s.n.* (Bz--21106); *Hallier 271* (Bz--21081),

s.n. [13.XII.1894] (Bz--21098), *s.n.* [11.VIII.1896] (Bz--21144), *s.n.* [16.VIII.1896] (Bz--21097), *s.n.* [24.VIII.1896] (Bz--21145), *s.n.* (Bz--21099); *Hardenberg 29* (Bz--21090); *Hoogerwerf 79* (Bz--21071); *Koorders 1976** [32986b] (Bz--21179), *2996** [23762b] (Bz--21178); *Kostermans s.n.* (Bz--72916); *Lam 457j* (Bz--21109); *Thorenaar 264* (Bz--21082, Bz--21083, Cp, Ld--photo, N--photo); *Wolff von Wilfing 4867* (Bz--21093). Kangean: *Backer 27331* (Bz--21191), *27548* (Bz--21190). Madura: *Backer 19799* (Bz--21197, Bz--21198), *20346* (Bz--21195); *Vorderman 115* (Bz--21199). Saboenting: *Backer 29904* (Bz--21185). Simalur: *Achmad 239* in part (Bz--21257). Sumatra: *Docters van Leeuwen 3124*in part (Bz--21248); *Lörzing 12957b* (B). MOLUCCA ISLANDS: Amboina: *Rant 214* (Bz--21202), *747* (Bz--21203). CULTIVATED: Brazil: *Occhioni s.n.* [Herb. JaRD. Bot. Rio Jan. 29542] (B). Germany: *Hiendlmayr 27* (Mu--1368). Java: *Burger 412* [2-2-1922] (Bz--21107), *412* [10-6-1922] (Bz--21108); *Herb. Hort. Bot. Bogor. X.F.17* in part (Bz--21069).

GMELINA FASCICULIFLORA Benth. in Benth. & F. Muell., Fl. Austral. 5: 65. 1870.

Synonymy: *Vitex leichhardtii* var. *glabrata* F. Muell. ex Benth. in Benth. & F. Muell., Fl. Austral. 5: 65 in syn. 1870. *Gmelina fasciculifera* F. Muell. ex Uphof, Dict. Econ. Pl., ed. 2, 246. 1968.

Bibliography: Benth. & F. Muell., Fl. Austral. 5: 65. 1870; F. Muell., Sec. Syst. Cens. Austral. Pl. 1: 173. 1889; F. M. Bailey, Cat. Indig. Nat. Pl. Queensl. 35. 1890; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1039. 1893; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 173. 1895; F. M. Bailey, Queensl. Fl. 4: 1177 & 1178. 1901; F. M. Bailey, Compreh. Cat. Queensl. Pl. 386. 1913; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 69 & 93. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1039. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 153 & 186. 1949; Mold., Résumé 209 & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1039. 1960; Willaman & Schubert, Agr. Res. Serv. U. S. Dept. Agr. Tech. Bull. 1234: 237. 1961; Uphof, Dict. Econ. Pl., ed. 2, 246. 1968; Mold., Résumé Suppl. 18: 12. 1969; Mold., Fifth Summ. 1: 346 (1971) and 2: 523 & 880. 1971; Mold., Phytol. Mem. 2: 337 & 549. 1980; Webb & Tracey in Groves, Austral. Veg. 80, fig. 4.6. 1981; Mold., Phytologia 55: 333. 1984.

Illustrations: Webb & Tracey in Groves, Austral. Veg. fig. 4.6. 1981.

A tall tree, nearly glabrous throughout, except for the inflorescence; leaves decussate-opposite; leaf-blades subcoriaceous, ovate, 7.5--35 cm. long, usually to 24 cm. wide, apically obtuse or obtusely acuminate, shiny above; midrib and secondaries much elevated beneath; tertiaries not nearly as intricately reticulate as in *G. leichhardtii*; inflorescence ferruginous-villous or brown-velvety, the cymes reduced to dense, opposite, sessile clusters along the branches of a terminal panicle, bracteate; bracts at the base of the cyme clusters, broad, shorter than the calyx; pedicels very short or obsolete; calyx usually broadly campanulate, about 4 mm. long, apically truncate or more or less distinctly toothed, externally ferruginous-villous; corolla pale-purple or internally cream-color spotted

with blue, externally villous or brown-velvety, the tube short, much more dilated and oblique than in *G. leichhardtii*, the lower lip fully 1.3 cm. long, with a large, broad middle lobe, the lobes of the upper lip all broad but much shorter than the lowest; fruit not seen.

The species is based on an unnumbered Dallachy collection from Rockingham Bay, Queensland, Australia, but the species is said to occur also in "other tropical scrubs" and in "dense vine forests". Vernacular names recorded for it are "toeah" and "white beech".

Citations: AUSTRALIA: Queensland: *Kajewski 1337* (N, S); *Michael 260* (Bz--21268); *Du Rietz 4262* (S); *C. T. White 1337* (S).

GMELINA HAINANENSIS Oliv. in Hook., Icon. Pl. 19: sub pl. 1874. 1889.

Bibliography: Oliv. In Hook., Icon. Pl. 19: pl. 1874. 1889; Forbes & Hemsl., Journ. Linn. Soc. Lond. Bot. 26 [Ind. Fl. Sin. 2]: 257. 1890; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 185. 1902; Dunn & Tutcher, Kew Bull. Misc. Inf. Addit. Ser. 10: 203. 1912; Chung, Mem. Sci. Soc. China 1 (1): 227. 1924; E. D. Merr., Lingn. Sci. Journ. 5: 158. 1927; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 116 & 120--121. 1932; Dop, Rev. Internat. Bot. Appliq. Agric. Trop. 13: 893, 894, & 897. 1933; Dop in Lecomte, Fl. Gén. Indo-chine 4: 842 & 844--845. 1935; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 185. 1941; Mold., Alph. List Inv. Names 24. 1942; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 185. 1959; Mold., Résumé 174 & 456. 1959; Mold., Fifth Summ. 1: 289 & 292 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 279, 281, & 549. 1980; Raj, Rev. Palaeobot. Palyn. 39: 357, 372, & 395. 1983; Mold., Phytologia 55: 336. 337, & 493 (1984) and 56: 34 & 35. 1984.

A tall tree, to 22 m. tall, or erect woody shrub, 2--3 m. tall, with a spreading crown; trunk closely resembling that of *Sapium*, to 90 cm. in girth and 4--18 cm. in diameter at breast height; branchlets pubescent when young, glabrous in age; leaf-scars and lenticels very prominent; flower-buds brownish-gray woolly; leaves decussate-opposite; petioles 3--4.5 cm. long, canaliculate above, brown-pubescent; leaf-blades thick-chartaceous, green above, gray- or bluish-green beneath, broadly ovate, 7--15 cm. long, 5.5--9 cm. wide, apically acute, marginally entire, basally cuneate to truncate, shiny above, downy-pubescent or minutely hispidulous and glandular-hoary beneath; secondaries about 4 per side, prominently elevated beneath; inflorescence terminal, cymose-paniculate, dense; bracts foliaceous, ovate, subsessile, 8--10 mm. long, 5--8 mm. wide, deciduous; flowers ill-scented or odorless, irregular; calyx pale-green, bilabiate, 5-lobed, the lobes broadly ovate-deltoid, externally pubescent and with numerous, large, discoid glands, internally sparsely pubescent; corolla pinkish-white or white to yellow or red, often maroon or purple to lavender and orange within, about 2.5 cm. long, 2 cm. wide at the throat, 2-lipped, both externally and internally glandular-pubescent, the tube about 2.5 cm. long, the lobes fringed with yellowish appressed hairs; stamens 4, white, the filaments and anthers sparsely glandulose; style white, sparsely glandular-pilose; ovary externally densely pubescent; fruit ovoid, about 1.5 cm. long and 1 cm. wide, equaling the fruiting-calyx, glaucescent, green or bluish-green.

This species is based on a B. C. Henry collection from Hainan island, where it appears to be endemic. P'ei (1932) notes that it is distinguishable from all other known Chinese species by its ovoid-deltoid calyx-lobes. He cites from Hainan only *Chun 253* & *1078*, *Hs'ang, Tang. & Fung 97*, *McClure 2724*, and *Tak 500* & *904*.

Raj (1983) describes the pollen on the basis of *How 70453* in the Stockholm herbarium.

The Dop (1933) record from Tonkin, Vietnam, is doubtless a misidentification of *G. racemosa* (Lour.) Merr.

P'ei (1932) distinguishes the Chinese species known to him as follows:

1. Calyx-rim truncate or shortly toothed, the teeth not over 1.5 mm. long.
   2. Ovary densely pubescent, calyx-rim truncate or with only rudimentary teeth; leaf-blades elliptic-ovate.....*G. chinensis*
   2a. Ovary glabrous or nearly so; calyx-rim short-dentate; leaf-blades broadly elliptic.
      3. Erect trees; leaves large, the blades 10--25 cm. long, 5--18 cm. wide; inflorescence erect.....*G. arborea*
      3a. Scandent shrubs, at least when young; leaves small, the blades not over 10 cm. long; inflorescence pendulous....*G. asiatica*

1a. Calyx-rim distinctly lobed, the lobes to 11 mm. long.
   4. Ovary densely pubescent; calyx with many large glands; leaves large, the blades usually 7--15 cm. long and 5.5--7.5 cm. wide; inflorescence dense.....*G. hainanensis*
   4a. Ovary glabrous; calyx usually with only a few large glands; leaves small, not over 2.5 cm. long; inflorescence loose.....*G. delavayana*

Gmelina hainanensis is sometimes reduced to synonymy under the very similar *G. racemosa* (Lour.) Merr.

Collectors have found *G. hainanensis* growing on cleared hillsides partly reverting to forest, in woods and mixed or light woods, in thickets, in dense shade, on dry ground, and on open grassy hillsides, at 320--1700 m. altitude, in flower from March to July, as well as in September, and in fruit in June, August, and September. Fung reports it "fairly common but scattered, in clay on dry gentle slopes", but it is described as "rare" by Lei "on dry level ground in sandy soil of thickets and village commons" and by Lau "in thickets in dry sandy soil on gentle slopes".

The corollas are described as having been "yellow" on *Liang 61767*, "white" on *Lau 75* and *Tsang 704*, "white and yellow" on *Tsang & al. 97*, "white outside, maroon inside" on *McClure 20049* "white or pinkish outside, lavender and orange inside" on *McClure 2724*, "white, but purple inside" on *Ko 52188*, "yellow and purple-red" on *Chun 7007*, "pinkish-white" on *Chun 1078*, "purplish-white" on *Wang 32777*, "white and purple" on *Liang 61985*, "purple with white edge" (Dunn & Tutcher, 1912), "cream" on *Gressitt 1077*, "red" on *Tsang 500*, "yellowish-white" on *How 71643*, and "white tinged with yellow and purplish-red" on *How 70453*.

Vernacular names recorded for the species are "shek tsz", "shek

tsz shue", "shek tzi shu", and "song tsio gun". McClure asserts that the wood is commercially valuable in boat building.

Dunn & Tutcher (1912) list the species from mainland Kwangtung with a question. The alleged occurrence in Annam is most probably a misinterpretation of *G. racemosa* (Lour.) Merr., a taxon which, along with *G. balansae* Dop, is often erroneously reduced to the synonymy of *G. hainanensis*.

Citations: CHINESE COASTAL ISLANDS: Hainan: *Ching 5995* (N); *W. Y. Chun 1078* [Herb. Univ. Nanking 6461] (Ca--239972, N--photo), *7007* (N); *Chun & Tso 32542* (N), *43542* (Bi, Go, N, S); *Dalziel s.n.* [Wu-king-fu, April 1899] (Ed); *Fung 20370* (B, Bz--21272, Ca--11447, Mi, N, W--1751157); *Gressitt 1077* (Gg--316086, I); *How 70453* (Bi, Go, Mi, N, S), *70801* (Bi, Go, N, S), *71643* (Bz--21271); *Ko 52188* (B, N, W--1669633); *Lau 75* (B, Ca--525237, I, Mi, N, W--1629055), *1582* (N), *3664* (Bi, S); *Lei 450* (B, Ba, Bz--21270, Ca--611281, Mi, N, W--1754103); *Liang 61767* (B, N, W--1669762), *61985* (Go, N), *63162* (N), *65341* (N); *McClure 2724* [Herb. Canton Chr. Coll. 9281] (Bi, Gg--127990, N, Ph), *20049* (Ca--603393, N, W--1665058); *Tak [W.-T. Tsang] 500* [Herb. Lingnan Univ. 17249] (B, Ca--356591, N, W--1659772), *904* [Herb. Lingnan Univ. 16403] (Ca--326121, N, W--1249457); *Tsang, Tang, & Fung 97* [Herb. Lingnan Univ. 17628] (N, W--1672550); *Wang 32777* (Go, N, W--1670023).

GMELINA LEDERMANNI H. J. Lam, Verbenac. Malay. Arch. 226. 1919.

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A usually small tree, 10--30 m. tall; outer bark gray-brown, longitudinally fissured; inner bark yellowish; wood pinkish or white; branchlets minutely pubescent, finally glabrescent; leaves decussate-opposite; petioles 2--4 cm. long, at first minutely pubescent, later glabrescent, red-brown; leaf-blades coriaceous, dull mid-green, broadly ovate or ovate-rotundate, 8--14 cm. long, 4.5--9 cm. wide, apically rotundate or abruptly and obtusely acuminate, marginally entire, basally rotundate or slightly cordate, glabrous above when mature, eglandulose, glabrous beneath except for the subpubescent midrib; secondaries 6--8 per side, with 2 large glands beneath the lowermost; principal veins red-brown; inflorescence paniculate, minutely pubescent, eventually glabrescent, pyramidal, 13--25 cm. long, 2--4 cm. wide. terminal, the corymbs borne in the axils of rotundate bracts which are pubescent on both surfaces; calyx 3 mm. long (after anthesis 5 mm. wide), externally pubescent or glabrous and with a few large glands, the rim irregularly 5-dentate or -sinuate to subtruncate; corolla fulvous-yellow or whitish-pink with a yellow spot on the lower lip, 1.4 cm. long, externally appressed-pubescent, the tube 7 mm. long, the limb oblique, marginally pubescent within, bilabiate, the upper lip small, 2-lobed, the lower

lip larger, 3-lobed, with the middle lobe longer than the other two; stamens 4, slightly exserted; style filiform, the apex subulate, not bifid; ovary externally glabrous except for the rigidly pilose apex, 4-celled, 4-ovulate; fruit drupaceous, consisting of a single pyrene, 4-celled, 4-seeded, blue or violet-purple when mature.

This species is based on *Ledermann 6537* and *10455a* and *Schlechter s.n.*, the two former from the Malu headquarters, at an altitude of 60 m., near the Sepik river, New Guinea, at least the first number collected in anthesis on March 3, 1912. The Schlechter collection is from near Dschischugari, at 800 m. altitude, New Guinea, collected in bud on May 25, 1909. All three collection are apparently from the northeastern portion of the island, now known as Territory of New Guinea. Lam (1919) comments that "Our species has a close resemblance with *G. Dalrympleana*, but differs from it by its smaller leaves which never have more than 2 basal glands, its narrower inflorescence, its glabrous calyx, and its yellow corolla." It should be noted, however, that in his formal description he distinctly says "calyx pubescens" -- perhaps it is glabrescent in age. Fedde & Schuster (1941) cite only the two Ledermann collections, implying that only these are to be regarded as cotypes.

It should also be noted that in all probability the Schlechter collection, cited without number by Lam, is his *no. 19566*.

The species has been encountered in lowland hill forests, at 12--800 m. altitude, in flower in March and May, and in fruit in May. While Lam emphasized the yellow color of the corolla, Ridsdale implies that it is mostly pinkish-white with only a "yellow mark" on the lower lip.

Citations: NEW GUINEA: Papua: *Ridsdale NGF.31714* (Mu). Territory of New Guinea: *F. R. R. Schlechter 19566* (Br, Ca--226554, F--photo, Ld--photo, N, N--photo, Si--photo).

GMELINA LEICHHARDTII (F. Muell.) F. Muell. ex Benth. & F. Muell., Fl. Austral. 5: 65. 1870.

Synonymy: *Vitex leichhardtii* F. Muell., Fragm. Phyt. Austral. 3: 58. 1862. *Tectona grandis* W. Hill, Cat. Queensl. Woods [Lond. Internat. Exhib.] 20. 1862; Domin, Bibl. Bot. 89 (6): 1114 in syn. 1928 [not *T. grandis* L. f., 1781]. *Gmelina leichardtii* F. Muell. ex Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1039. 1893. *Gmelina leichhardtii* F. Muell. ex Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2:1285. 1895. *Gmelina leichhardtii* Benth. ex Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 173. 1895. *Gmelina leichardii* Geissman & Hinreiner, Bot. Rev. 18: 91. 1952; Mold., Résumé Suppl. 16: 22 in syn. 1968. *Gmelina leichthardtii* F. Muell. ex Uphof, Dict. Econ. Pl., ed. 2, 71. 1968. *Gmelina leichhardti* Lord, Trees Shrubs Austral. Gard., ed. 5, 22. 1978.

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Proc. Roy. Soc. Queensl. 2: 48. 1885; F. M. Bailey, Queensl. Woods 91. 1888; F. Muell., Sel. Extratrop. Pl., ed. 7, 189. 1888; F. M. Bailey, Queensl. Woods 104. 1889; F. Muell., Second Syst. Cens. Austral. Pl. 1: 171 & 173. 1889; F. M. Bailey, Cat. Indig. Nat. Pl. Queensl. 35. 1890; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1039 (1893) and imp. 1, 2: 1213 & 1285. 1895; Briq. in Engl. & Prantl. Nat. Pflanzenfam., ed. 1, 4 (3a): 173. 1895; Maiden, Agric. Gaz. N. S. Wales 6: [287]--289 & 681. 1895; F. M. Bailey, Queensl. Fl. 4: 1177 & 1178. 1901; Gamble, Man. Indian Timb., ed. 2, imp. 1, 537 & 778. 1902; Maiden, Commerc. Timb. N. S. Wales, ed. 2, 23. 1904; Maiden, For. Fl. N. S. Wales 1: 185, pl. 33. 1904; MacMahon, Merch. Timb. Queensl. 53. 1905; Maiden, For. Fl. N. S. Wales 2: 199 (1906) and 4 [40], pl. [20] & [21]. 1910; Gerth van Wijk, Dict. Plantnames, imp. 1, 1: 596. 1911; Guilfoyle, Austral. Pl. 187. 1911; F. M. Bailey, Compreh. Cat. Queensl. Pl. 386. 1913; Maiden, Some Princip. Comm. Trees N. S. Wales [N. S. Wales For. Handb.] 207. 1917; H. J. Lam, Verbenac. Malay. Arch. 221. 1919; Gamble, Man. Indian Timb., ed. 2, imp. 2, 537 & 778. 1922; Janssonius, Mikrogr. Holz. Java 804. 1926; Domin, Bibl. Bot. 22 (89): 1114. 1928; Francis, Proc. Linn. Soc. N. S. Wales 53: 474--484, fig. 1--9, & pl. 29--31. 1928; Francis, Austral. Rain-for. Trees, ed. 1, 333--336, fig. 222--224. 1929; Stapf, Ind. Lond. 3: 299. 1930; Dadswell & Eckersley, Austral. Counc. Sci. Ind. Res. Bull. 90: 70, fig. 55. 1935; Wangerin, Justs Bot. Jahresber. 56 (1): 669 (1936) and 58 (1): 845. 1938; Birch & Lyons, Journ. Proc. Roy. Soc. N. S. Wales 71: 391--405. 1938; Fedde, Justs Bot. Jahresber. 58 (2): 550. 1939; Harradence & Lyons, Chem. Abstr. 35: 460. 1941; Mold., Suppl. List Inv. Names 3. 1941; Worsdell, Ind. Lond. Suppl. 1: 441. 1941; Mold., Alph. List Inv. Names 25. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 69 & 93. 1942; Aulin-Erdtman & Erdtman, Chem. Abstr. 38: 5821. 1944; Mold., Phytologia 2: 104. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1039 (1946) and imp. 2, 2: 1213 & 1285. 1946; H. N. & A. L. Mold., Pl. Life 2: 69. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 153, 160, & 186. 1949; Metcalfe & Chalk, Anat. Dicot. 2: 1037. 1950; Francis, Austral. Rain-for. Trees, ed. 2, 366--369, fig. 230--231. 1951; Geissman & Hinreiner, Bot. Rev. 18: 91. 1952; Birch, Hughes, & Sm., Austral. Journ. Chem. 7: 83. 1954; Anon., U. S. Dept. Agr. Bot. Subj. Ind. 15: 14357. 1958; Karrer, Konstit. Vork. Org. Pflanzenst. 464. 1958; Mold., Résumé 209, 218, 297, 385, & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1039 (1960) and imp. 3, 2: 1213 & 1285. 1960; Beadle, Evans, & Carolin, Handb. Vasc. Pl. Sydney Dist. 415. 1962; Gerth van Wijk, Dict. Plantnames, imp. 2, 1: 596. 1962; Streets, Exot. For. Trees Brit. Commonw. 401. 1962; Lord, Shrubs Trees Austral. Gard., ed. 2, 22--23. 1964; Neal, In Gard. Hawaii, ed. 2, 720 & 730. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 1: 1105. 1966; Blombley, Guide Nat. Austral. Pl. 191. 1967; D. & E. Venkata Rao & Viswanadham, Curr. Sci. India 36: 71. 1967; Mold., Résumé Suppl. 16: 22. 1968; Uphof, Dict. Econ. Pl., ed. 2, 71, 246, & 513. 1968; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Ind. 6: 264. 1969; Mold., Résumé Suppl. 18: 12. 1969; Gerth van Wijk, Dict. Plantnames, imp. 3, 1: 596. 1971; Mold., Fifth Summ. 1: 346, 363, &

423 (1971) and 2: 524, 720, & 880. 1971; Beadle, Evans, Carolin, & Tindale, Fl. Sydney Reg., ed. 2, 508. 1972; Gamble, Man. Indian Trees, ed. 2, imp. 3, 537 & 778. 1972; T. B. Muir, Muelleria 2: 167. 1972; Hegnauer, Chemotax. Pfl. 6 [Chem. 21]: 663. 1973; Howes, Dict. Useful Pl. 25 & 255. 1974; Napp-Zinn, Anat. Blatt. A (1): 232, 352, & 383. 1974; Mold., Phytologia 34: 269. 1976; Lord, Trees Shrubs Austral. Gard., ed. 5, 22--23. 1978; Mold., Phytol. Mem. 2: 237, 354, & 549. 1980; Francis, Austral. Rain-for. Trees, ed. 4, 366--369 & 372, fig. 230--232. 1981; Mold., Phytologia 50: 261 & 265 (1982) and 54: 240. 1983; Munir in Morley & Toelken, Flow. Pl. Austral. 286 & 287, fig. 174 b & c. 1982; Mold., Phytologia 55: 333 (1984) and 56: 38. 1984.

Illustrations: Maiden, Agric. Gaz. N. S. Wales 6: [287]. 1895; Maiden, For. Fl. N. S. Wales 1: pl. 33 (1904) and 4: pl. [20] & [21]. 1910; Guilfoyle, Austral. Pl. 187. 1911; Maiden, Some Princip. Comm. Trees N. S. Wales [N. S. Wales For. Handb.] 207. 1917; Francis, Proc. Linn. Soc. N. S. Wales 53: pl. 29--31 & fig. 1--9. 1928; Francis, Austral. Rain-for. Trees, ed. 1, 333--335, fig. 222--224. 1929; Dadswell & Eckersley, Austral. Counc. Sci. Ind. Res. Bull. 90: fig. 35. 1935; Francis, Austral. Rain-for. Trees, ed. 2, 366, 368, & 369, fig. 230--232 (1951) and ed. 4, 366, 368, & 369, fig. 230--232. 1981; Munir in Morley & Toelken, Flow. Pl. Austral. 286, fig. 174 b & c. 1983.

A large, usually tall tree, to 130 feet in height; trunk to 4 feet in diameter at breast height, flanged at the base but not prominently buttressed; bark gray or dark-gray, scaly, the scales generally angular but occasionally rounded, brownish-yellow when cut, flesh-color near the sapwood, about 1.25 cm. thick on trees with a 2-foot trunk-diameter; wood white, with a tinge of brown or very pale-brown to gray-brown, medium-textured, strong, very durable, resistant to termite attack, easily worked, subject to little or no shrinkage in dry weather or expansion in wet weather, not likely to warp, plain or rather close-grained, weighing 35--50 pounds per cubic foot; young branches thick, downy-tomentose with light-brownish hairs; leaves decussate-opposite, partly deciduous, quickly detaching in drying; petioles fairly thick, 2.5--3.5 cm. long, downy-pilose with 1--5-celled brownish hairs; leaf-blades subcoriaceous, ovate or broadly ovate, 7--14 cm. long, 1½--3 times as long as wide, apically obtuse or acute to subacuminate, marginally entire, basally obtuse or rounded to cuneate, glabrous and subrugose above, densely and softly downy-tomentose (especially on the venation) beneath with long, weak, 2- or 3-celled hairs and 4-branched round-based glanduliferous hairs intermixed; midrib, secondaries, and principal veinlets visible on both surfaces, prominent and hairy beneath, the veinlets conspicuously reticulate; inflorescence large, terminal, paniculate, ovoid or short-pyramidal. surpassing the leaves, tomentose like the branchlets, the cymes opposite, pedunculate; pedicels much shorter than the flowers; flowers large and conspicuous; calyx broadly turbinate-campanulate, 3.5--6 mm. long, obscurely 2-lipped, externally villous or tomentose, the rim truncate, enlarging and spreading beneath the fruit; corolla about 2.5 cm. long, white with purple and

yellow markings or sometimes entirely purple, externally villous, the tube very broad and apically dilated, 8--10 mm. long, the limb 5-lobed, the lobes ovate, spreading, over 4 mm. long, shorter than the tube, the 2 upper ones smaller and shortly united to form an upper lip, the 3 lower ones larger, forming the lower lip, the middle one purple surrounding 2 small bars of yellow; stamens slender, incurved, inserted near the corolla-base, didynamous, the shorter pair about 12.5 mm. long, the longer pair about 15.5 mm. long, about equalling the upper lip; anther-cells (thecae) two, divergent; style short, slender, about 18.6 mm. long; stigma shortly bifid; ovary globose, 4-locular; fruiting-calyx horizontally patent or flattened, 1.2--1.6 cm. wide, the rim obscurely sinuate-toothed; fruit drupaceous, round or subrotund, 2.5 cm. long and wide or somewhat wider, often deformed or destroyed by insects, blue or mauve to deep-indigo when mature, the exocarp fleshy, the endocarp osseous, the pyrene at least apically 4-celled, each cell 1-seeded; seeds oval, about 7.5 mm. long.

This species is based on an unnumbered Leichhardt collection from Myall Creek, Queensland, Australia, but Mueller (1870) cites also an unnumbered W. Hill collection as *W. Hill, Queensland Woods, London Exhibition (1862) 30* and *Fizalan s.n.* from Queensland, as well as *Beckler s.n., W. Moore N.S. Wales Woods, London Exhibition (1862) 68 & 171* and *Macarthur, Paris Exhibition (1855) 193* from New South Wales. He refers to it as "a fine timber tree".

Collectors have found this plant growing in rainforests, in flower in February and in fruit in April. Clemens describes the corollas as "white with purple".

Francis (1981) asserts that normally the tree flowers in November and December and bears fruit in March and April. He records it from "As far south as Shoalhaven River, N.S.W. (J. H. Maiden), to Eungella Range (west of Mackay), Queensland." He goes on to say that "The timber is one of the most useful of Australian scrub woods. It is durable, easy to work, and does not shrink very much. It is used for almost all indoor purposes such as furniture-making, general fittings, and wood-carving. Owing to the high reputation of the timber in the past and present, it is not plentiful now." He provides photographs of it growing in situ in company with *Solanum mauritianum* and *Araucaria cunninghamii*. He notes that "most of the old leaves are shed in November and the new leaves appear early in December or late in November."

As indicated above, the tree is highly prized for its very useful timber, which is employed locally for various purposes, having excellent woring quality. In shipbuilding it is used for decking and templates; furthermore it is used in pattern making and turnery, in wood carving, and to manufacture churns, veranda floors, gratings, pully blocks, the floats of millwheels, window jambs, picture frames, furniture, wine vats, "and innumerable other purposes".

Vernacular names reported for the species are "beech", "binburra", "coo-in-new", "cullonen", "cullouen:, "gray teak", "grey teak", "Queensland beech", "white-beech", "white beech", and "whitebeech".

Streets (1962) refers to the plant as "A rain-forest species of very wide distribution, from New Zealand to New South Wales and

central Queensland. In New Zealand the rainfall is about 60--100 in a year with a winter maximum, and in Queensland about 40--60 in with a summer maximum. [It is] associated with such species as *Agathis robusta* (Kauri), on damp rich loams in valleys from near sea-level to about 2,500 ft." It has been introduced into Kenya and South Africa in commercial plantings. Troup (1932) reports that in South Africa it is a tree "of slow growth and poor form. A 30year-old plantation at 4,000 ft had a mean height of 30 ft and 12.4 in diameter in a stocking of 34 stems per acre on a deep fine soil with 66-in annual rainfall, many trees were forked."

Maiden (1895) informs us that the species needs careful conservation, perhaps by artificial propagation, since "one sees so few seedlings or saplings.....in its native haunts.....It would be nothing less than a calamity if this valuable tree were to practically die out. In most cases our trees propagate themselves readily, and what is chiefly required is to conserve the young growth..... but in the case of the White Beech I think an exception should be made, and artificial propagation resorted to in suitable localities."

Lord (1964) and Uphof (1968) aver that the species is suitable for the northeastern high forest country of Australia and that in its natural habitat it usually occurs sparsely in the mixed jungles of the coastal lowlands of New South Wales and Queensland." Dadswell & Eckersley (1935) provide detailed notes on the characters of its wood anatomy.

Napp-Zinn (1974), quoting Francis (1928), reports: "Blattstiel mit ein- bis fünfzelligen bräunlichen Haaren, Spreiten-US [=unterseits] mit langen, weichen, zwei- bis dreizelligen Haaren, besonders zahlreich auf den Nerven; viergliedrige Drüsenhaare mit kugelförmiger Baselzelle auf der Spreinte-US."

Mueller (1868) notes: "nuper ad Illawara detegebatur, nec non ad flumen Richmond's River. Drupa statu imperfecto visa globosa, exsuccosa, ½--2/3" metiens. De *Ephieli simplicifolia* sive *Vitice macrophylla* videbis observationes eximias Seemanni in Flor. Vit. p. 189."

Kerrer (1938) reports on the chemical characters and formula of the substance, gmelinol, found in this species. Its formula is $C_{22}H_{26}O_7$. Birch & Lyons (1938) describe structural studies on the same substance derived from wood shavings and denominated by them as "gmelinolia lignane".

Domin (1928) cites an unnumbered collection made by him in March of 1910 in Australia.

It should be noted here that the Mueller (1862) reference to this species in the bibliography (above) is sometimes cited as "1862--1863", and the author's name is sometimes inaccurately written as "G. L. F. Muell." -- his full name actually was Sir Ferdinand Jacob Heinrich von Müller.

Citations: AUSTRALIA: New South Wales: *J. B. Campbell 212* (Ng--16907); *Collector undetermined s.n.* [Pine Ck., 15.9.1950] (Ng--16906); *Maiden s.n.* [Port Macquarie, Nov. '9;] (Mi); *A. Phillips s.n.* [March 1940] (S). Queensland: *M. S. Clemens 43570* (Mi), *s.n.* [Brisbane, 10 April 1945] (Ca--81169, Mi), *s.n.* [1 February 1946] (Mi), *s.n.* [March 1947] (F--photo, Ld--photo, N, N--photo, Or--

55583, Si--photo), *s.n.* [Dalrymple Heights, July-Nov. 1947] (Ca--81168, Mi, N). CULTIVATED: Australia: *Herb. Sydney Bot. Gard. s.n.* (F--photo, Gg--198856, Ld--photo, N--photo, Sg--photo); *Kaulfuss s.n.* [Bot. Gard. Sydney 12.1908] (Mu--4155); *E. Wall 51* [12/1908] (Ew, Ld--photo, N). Hawaiian Islands: *McEldowney s.n.* [Aug. 6, 1948] (Bi, Bi). MOUNTED ILLUSTRATIONS: Francis, Austral. Rain-for. Trees, ed. 1, 335, fig. 224. 1929 (Ld) and ed. 4, 369, fig. 231. 1981 (Ld); Maiden, Agric. Gaz. N. S. Wales 6: 287. 1895 (Ld).

GMELINA LEPIDOTA Scheff., Ann. Jard. Bot. Buitenz. 1: 41--42. 1876.

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A somewhat climbing shrub or tree, to 30 m. tall; trunk to 60 cm. in diameter at breast height; branchlets ferruginous-pubescent; leaves decussate-opposite; petioles about 2.5 cm. long, ferruginous-pubescent; leaf-blades ovate or elliptic to narrow-elliptic, 5.5--11 cm. long, 1.5--6 cm. wide, apically sharply acute or short-acuminate, marginally entire, basally acute or acuminate, glabrous and shiny above, densely brown-lepidote with minute scales beneath; secondaries 4--6 pairs; inflorescence terminal, paniculate, lax, pyramidal, the cymules ferruginous-pubescent; flower-buds yellow; calyx about 5 mm. long, externally lepidote, the rim shortly 5-toothed; corolla large, 1.8 cm. long, externally pubescent, the tube 3 times as long as the smaller lobes, the limb bilabiate, the upper lip 2-lobed, the lower lip 3-lobed with the central lobe longer than the others; stamens 4; filaments pilose; ovary 4-celled, 4-ovulate; fruiting-calyx enlarged, to 8 mm. long; fruit drupaceous, about 1 cm. long, the pyrene 1--4-celled.

Lam (1919) comments: "Its affinity is with *G. Leichhardtii* F. v. Muell. from tropical Australia. The latter species,, however, is a tree and differs from the present one in the [leaf] texture, and in the dimensions of calyx and corolla." The present species, however, is also described by collectors as growing to be a large tree. It would appear that the lepidote lower leaf-surface and calyx are its chief distinguishing characters.

Gmelina lepidota is based on *Teijsmann 6744* from Tow island, New Guinea, collected in August, 1871, and deposited in the Buitenzorg herbarium. Lam (1919) misspells the island name "Faw". Whitmore

(1966) refers to the species as "a rare big tree" in disturbed lowland forests in the Solomon Islands west to New Guinea, but not on Santa Cruz island. He reports the vernacular name, "maladala". It has been encountered at up to 1000 m. altitude.

Citations: MOLUCCA ISLANDS: Morotai: *Kostermans & Aden 1276* (Bz--72964); *Kostermans, Main, & Aden 1276* (Ng--16920, Ng), *1292* (Bz--72874, N, Ng--16933, Ng). Ternate: *Haan 287* [Boschbouwproefst. bb. 23789] (Bz--21351). NEW GUINEAN ISLANDS: Tow: *Teijsmann 6744* (Bz--21273--type, Ld--photo of type, N--isotype, N--photo of type).

GMELINA LEPIDOTA var. *LANCEOLATA* Mold., Phytologia 6: 325--326. 1958.

Bibliography: Mold., Phytologia 6: 325--326. 1958; Mold., Biol. Abstr. 33: 1215. 1959; Mold., Résumé 204 & 456. 1959; Hocking, Excerpt. Bot. A.5: 44. 1962; Mold., Fifth Summ. 1: 339 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 329 & 549. 1980; Mold., Phytologia 55: 334. 1984.

This variety differs from the typical form of the species in having its leaf-blades quite distinctly lanceolate and more elongate, 12--22.5 cm. long, 3--6 cm. wide, apically acuminate, and basally apruptly acute.

The variety is based on *Mair 1894* from deep volcanic soil in a rainforest, at 500 m. altitude, at Nantambu, Open Bay, New Britain, in the Bismark Archipelago, deposited in the herbarium of the Department of Forests at Lae, New Guinea. The collector describes the plant as a tree, 65 feet tall, the bole 45 feet high, buttressed to 2 feet, with a diameter of 2 feet at breast height, and a leafy crown. The outer bark is described as dark gray-brown, with closely spaced, irregular, longitudinal fissures, scaling off in 6.2--12.5 mm. plates, with some black pustular lenticels unevenly distributed, about 3 mm. thick. The under bark is light creamy-yellow, the inner bark creamy-yellow with light-brown dappling, about 9 mm. thick. The sapwood is indefinite, the wood light straw-color, with a greasy feel. The leaves are decussate-opposite, simple, dark-green above, apically tapering, and with prominent creamy-yellow venation above, dull gray-brown with stellate pubescence and prominent venation beneath. The petioles are 2.5--3 cm. long. The peduncles are tetragonal in cross-section, and the inflorescence is both terminal and axillary in the uppermost leaf-axils, paniculate. The flowers are borne in sessile opposite cymules, subtended by herbaceous bractlets. The corolla is mauve, bilabiate, about 13 mm. long, externally with dark-purple hairs.

Citations: BISMARK ARCHIPELAGO: New Britain: *Mair 1894* (Ld--isotype, Ng--6593--type).

GMELINA LIGNUM-VITREUM Guillaum., Bull. Mus. Hist. Nat. Paris, ser. 2, 23: 539--540. 1952.

Synonymy: *Gmelina* [sp.] ?, Guillaum., Bull. Mus. Hist. Nat. Paris, ser. 2, 22: 118. 1950.

Bibliography: Guillaum., Bull. Mus. Hist. Nat. Paris, ser. 2, 22: 118 (1950) and ser. 2, 23: 539--540. 1952; Sarlin, Cent. Techn. For. Trop. Publ. 6: [270]--271, 285, 293, & 295, pl. 131. 1954; G. Taylor,

Ind. Kew. Suppl. 12: 63. 1959; Mold., Phytologia 23: 425. 1972; Mold., Phytol. Mem. 2: 331 & 549. 1980; Mold., Phytologia 55: 333. 1984.

Illustrations: Sarlin, Cent. Techn. For. Trop. Publ. 6: [270], pl. 131. 1954.

A small or medium-sized tree; trunk black, elongate, 12--15 m. long, narrow, crooked, smooth, with a diameter of 60--80 cm., diminishing at the rate of 1.6 cm. per m., basally buttressed, eventually fissured, the fissures elongate, narrow, moderate in depth; bark 10--12 mm. thick, even, blackish, the outer portion 3 mm. thick, very firm, dark-colored, the inner portion spongy, friable, 7--8 mm. thick, gray; sapwood white, veined with rose; heartwood salmon-color, very brittle, odorless; branches short, rather crooked, leafy, at first minutely lanuginous, finally glabrous, with black bark; branchlets smooth, dark except for the white leaf-scars and lenticels; leaves decussate-opposite, simple, deciduous in December and January; petioles 2--3 cm. long; leaf-blades membranous, narrowly elliptic or ovate-lanceolate, 10--13 cm. long, 4--7 cm. wide, apically usually acutely attenuate or acute to obtuse, marginally entire, basally cuneately acute or acuminate to rounded, at first minutely lanuginous and glandular on both surfaces, finally glabrous, the venation delicate and distinctly prominent on the lower surface, less so above; inflorescence terminal, spicately paniculate, about 7 cm. long, in the live state malvaceous-silvery, when dried rufous-lanate or pubescent; bracts very narrowly lanceolate or linear; calyx campanulate, externally lanuginous, internally glabrous, the rim more or less irregularly 5-undulate or 5-dentate with small, irregular, apically acute teeth; corolla-tube externally lanuginous or velutinous, internally glabrous, the lobes somewhat unequal, oblique, rounded, in bud 5 mm. long and lanuginous or velutinous on both surfaces; fertile stamens 4; anthers 2-locular, the thecae apically united; staminode 1; style short; fruit fleshy, ovoid, 4 cm. long, 3 cm. wide, plum-color, externally glabrous, the pyrene thick, conic, basally with numerous unequal points.

This species is based on *Sarlin 81, 137* in part, & *140* from the forest at Thy, New Caledonia, probably deposited in the Paris herbarium. Guillaumin (1952) comments that it is "Bien différent dès le premier aspect du *G. neocaledonica* S. Moore, notamment par ses feuilles minces, ovales-lanceolées, glabres a l'état adulte".

I know nothing of this apparently endemic New Caledonian species beyond what is said of it in the literature. Guillaumin (1954) says of it "Le bois a une odeur de futaille à l'état vert. Devient jaune clair en séchant, homogène, sans accroissements visibles" and this is followed by more details of the wood anatomy. He concludes: "Bois: Blanc brillant à peine jaunâtre. Bon bois, inutilisableable en raison de sa rareté." He records the local vernacular name, "bois de verre", and comments that the deciduous nature of the species is exceptional in the New Caledonian forest flora. He reports that the tree flowers and fruits in December. In his 1950 work he cites *Sarlin 81* & *141* from "Forêt de Thy".

Citations: MOUNTED ILLUSTRATIONS: Guillaum. in Sarlin, Cent.

Techn. For. Trop. Publ. 6: pl. 121. 1954 (Ld).

GMELINA MISOOLENSIS Mold., Phytologia 4: 54. 1952.

Bibliography: Mold., Phytologia 4: 54. 1952; Mold., Résumé 203 & 456. 1959; G. Taylor, Ind. Kew. Suppl. 12: 63. 1959; Mold., Fifth Summ. 1: 338 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 328 & 549. 1980; Mold., Phytologia 55: 335. 1984.

A tree, to 12 m. tall; trunk to 12 cm. in diameter at breast height; branches and branchlets rather stout, glabrate, often white- or gray-flecked; principal internodes 1--7 cm. long; nodes not annulate; leaves decussate-opposite; petioles rather slender, 1.5--2.5 cm. long, nigrescent in drying, glabrous, flattened above; leaf-blades coriaceous, bright-green and very shiny on both surfaces, elliptic, 5.5--12 cm. long, 3--6 cm. wide, apically rounded or obtuse, marginally entire, often somewhat revolute in drying, basally acuminate, very smooth on both surfaces; midrib rather coarse, flat above, very prominent beneath; secondaries very slender, 4--6 per side, arcuate-ascending, anastomosing in many loops several mm. from the margins beneath, flat above, prominulous beneath; veinlet reticulation sparse, flat above, very slightly subprominulous beneath on the larger parts only; inflorescence racemose-paniculate, terminating short axillary twigs, 9--18 cm. long, 2--3 cm. wide, brunnescent or nigrescent throughout in drying; peduncles slender, 2--3.5 cm. long, glabrous; rachis similar to the peduncles, greatly elongated, composed of 5--10 sympodia, strict, glabrous; pedicels very slender, about 2 mm. long, glabrous; flowers not seen; fruiting-calyx campanulate, about 3 mm. long and 5 mm. wide, nigrescent, glabrous on both surfaces, truncate, split to the base into 2 subequal, truncate, quadrate lobes when mature; fruit drupaceous, obovate, green when young, red when ripe, about 12 mm. long and 6 mm. wide (when immature).

The type of this very distinct species was collected by Didit Rudolf Pleyte (*no. 1087*) at Fakal, on Misool island in the Radja Ampat group of islands, near New Guinea, on September 30, 1948, and is deposited in the Herbarium Bogoriense at Buitenzorg. The species is thus far known to me only from the original collection. The vernacular name, "batan me", has been reported for it.

Citations: NEW GUINEAN ISLANDS: Misool: *Pleyte 1087* (Bz--72872--type, Bz--72871--isotype, Ld--photo of type, N--isotype, N--photo of type).

GMELINA MOLUCCANA (Blume) Backer ex K. Heyne, Nutt. Pl. Ned. Ind. 4: 118. 1917.

Synonymy: *Tittius* Rumpf, Herb. Amboin. 3: 38, pl. 20. 1743. *Tittius alba* Rumpf, Herb. Amboin. 3: 38. 1743. *Tittius rubra* Rumpf, Herb. Amboin. 3: 38, pl. 20. 1743. *Vitex moluccana* Blume, Bijdr. Fl. Ned. Ind. 14: 813--814. 1826. *Gmelina macrophylla* Wall., Numer. List 49 [=50], no. 1819 hyponym. 1829; Schau. in A. DC., Prodr. 11: 680. 1847 [not *G. macrophylla* (R. Br.) Benth., 1870]. *Gmelina glandulosa* H. Hallier, Meded. Rijks Herb. Leid. 37: 57. 1918. *Gmelina moluccana* Miq. ex H. Hallier, Meded. Rijks Herb. Leid. 37:

57 in syn. 1918. *Gmelina moluccana* Backer apud A. H. Hill, Ind. Kew. Suppl. 7: 104. 1929. *Gmelina salomonensis* Bakh., Journ. Arnold Arb. 16: 72--73. 1935. *Gmelina solomonensis* Bakh. ex Mold., Résumé Suppl. 3: 32 in syn. 1962. *Gmelina solomensis* Bakh., in herb. *Geunsia moluccana* Lam, in herb.

Bibliography: Rumpf, Herb. Amboin. 3: 38, pl. 20. 1743; Poir. in Lam., Encycl. Méth. Bot. 5: 163. 1804; Blume, Bijdr. Fl. Ned. Ind. 14: 813--814. 1826; Wall., Numer. List 49 [=50], no. 1819. 1829; D. Dietr., Syn. Pl. 3: 611. 1843; Voigt, Hort. Suburb. Calcut. 470. 1845; Schau. in A.DC., Prodr. 11: 680 & 695. 1847; Buek, Gen. Spec. Syn. Candol. 3: 200 & 502. 1858; Miq., Fl. Ned. Ind. 2: 865 & 867. 1868; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1:1040 (1893) and imp. 1, 2: 1214. 1895; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 173. 1895; H. Hallier, Jahrb. Hamburg. Wiss. Anst. 22 (3): 31--46. 1905; K. Heyne, Nutt. Pl. Ned. Ind., ed. 1, 4: 118. 1917; E. D. Merr., Interpret. Rumph. Herb. Amboin. 452 & 594. 1917; H. Hallier, Meded. Rijks Herb. Leid. 37: 56--67. 1918; H. J. Lam, Verbenac. Malay. Arch. 216, 220, 225--226, & 366. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 65 & 67--68. 1921; Fedde, Justs Bot. Jahresber. 45 (1): 525. 1923; Fedde & Schust., Justs Bot. Jahresber. 45 (1): 148. 1923; H. J. Lam in Lauterb., Engl. Bot. Jahrb. 59: 93. 1924; A. W. Hill, Ind. Kew. Suppl. 6: 92. 1926; K. Heyne, Nutt. Pl. Ned. Ind., ed. 2, 1: 24 (1927), ed. 2, 2: 1321 (1927), and ed. 2, 3: 1646. 1927; Bakh., Journ. Arnold Arb. 10: 71. 1929; A. W. Hill, Ind. Kew. Suppl. 7: 104. 1929; Stapf, Ind. Lond. 6: 479. 1931; Bakh., Journ. Arnold Arb. 16: 72--73. 1935; A. W. Hill, Ind. Kew. Suppl. 9: 125. 1938; Mold., Suppl. List Comm. Vern. Names 22. 1940; Mold., Alph. List Inv. Names 25. 1942; Mold., Phytologia 2: 104. 1945; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 64, 67, 68, & 93. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1040 (1946) and imp. 2, 2: 1214. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 144, 148, 150, & 186. 1949; C. T. White, Journ. Arnold Arb. 31: 113. 1950; Mold., Phytologia 4: 178. 1953; Bakh. & Van Steenis, Taxon 5: 81. 1956; Mold., Résumé 190, 197, 199, 201, 204, 296, 297, 354, 386, & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1040 (1960) and imp. 3, 2: 1214. 1960; Mold., Résumé Suppl. 3: 32. 1962; Whitmore, Guide For. Brit. Solom. Isls. 115, 116, 135, & 184. 1966; Whitmore, Gard. Bull. Singapore 22: [17]--21. 1967; Uphof, Dict. Econ. Pl., ed. 2, 246. 1968; Anon., Biol. Abstr. 50 (12): B.A.S.I.C. S. 84. 1969; Mold., Biol. Abstr. 50: 6338. 1969; Mold., Phytologia 18: 71. 1969; Mold., Résumé Suppl. 18: 12. 1969; Anon., Biol. Abstr. 51 (17): B.A.S.I.C. S.89. 1970; Hocking, Excerpt. Bot. A.15: 422. 1970; Mold., Biol. Abstr. 51: 9630. 1970; Mold., Phytologia 19: 439. 1970; Mold., Excerpt. Bot. A.18: 445. 1971; Mold., Fifth Summ. 1: 325, 330, 332, 336, 339, & 340 (1971) and 2: 523, 524, 643, 722, 880, & 970. 1971; Versteegh, Meded. Landbouwhogesch. Wagen. 71-19: 15, 37, & 38. 1971; Foreman, Div. Bot. Dept. For. N. Guin. Bot. Bull. 5: 63, 126, & [127]. 1972; Rouleau, Taxon Ind. 1: 382. 1972; Anon., Gov. For. Exp. Sta. Meguro Tokyo 254: 60, 61, 64, & 66, fig. 2 & 3. 1973; Hartley, Dunstone, Fitzg., Johns, & Lamberton, Lloydia 36: 293. 1973; Farnsworth, Pharmacog. Titles 9 (1): xii. 1974; Mold., Phytologia 28: 448 (1974) and 31:

391. 1975; Mold., Phytol. Mem. 2: 315, 320, 322, 327, 329, 330, 354, 445, & 549. 1980; Mold., Phytologia 55: 330, 334, 335, & 493 (1984) and 56: 35, 38, & 39. 1984.

Illustrations: Rumpf, Herb. Amboin. 3: pl. 20. 1743; Foreman, Div. Bot. Dept. For. N. Guin. Bot. Bull. 5: [127]. 1972; Anon., Gov. For. Exp. Sta. Meguro Tokyo 254: 64 & 66, fig. 243. 1973.

A large, erect, leafy, many-branched, canopy tree, often to 40 m. tall; trunk often buttressed, straight or crooked, the bole cylindric, to 20 m. long and 1 m. in diameter above the buttresses and 1.5--2 m. in girth, often 62 cm. in diameter at 1.5 m. above the base, 41 cm. at 2 m., and 25 cm. at the first branch, sometimes 10--18 m. to the first branch; buttresses, when present, variable, thick and rounded, sometimes slight or even not prominent but ascending 1.5--3 m. up the trunk and sometimes 50 cm. wide, frequently concave; crown usually dense, sometimes medium-dense or sparse; outer bark dark- or pale-brown to gray-brown, gray, or light yellowish-gray, sometimes brown- or greenish-brown-banded or -blotched, soft, smooth, shallow, 1--3 mm. thick, rather corky, deeply or shallowly and finely longitudinally fissured or fluted (the depressions wide-spaced, about 9 mm. wide and pustular-lenticellate), often exfoliating in small, irregular, thick, pustular flakes; under bark light-straw; inner bark creamy-green or very light- to medium-brown, orange-brown, pale-straw, dirty-white, or pinkish-white, sometimes white-banded, rapidly turning red or orange-red to reddish-brown or brown on exposure, about 1 cm. thick, with an unpleasant odor; outer wood or sapwood white, cream, or straw-color to light- or pale-brown with a pink tinge, light, weak, very soft in cross-cut, with a very unpleasant or sour odor, 3--7 cm. thick or often not clearly defined, the exudate slight and odorless; heartwood very light-brown or brownish. often rotted; slash hard, white; blaze a thin brown line or white with occasional brown flecks, turning to orange in a minute on exposure; branchlets (about 7 mm.) thick, obscurely tetragonal, sparsely lenticellate with scattered, lighter, often green, elliptic lenticels which are raised beneath, the younger parts densely appressed ferruginous- or ochraceous-pubescent or rufous-tomentose, in age glabrescent, grayish, and terete, shiny; leaves decussate-opposite, large, simple, petiolate, held horizontally, usually clustered at the ends of the branches, often attacked by insects, at times shed from the crown; petioles stout, subterete, 1.5--10 cm. long, 2--5 mm. wide, slightly sulcate or canaliculate above, densely ferruginous-puberulent or brown-pubescent with simple hairs in the sulcation and apically when young, later glabrescent; leaf-blades large, coriaceous when mature, oval or ovate to broadly ovate or ovoid, sometimes oblong-elliptic, obovate-subrotund, or obovate, 10--40 cm. long, 7--35 cm. wide, apically very shortly acuminate to blunt or obtuse, marginally entire or lightly and irregularly sinuate, basally subacute or obtuse to rounded or subcordate, dull or glossy dark-green above, paler and light- or gray-green beneath, densely pilose or finely villous when young but finally glabrous (except for the ferruginous-puberulent larger venation) above, softly brown-villous or ferruginous-puberulent to rufous-

tomentose beneath (except for the glabrous larger venation), with 2 rather large concave glands at the base beneath, often rugose or bullate above, sometimes [f. *glandulosa* (H. Hallier) Mold.] also with many large, dark, discoid glands above and similar but smaller ones along the larger venation beneath; secondaries pinnate, 8--18 per side, impressed above, prominulently raised beneath; veinlets clathrate-reticulate, prominulent beneath; inflorescence racemose, mostly terminal, sometimes also axillary, the terminal ones large, 15--30 cm. long and 10--25 cm. wide, pyramidal-paniculate, pedunculate, very densely appressed ferruginous short-villous, loosely or densely many-flowered, bracteolate, basally foliose, the branches dichotomous and each terminating in a cincinnus or the lower ones paniculate; peduncles 10--15 cm. long, densely brown-tomentose; rachis usually densely dark brown-hairy; flower-buds greenish-brown; cymules rather many-flowered, borne in the axils of deciduous foliose bracts; bractlets small, linear or lanceolate-oblong, 5--10 mm. long, 2--3 mm. wide, apically and basally acute or acuminate, tomentose on both surfaces; flowers rather large or medium in size, subsessile, drooping; calyx cyathiform or cupuliform, about 5 mm. long, 3--7 mm. wide, externally densely ferruginous-villous with long, brown, silky or appressed, ferruginous hairs (except on the rim) or rugous-tomentellous, internally sparsely pubescent or subglabrous, subbilobed, the rim unequally, obtusely and very shortly 5-dentate or subtruncate, with 2--4 black, orbicular or discoid glands of varying size (but mostly small) on the outer surface, resinous-punctate on both surfaces, scarcely enlarged in fruit; corolla showy, white or whitish to purplish-pink, pale-mauve, pale-blue, pale-violet, or purple, often with a yellow throat, sometimes white with a purple lower lip, nigrescent in drying, 2.5--2.6 cm. long, about 2 cm. wide, bilabiate or subbilabiate, externally densely ferruginous-strigulose or with long, brown, silky hair, the tube 1.5--2 cm. long, narrowed for the lower 1/3--½ of its length, apically ampliate and ventricose, mostly 2--2½ times as long as the calyx, externally (except for the lower part) densely pubescent, the lower part glabrescent, the limb unequally 5-lobed, densely farinose-pubescent, copiously resinous-punctate on both surfaces, the upper lip 2-lobed, the lobes broadly ovate, apically obtusely rounded, the lower lip 3-lobed, the 2 lateral lobes similar to the upper ones, 5--10 mm. long and 4--5 mm. wide, the middle lobe larger, 7--10 mm. long and 3.5--5.8 mm. wide, often with a basal deep-mauve patch; stamens 4, didynamous, slightly or scarcely exserted, 1--1.5 cm. long, green in bud; mature filaments pale-lilac, terete, sparsely short-pilose with glanduliferous hairs; anthers subsagittate or unguliform, orange, dorsifixed above the center, 2.5--3 mm. long, introrse, 2-celled, glabrous; style filiform, terete, 2.5--3 cm. long, slightly exserted, sparsely glandular-pilose, apically incurved; stigma unequally bifid, the posterior branch very short, the anterior one subulate; ovary sessile, ovate-oblong, basally externally glabrous, apically densely pubescent, 4-loculate, the cells 1-ovulate; fruiting-calyx persistent, somewhat accrescent, shortly excrescent, almost flat or marginally reflexed, 5--7 mm. wide, 5-angulate; fruit drupaceous, rather large, oblong or subobovate to ovoid, ovoid-globose, or

round, 2.5--3 cm. long, 1.2--2 cm. wide (when dry), at first green or light-green with purple dots to greenish-red or red, maturing very dark-blue, purple, purplish-black, or black, shiny, apically depressed, at first externally farinose, finally glabrous, the nut-like endocarp obovate, thickly woody, apically flattened and centrally umbonate, marginally 5-torous, by abortion 1-celled and 1-seeded.

Collectors have encountered this plant in primary forests and light woods, coastal and low-ridge rainforests, in well-drained secondary forests on flat plains, in forests on sandy loam soil, in orange-brown clay of general lowland rainforests, and even in grasslands, at altitudes of sealevel to 1200 m., in flower from March to June, as well as in August and November, and in fruit in March, from May to July, and from September to December. Brass & Versteegh report it "rare on slopes in primary forests". Main & Aden found it "scattered along rivers"; Whitmore refers to it as a "common big tree" in the Solomon Islands, where Brass also reports it as a "common tall tree, attaining a large size".

The corollas are described as "purple" on *Clemens 3219*, "pale-violet, yellow in the throat" on *Stone & Streitmann 10336*, "pale-blue" by Womersley & Van Royen, "blue with pink tip, a yellow patch inside of lower lip" on *Main 1854*, "pale-mauve" on *Walker 169*, "purplish-pink" on *Wiakabu & al. 73347*, "purplish-white with a yellow stripe on inner side of lip" on *Kuswarta & Soepadmo 103*, "light-violet" on *Kostu B.W.1804*, "violet-purple, the longest lobe deep-mauve with a yellow patch" on *Sayers NGF.21642*, "white" on *Brouwer 2522* and *Buwalda 606*, "white, the lip purple and throat yellow" on *Foreman & Katik LAE.59277*, "brown" on *Main & Aden 941*, and "light-brown on *Schram BW.1814*.

Gmelina moluccana is native to the Molucca Islands, New Guinea, New Britain, and the Solomon Islands. Its wood is used for light construction, boat decking, planking, furniture, turnery, joinery, and moldings. Evans refers to the species as "a valuable timber tree" in New Guinea, used there by the natives in canoe-making. Uphof (1968) refers to the wood as "very suitable for native vessels" and gives the tree's overall distribution as Malaya and Indonesia, especially Celebes. Hartley & al. (1973) refer to it as a "Medium to large tree in disturbed lowland and foothills rain forests", citing *nos. 10467, 10915, & 11024*. Foreman (1972) cites *Kajewski 2228* -- his publication is date "1971" on the titlepage, but did not actually get published until 1972.

Schram refers to *Gmelina moluccana* as "rather common" in West Irian, while Idjan & Moohtar found it to be "rare" there. Bakhuizen (1935) cites *Brass 2860* from San Cristoval island.

Various authors (e.g. Adanson, 1763) place *Tittius* Rumpf as a synonym of the genus *Gmelina* as a whole, while others (e.g. Merrill, 1917) place it only in the synonymy of *G. moluccana*. In his 1917 work Merrill says of *G. moluccana*: "This very characteristic species is known only from Amboina and Banka, the specimens cited above [*C. B. Robinson 296*] agreeing perfectly with Rumphius' figure and description and with a series of specimens collected in Amboina by Botter, Heyne, *Teysmann 5031* and Binnendyck and with *Teysmann 5158*

from Banda. Poiret, in Lamarck Encycl, 5 (1804) 163, suggested that t. 20 [of Rumpf's work] might be *Clerodendron infortunatum* Linn., but erroneously cites the description of *Tittius litorea*. It has nothing in common with that species. The plate is *Vitex moluccana*, but the description cited [i.e. the description of *T. litorea*] is a *Clerodendron* [now, however, regarded as, instead, applying to *Guettarda speciosa* L. in the *Rubiaceae*]. Blume cites the Rumphius plant in the original description of his *Vitex moluccana*, in which he has been followed by later authors. It seems very probable that the two forms indicated by Rumphius as *Tittius alba* and *Tittius rubra* are merely slight variants of the same species."

Bakhuizen (1921) cites *Teijsmann 1859 & 5031* from Amboina, *Teijsmann 5158* from Banda, and *Heyne 194* from Ceram. Fedde & Schuster (1923) erroneously cite *Teijsmann 5158* from Amboina. Lam (1924) cites *Schlechter 16441* from Northeastern New Guinea, giving the overall distribution of the species as Amboina, the Moluccas, and New Guinea. Voigt (1845) records it as cultivated in the vicinity of Calcutta.

Foreman (1972) states that the tree sometimes has a similar appearance to *Anthocephalus*, while the fruit is superficially like that of *Elaeocarpus sphaericus* "but it is somewhat rougher in appearance". Several authors refer to the fruit as "baccate" or "berry-like", but it is actually and very plainly a drupe. Some collectors refer to its possessing "spur-roots to 2½ feet long."

Hallier (1917) has pointed out that "Bei logischer Anwendung des Prioritätsgrundsatzes auf vollständige Artnamen, nicht auf unselbständige spezifische Attribute, gebührt der *Gm. macrophylla* Wall. ed, Schauer 1847 vor *Gm. macrophylla* Benth. 1870 der Vorzug. Letztere muss hiernach den Namen *Gm. Dalrympleana* (F. v. Muell. 1864-4) m. erhalten." For his *G. glandulosa* he cites as synonym *Tittius alba* Rumpf and "*Vitex moluccana* (haub. Bl.!) Miq. l.c. (1856) p. 865 quoad specim. Reinw.! tantum." He bases the species on *Reinwardt 1362* from Ay island and *DeVriese s.n.* from Neira, both of these islands being in the Banda group of the Molucca Islands, the former collected in June, 1821, and the latter in May, 1859.

Gmelina salomonensis is based on *Brass 3309*, collected at Tiratoña, at 600 m. altitude, on Ysabel island in the Solomons, on December 8, 1932. Bakhuizen (1935) avers that "This plant is intermediate between *G. moluccana* (Bl.) Backer and *G. macrophylla* (R. Br.) Benth. and may be a hybrid between these species. From *G. moluccana* it differs in the tomentose under side of the leaves and the villous calyx; from *G. macrophylla* in the terete branches, the elevated nerves and veins on the upper side of the leaves, somewhat in the form of [the] panicles, but especially in the small and regular 5-toothed calyx."

Blume's original (1826) description of *Vitex moluccana* is: "V. foliis simplicibus subrotundo-ovatis aut ovalibus acutiusculis subintegerrimis coriaceis infra puberulis basique glandulosis, panicula terminali divaricatis."

Heyne (1917) has described the wood of this species and also discussed the "white" and "red" forms described by Rumpf, giving their characteristics as "de witte is voor vaartuigen meer geschikt dan de

roode, daar het hout wel water opzuigt, doch spoedig meer droog wordt. Dat van den anderen vorm is rooder; ook dat zwelt op in het water, maar scheurt bij het drogen. De roode wordt daarom het minst aangeplant." Wood specimens to illustrate these features are deposited in the Buitenzorg museum.

Common and vernacular names recorded for this species are "arakoko", "arokoko", "caju titti", "daun titti", "gow", "hai", "kajoe titi", "kajoe titi mera", "kajoe titipeiti", "kajuh tittie", "kaju titi", "kaju titie", "kaju tittie", "koko", "omormi", "ossogee", "tietie", "tietieje", "titi", "titie", "titipoeti", "titti", "toehoe", and "toeroe".

Schauer (1847) cites only *Wallich 1819* in the DeCandolle Herbarium at Geneva, an admittedly "incomplete" specimen from material collected in the Calcutta Botanical Garden, originally from Amboina, the type collection of *G. macrophylla* Wall.

White (1950) cites as *G. salomonensis* from the Solomon Islands *Walker B.S.I.P. 257* and *Walker & White B.S.I.P. 59* & *169* and comments that number *59* is a good match for the type gathering but *no. 169* & *257* differ in the adult leaves being glabrous or the young and half-grown leaves having a slight pubescence on the midrib and main lateral nerves on the lower surface. "The species is very close to *G. moluccana* (Bl.) Backer. Bakhuizen.....suggests it may be a hybrid between that species and *G. macrophylla* (R. Br.) Benth. The glabrous character of the New Georgia and San Cristobal specimens (*nos. 169* & *257*) suggest an approach to this latter species." I regard these collections as representing *G. moluccana* f. *glabrescens* (Mold.) Mold.

Whitmore (1967), in his detailed discussion of *G. moluccana*, says that "There is a common *Gmelina* found throughout the Solomons. It is a big tree of disturbed lowland-forest and is well known locally as it is the best canoe timber in the archipelago. We have made many collections of this species. There are two fairly distinct varieties which have different ranges. Thus: (1) Leaves densely velvety below, rather thick in texture; inflorescence axes, stems and petioles densely fulvous tomentose all over; fruit sometimes cylindrical; central and eastern Solomons. Collections seen (all BSIP series unless indicated): Santa Ysabel *2487, 4072, 2301 Brass 3309.* Guadalcanal *59*, 649.* Malaita *3501.* San Cristobal *4255; Brass 2860*.* (2) Leaves glabrous below except for a few hairs on veins, rather thin in texture; inflorescence axes, stems and petioles partly glabrous partly fulvous tomentose but thinly so; fruit always conical; western Solomons (except *257*). Collections seen (all BSIP series): San Cristobal *257*.* Shortlands Fauro *3949, 5708.* New Georgia Islands: Baga *1870, 5573* Gizo *5603* Kolombangara *819, 851.* Rendova *1854* New Georgia *169*, 3709.* The starred numbers are at BRIS and L; the others (i.e. the recent part of the BSIP series) at K, L, LAE, US, and SING.

"The hairiness and texture of the leaves apparently does not depend on their maturity, all leaves on every collection are similar to one another. Nevertheless I prefer not to give these differences specific status as in their essential parts these taxa are the same. The hairy leaved eastern form is a good match for *G. moluccana* (Bl.) Backer, abundantly represented at Leiden and Lae from New Britain,

all over New Guinea and the Moluccas.....All the sheets seen have coriaceous leaves, most of them velvety hairy but a few glabrous or glabrescent below (e.g. *NGF 1854, 4580, 5870, 8213*). There is none of the other form is [=in] Lae or Leiden. As with the Solomons' material there is no suggestion that texture or degree of hairines changes much on ageing.

"*G. salomonensis* Bakh. was described on the basis of a single collection, *Brass 3309*, from Santa Ysabel, Tiratona. Bakhuizen stated that it is intermediate and possibly a hybrid between *G. moluccana* and *G. macrophylla* (R. Br.) Benth., which is properly called *G. dalrympleana* (F. Muell.) H. J. Lam.....I have examined an isotype at Leiden which fits the hairy-leaved typical *G. moluccana* of the eastern Solomons, although the leaves are rather large, slightly thinner and less hairy than is usual.

"White.....annotating Walker's Solomons' collections also noted how close *G. salomonensis* is to *G. moluccana*. On the other hand *G. dalrympleana* in Moldenke's sense is a very distinct entity as I show below. It has not been found yet east of mainland New Guinea and none of the Solomons' collections come near to it, including, in my opinion, the type of *G. salomonensis*. In my opinion *G. salomonensis* must be considered synonymous with *G. moluccana*, which occurs in the archipelago in its typical form in the eastern islands and in a glabrous form in the western islands. The glabrous form may be Moldenke's *G. salomonensis* forma *glabrescens*.....from Bougainville."

Bakhuizen (1921) distinguishes *G. moluccana* from other species of the genus known to him as follows:

1. Inflorescence axillary,1--few-flowered; calyx 1.5--2.5 cm. long, with large deltoid segments, densely villous within.

1a. Inflorescence terminal, paniculate, many-flowered; calyx 0.5--1 cm. long, shortly toothed to subtruncate, glabrous or with some hairs within.

2. Ovary densely hairy, especially toward the top; flowers with a shade of purple in the center, sometimes bright yellow or bright blue.

3. Leaves more or less densely pubescent beneath; calyx 0.5--1 cm. long, with some long hairs within.....*G. moluccana*.

3a. Leaves glabrous beneath or scarcely pubescent on the veins only; calyx 3--5 mm. long, glabrous within.*G. macrophylla*. [=*G. dalrympleana*].

2a. Ovary glabrous or nearly so; flowers yellow.

4. Trees; inflorescence terminal, erect; leaves large.

5. Calyx glabrous; filaments distinctly hairy...*G. palawensis*.

5a. Calyx densely pubescent; filaments glabrous or with some glanduliferous hairs.

6. Leaves oblong or subobovate, basally truncate or subcuneate, apically short-acuminate, glabrous or somewhat pubescent on the veins beneath.....*G. arborea*.

6a. Leaves broadly ovate, basally cordate, apically abruptly acuminate, densely hairy beneath.....*G. asiatica*.

4a. Climbing shrubs; inflorescence subpendulous; leaves small.

7. Corolla large, 4-lobed, apically ventricose, 4--9 times as long as the calyx.....*G. asiatica*.

7a. Corolla small, 5-lobed, less than 4 times as long as the calyx.....*G. lepidota*.

It should, of course, be noted that *G. arborea* and *G. asiatica* are not regarded in this key in the same sense as in the present work.

Material of *G. moluccana* has been misidentified and distributed in some herbaria as *Guettarda speciosa* L., *Faradaya splendida* F. Muell., *Volkameria obovata* Roxb., and *Clerodendrum obovatum* Walp.

Citations: GREATER SUNDA ISLANDS: Java: *Reinwardt 379* (S). LESSER SUNDA ISLANDS: Timor: *Therik 23* [Boschproefst. bb.7217] (Bz--21349, Bz--21350). MOLUCCA ISLANDS: Amboina: *Binnendyk s.n.* (Bz--21281, Bz--21282); *Botter s.n.* (Bz--21285, Bz--21286, Bz--21287, Bz--21288, Ut--63385); *Heyne s.n.* (Bz--72824, Bz--72825); *C. B. Robinson 296* (Bz--72823, N, W--654614); *Teijsmann 1859* (Bz--21280, Bz--21283), *5031* (Bz--21284). Banda: *DeBell 32* [Boschproefst. bb.13437] (Bz--21289, Bz--21290, N); *Teijsmann 5158* (Bz--21291, Ut--44155). Buru: *Oersipuny 193* [Boschproefst. bb24455] (Bz--21294, N). Ceram: *Buwalda 606* [Boschproefst. bb.25951] (Bz--21292, Bz--21293); *Kuswatz & Soepadmo 103* (N). Halmahera: *Beguin 1746* (Bz--21298, Bz--21299, Bz--21300, N, Ut--70965). Morotai: *Kostermans & Aden 941* (Bz--72963); *Main & Aden 941* (Ng--16855); *Tangkilisan 257* [Boschproefst. bb.33927] (Bz--72584). Tanimbar: *Buwalda 212* [Boschproefst. bb.24431] (Bz--21352). Ternate: *Beguin 1408* (Bz--21296, Bz--21297). Tobelo: *Haan 384* [Boschproefst. bb.24572] (Bz--21295). NEW GUINEA: Papua: *Clemens & Clemens 3219* (A, B); *A. J. Hart 5036* (Ng--16868, Ng); *Jackson & McDonald 4580* (Ng--16939); *Matatula 11* [Boschproefst. bb.21807] (Bz--21353); *Wiakabu & al. LAE.73347* (W--2936453); *Womersley & Van Royen 5870* (Ng--16918, Ng). Territory of New Guinea: *Evans 74* (Ng--16946); *E. Gray 5217* (Ng--16947, Ng); *Sayers NGF.21642* (Mi, N); *Vickery NGF.1428* (Ng--6597, Ng--16895). West Irian: *Brass & Versteegh 13580* (A); *Brouwer BW.2522* (Ng--16909); *Idjan & Moohtar 321* (Ng--16866); *Koster BW.1104* (Ng--20201); *Kostermans 61* [Boschproefst. bb.33304] (Bz--73015), *442* [Boschproefst. bb.33600] (Bz--72809, Bz--72810); *Schram BW.1814* (Ng--20219), *BW.2730* (Ng--20214). BISMARK ARCHIPELAGO: Manus: *Foreman & Katik LAE.59277* (Mu); *Stone & Streimann 10336* [LAE.53836] (Mu, W--2917579). New Britain: *Floyd 6637* (Bi, Ng--16915, W--2603275); *Mair 1854* (Ng--6593); *N.G.F.141* (Ng--6592). SOLOMON ISLANDS: New Georgia: *Ma'enu'u s.n.* [Herb. Brit. Sol. Isls. Prot. 6463] (W--2578862). San Cristoval: *Brass 2860* (Bi, Bz--21303, Bz--21304). Ysabel: *Beer's Collector s.n.* [Herb. Brit. Sol. Isls. Prot. 7078] (W--2578234); *Brass 3309* (Bi, Bz--21334, Bz--21335, Ld--photo, N, N--photo). LOCALITY OF COLLECTION UNDETERMINED: *Herb. Hort. Bot. Bogor 21301* (Bz), *21302* (Bz); *Roxburgh 2632* (Br). MOUNTED CLIPPINGS & ILLUSTRATIONS:Foreman, Div. Bot. Dept. For. N. Guin. Bot. Bull. 5: [127]. 1972 (Ld); Merr., Interpret. Rumph. Herb. Amboin. 452. 1917 (W).

GMELINA MOLUCCANA var. *ELLIPTICA* (Mold.) Mold., Phytologia 19: 439. 1970; Mold., Phytologia 55: 334. 1984.

Synonymy: *Gmelina salomonensis* var. *elliptica* Mold., Phytologia 18: 71. 1969.

[to be continued]

BOOK REVIEWS

Alma L. Moldenke

"PHYTOLOGIA MEMOIRS" published by Harold N. Moldenke & Alma L. Moldenke, 303 Parkside Road, Plainfield, New Jersey 07060, U.S.A., is an international scientific series to facilitate the publication of more extensive botanical and phytoecological papers from camera-ready copy on 8½ x 11 in. paper.

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VII - 1984 - "AN INTERNATIONAL CENSUS OF THE *CONIFERAE*. I", 79 pp., compiled by John Silba, woody plants taxonomist at the Agricultural & Technical College, Farmingdale, New York. Available from the author, 198 West Hoffman Avenue, Lindenhurst, N. Y. 11757, for $6.50 (USA nonprofit institutions), $7.50 (USA individuals & dealers), $8.50 (foreign).

The author has studied the *Coniferae* in 8 internationally important herbaria. He accepts the 3 orders of the Florin system, the 7 families of DeLaubenfels and the 60 genera of DeLaubenfels and Silba for a total of 555 species. Each species is carefully accredited with source citations, common names and geographic distribution. Important synonymy is included.

VI - 1983 - "A PRELIMINARY VERIFIED LIST OF PLANT COLLECTORS IN MEXICO", iv & 179 pp., compiled by Irving William Knobloch, Professor Emeritus, Department of Botany, Michigan State University, East Lansing, Michigan. Available from the author at 438 Tulip Tree, East Lansing, Michigan 48823, or from the Moldenkes, for $17.00 (USA nonprofit institutions), $16.50 (USA individuals), $17.50 (USA dealers), $18.50 (foreign).

The author's intent "is to document the extent of collecting activity that has progressed in Mexico". The very first entry is for M. Abarca and the last is Miguel Zuniga. The bibliography contains over 1,600 titles. This work is a splendid supplement to the bibliographic work of I. Langman (1964).

V - 1982 - "THE FLORA OF NEW ENGLAND" - Second Edition, xvii & 611 pp., ca. 400 b/w fig. & 1 map, by Frank Conklin Seymour, former president of the New England Botanical Club. Available from the Moldenkes or from the author, 264 Hixville Road, North Dartmouth, Massachusetts 02727, for $22 (USA nonprofit institutions), $22.50 (USA individuals & dealers), $23/50 (foreign).

This is a revised "manual for the identification of all vascular

plants including ferns and fern allies growing without cultivation in New England" with additions and corrections that are usually marked by asterisks in the text and written out in a 10-page addendum.

IV - 1981 - "STUDIES IN THE *BEGONIACEAE*", vi & 88 pp., 277 b/w fig., 4 b/w photo. & 1 tab., by Andrey I. Baranov. *Begonia* efficionado. Available from the author, P. O. Box 131, Cambridge, Massachusetts 02140, for $12.45 (USA nonprofit instututions), $11.45 (USA individuals), $13.45 (foreign).

"This work is a revised and updated version of the author's thesis submitted in 1973 at Northeastern University, Boston, under the direction of Dr. Fred A. Barkley. It gives both a taxonomic history of the family and then new floral information with fine drawings.

III - 1981 - "ANTILLEAN STUDIES I, FLORA OF HISPANIOLA Part I: *Celastrales, Rhamnales, Malvales, Thymeleales, Violales*", 218 pp. & 73 b/w fig., by Alain Henri Liogier, taxonomist, Jardin Botanico, Universidad de Puerto Rico, G. P. O. Box 4984-G, San Juan, Puerto Rico 00936, Available from the author for $15 (USA), $15.75 (foreign),

The author is long and well experienced in floral studies of these island areas and has had the good fortune to have studied in several of the herbaria with important collections from the region. The text is in easily readable Spanish.

II - 1980 - "A SIXTH SUMMARY OF THE *VERBENACEAE, AVICENNIACEAE, STILBACEAE, CHLOANTHACEAE, SYMPHOREMACEAE, NYCTANTHACEAE,* AND *ERIOCAULACEAE* OF THE WORLD AS TO VALID TAXA, GEOGRAPHIC DISTRIBUTION AND SYNONYMY", 629 pp., compiled by Harold N. Moldenke, retired professor & honorary curator of the New York Botanical Garden, New York. Available from the author, 303 Parkside Road, Plainfield, New Jersey 07060, for $27 (USA), $28.50 (foreign).

This work embraces the results of 50 years field and herbarium study, the latter involving examination of over 246,000 specimens in 320 private and institutional herbaria.

I - 1980 - "A CHECK LIST OF THE VASCULAR PLANTS OF NICARAGUA -- Based Largely on Collections in Nicaragua Made by the Author and Companions 1968--1976", x & 314 pp., edited by Frank Conklin Seymour, research associate, Missouri Botanical Garden, St. Louis. Available from the author, 264 Hixville Road, North Dartmouth, Massachusetts 02747, for $16.60 (USA nonprofit institutions), $17.35 (USA individuals & dealers), $17.65 (foreign).

About 30,000 specimens were collected and a large proportion was identified by named specialists. Synonymy is frequently included and the herbarium location of cited specimens is given.

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CHECKLIST OF THE VASCULAR PLANTS OF WAITS WOODS, HANCOCK COUNTY, ILLINOIS

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R. M. Myers and A. L. Kibbe Herbaria and Institute for Environmental Management, Western Illinois University
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ABSTRACT: A total of 213 species of vascular plants representing four divisions and 65 families has been collected at Waits Woods, Hancock County, Illinois. Two of these species, Phacelia purshii Buckley and Dodecatheon amethystinum Fassett are county records.

In December 1981, Dr. Myron Wait, a Hamilton, Illinois, dentist, and his wife, Mary, donated a 13-acre (5.26 ha) tract of land to Western Illinois University for preservation as well as for biological instruction and research purposes. The Waits for over 50 years have protected the area which they used for their own enjoyment of nature. The area is about eight miles (13 km) north of Hamilton, Hancock County, Illinois, near the Mississippi River. This paper presents a checklist of the vascular plants found in Waits Woods as a result of at least a monthly inventory from March through October 1982 and from which herbarium specimens are being prepared and will be deposited in the herbarium of the A. L. Kibbe Life Science Station (WARK) of Western Illinois University at Warsaw, Illinois. Nomenclature follows Mohlenbrock (1975).

The area is basically an oak-hickory-sugar maple woods on a moderately sloping mesic to dryish south to southwest-facing slope. This slope is on the north side of a small narrow valley formed by a stream cutting through the eastern Mississippi River bluff. The area has been disturbed primarily by logging (mostly oaks) in the past although some large trees remain. Some large electric power lines traverse the area in a north-south direction near the center of the woods and, as expected, the area below them has been cleared and the vegetation has been kept under control so as to not interfere with the lines.

The dominant trees are Acer saccharum Marsh., Carya cordiformis (Wang.) K. Koch, C. ovata (Mill.) K. Koch, C. tomentosa (Poir.) Nutt., Quercus alba L., Q. macrocarpa Michx., Q. rubra L., Q. velutina Lam. and, in certain places, Q. muhlenbergii Engelm. Tilia americana L. is also quite common. Major understory trees are Ostrya virginiana (Mill.) K. Koch and Prunus serotina Ehrh. The understory is rather open and, in general, has a characteristic typical herbaceous flora for this area of Illinois. There is somewhat of a contrast between the parts to the east and west of the power lines. The west side, due to being a little more mesic, has

perhaps a little better developed woody understory. At the southern edge of this woods were many Carpinus caroliniana Walt. and Monotropa uniflora L. plants as well being the only location we found Dodecatheon amethystinum Fassett, Corallorhiza odontorhiza (Willd.) Nutt. and Panax quinquefolius L. Commonly, and especially noticeable in spring and early summer, was the "carpeted" aspect of the ground due to a covering of Carex spp., Parthenocissus quinquefolia (L.) Planch. and Smilacina racemosa (L.) Desf. East of the power lines the ground often was likewise a cover of Carex spp., and Parthenocissus quinquefolia but also there was much shrubby Xanthoxylum americanum Mill.; near the north edge of this part were some Gymnocladus dioica (L.) K. Koch and at the southeastern tip on a small drier "tongue" some Danthonia spicata (L.) Beauv. Under the power lines there were herbaceous and especially woody forest remnants but this area was weedy with both herbaceous and woody (such as Ailanthus, Rhus, Rubus) species and it is here (as well as along the roadside) that about all of the alien species occurred. The upper end of a ravine traverses the power line area making for a small wet drainage in which some moist soil plants such as Mimulus ringens L., Leersia virginica Willd., Lobelia siphilitica L., Pilea pumila (P.) Gray and Scirpus georgianus Harper occur.

About 400 plant specimens were collected which represented four divisions, 65 families, 146 genera and 213 species. The Equisetophyta was represented by one family, one genus and one species. The Polypodiophyta was represented by two families, two genera and two species. Therefore, the pteridophytes consisted of three families, three genera and three species. The only gymnosperms, the Pinophyta, were represented by one family, one genus and one species. The Magnoliophyta (angiosperms) was represented by 61 families, 142 genera and 209 species; of which the Magnoliopsida (dicots) consisted of 52 families, 113 genera and 159 species while the Liliopsida (monocots) consisted of nine families, 29 genera and 50 species. Of the 213 species, 23 (10.8%) were aliens. The largest families are the Compositae and Poaceae with 31 and 22 species respectively.

Two county records, Phacelia purshii Buckley (per Mohlenbrock and Ladd, 1978) and Dodecatheon amethystinum (per Mohlenbrock, 1978) were found. This station along the western border of Illinois along with Vermilion County (Mohlenbrock and Ladd, 1978) on the eastern border of Illinois represent the present northern-most limit in the state for Phacelia purshii. A very small population of this species was growing well in a moist area at the power-line and woods boundary. This station for Dodecatheon amethystinum besides being another county in the expected range of this species (Ugent et al., 1982) is also another extant location (the seventh county per Bowles et al., 1981) for this Illinois endangered species. One plant, which was fruiting, of the Illinois threatened species Panax quinquefolius (Bowles et al., 1981) was found in the woods. A specimen of Tilia americana L. var. neglecta (Spach) Fosberg was collected which

according to Mohlenbrock (1982) is rare and is the fifth and southern-most county of its occurrence in Illinois. Two forms of Trillium recurvatum Beck occurred in the woods: forma luteum Clute which according to Mohlenbrock (1970) is found occasionally throughout the state and forma shayii Palmer & Steyerm. which Mohlenbrock (1970) states is known from about six counties in the central and southern parts of the state.

LIST OF SPECIES

The taxa are listed alphabetically within each division. An asterisk (*) indicates the species is an alien according to Myers (1972).

DIVISION EQUISETOPHYTA

Equisetaceae

Equisetum hymmale L. var. affine (Engelm.) A.A. Eaton

DIVISION POLYPODIOPHYTA

Ophioglossaceae

Botrychium virginianum (L.) Sw.

Polypodiaceae

Cystopteris fragilis (L.) Bernh. var. protrusa Weatherby

DIVISION PINOPHYTA

Cupressaceae

Juniperus virginiana L.

DIVISION MAGNOLIOPHYTA

CLASS LILIOPSIDA

Araceae

Arisaema dracontium (L.) Schott

Arisaema triphyllum (L.) Schott

Commelinaceae

Tradescantia ohiensis Raf.

Cyperaceae

Carex albursina Sheldon
Carex blanda Dewey
Carex cephalophora Muhl.
Carex grisea Wahlenb.
Carex hirtifolia Mack.
Carex jamesii Schwein.
Carex normalis Mack.
Carex oligocarpa Schk.
Carex pensylvanica Lam.
Carex rosea Schk.
Carex shortiana Dewey
Carex vulpinoidea Michx.
Cyperus strigosus L.
Scirpus georgianus Harper

Dioscoreaceae

Dioscorea villosa L.

Juncaceae

Juncus tenuis Willd.

Liliaceae

Allium canadense L.
*Asparagus officinalis L.
Polygonatum commutatum (Schult.) A. Dietr.
Smilacina racemosa (L.) Desf.
Trillium recurvatum Beck.
Trillium recurvatum Beck. f. luteum Clute
Trillium recurvatum Beck. f. shayii Palmer & Steyermark
Uvularia grandiflora Sm.

Orchidaceae

Corallorhiza odontorhiza (Willd.) Nutt.

Poaceae

*Bromus inermis Leyss.
Bromus pubescens Muhl.
*Dactylis glomerata L.
Danthonia spicata (L.) Beauv.
*Digitaria ischaemum (Schreb.) Muhl.
Echinochloa pungens (Poir.) Rydb.
Elymus hystrix L.
Elymus villosus Muhl.
Festuca obtusa Bieler
Leersia virginica Willd.
Muhlenbergia schreberi J. F. Gmel.
Muhlenbergia sobolifera (Muhl.) Trin.
Panicum capillare L.
Panicum dichotomiflorum Michx.
Panicum lanuginosum Ell.
Panicum latifolium L.
*Poa pratensis L.
*Setaria faberi Herrm.
*Setaria lutescens (Weigel) Hubb.
*Setaria viridis (L.) Beauv.
Sphenopholis obtusata (Michx.) Scribn. var. major (Torr.) Erdman
Tridens flavus (L.) Hitchcock

Smilacaceae

Smilax hispida Muhl.
Smilax lasioneuron Hook.

CLASS MAGNOLIOPSIDA

Aceraceae

Acer nigrum Michx. f.
Acer saccharum Marsh.

Anacardiaceae

Rhus aromatica Ait.
Rhus glabra L.
Toxicodendron radicans (L.) Kuntze.

Araliaceae

Aralia racemosa L.
Panax quinquefolius L.

Asclepiadaceae

Asclepias incarnata L.
Asclepias quadrifolia Jacq.
Asclepias syriaca L.
Asclepias verticillata L.
Cynanchum laeve (Michx.) Pers.

Berberidaceae

Podophyllum peltatum L.

Betulaceae

Carpinus caroliniana Walt.
Corylus americana Walt.
Ostrya virginiana (Mill.) K. Koch

Boraginaceae

Hackelia virginiana (L.) I. M. Johnston
Mertensia virginica (L.) Pers.

Campanulaceae

Campanula americana L.
Lobelia inflata L.
Lobelia siphilitica L.
Specularia perfoliata (L.) A. DC.

Caprifoliaceae

Lonicera prolifera (Kirchn.) Rehd.
Sambucus canadensis L.

Symphoricarpos orbiculatus Moench
Triosteum perfoliatum L.
Viburnum prunifolium L.

Compositae

Ambrosia artemisiifolia L.
Aster cordifolius L.
Aster lateriflorus (L.) Britt.
Aster ontarionis Wieg.
Aster pilosus Willd.
Aster sagittifolius Wedem. ex Willd.
Aster shortii Lindl.
Bidens frondosa L.
Cirsium discolor (Muhl.) Spreng.
*Cirsium vulgare (Savi) Tenore
Erigeron annuus (L.) Pers.
Erigeron canadensis L.
Erigeron philadelphicus L.
Eupatorium purpureum L.
Eupatorium rugosum Houtt.
Eupatorium serotinum Michx.
Gnaphalium obtusifolium L.
*Helianthus annuus L.
Helianthus hirsutus Raf.
Krigia biflora (Walt.) Blake
Lactuca canadensis L.
Lactuca floridana (L.) Gaertn.
*Lactuca serriola L.
Solidago canadensis L.
Solidago gigantea Ait.
Solidago ulmifolia Muhl.
*Taraxacum officinale Weber.
*Tragopogon dubius Scop.
Vernonia missurica Raf.

Cornaceae

Cornus drummondii C. A. Mey.

Cruciferae

Dentaria laciniata Muhl.

Ericaceae

Monotropa uniflora L.

Euphorbiaceae

Acalypha rhomboidea Raf.
Acalypha virginica L.
Chamaesyce maculata (L.) Small
Chamaesyce supina (Raf.) Moldenke
Poinsettia cyathophora (Murr.) Kl. & Garcke
Poinsettia dentata (Michx.) Kl. & Garcke

Fagaceae

Quercus alba L.
Quercus macrocarpa Michx.
Quercus muhlenbergii Engelm.
Quercus rubra L.
Quercus velutina Lam.

Geraniaceae

Geranium carolinianum L.

Hippocastanaceae

Aesculus glabra Willd.

Hydrophyllaceae

Ellisia nyctelea L.
Hydrophyllum virginianum L.
Phacelia purshii Buckley

Hypericaceae

*Hypericum perforatum L.
Hypericum punctatum Lam.

Juglandaceae

Carya cordiformis (Wang.) K. Koch
Carya ovata (Mill.) K. Koch
Carya tomentosa (Poir.) Nutt.
Juglans nigra L.

Labiatae

Blephilia ciliata (L.) Benth.
Monarda fistulosa L.
Pycnanthemum pilosum Nutt.
Scutellaria ovata Hill
Stachys tenuifolia Willd.
Teucrium canadense L. var. occidentale (Gray) McClintock & Epling

Leguminosae

Cercis canadensis L.
Desmodium dillenii Darl.
Desmodium glutinosum (Muhl.) Wood.
Desmodium nudiflorum (L.) DC.
Gleditsia triacanthos L.
Gymnocladus dioica (L.) K. Koch
*Lespedeza stipulacea Maxim.
*Medicago lupulina L.
*Melilotus alba Desr.
Robinia pseudoacacia L.
Strophostyles helvola (L.) Ell.
*Trifolium pratense L.

Menispermaceae

Menispermum canadense L.

Moraceae

*Maclura pomifera (Raf.) Schneider
*Morus alba L.
Morus rubra L.

Oleaceae

Fraxinus americana L.
Fraxinus quadrangulata Michx.

Onagraceae

Circaea quadrisulcata (Maxim.) Franch. & Sav. var. canadensis (L.) Hara
Oenothera biennis L.

Oxalidaceae

Oxalis dillenii Jacq.
Oxalis violacea L.

Papaveraceae

Dicentra cucullaria (L.) Bernh.
Sanguinaria canadensis L.

Phyrmaceae

Phryma leptostachya L.

Phytolaccaceae

Phytolacca americana L.

Plantaginaceae

Plantago rugelii Dcne.

Platanaceae

Platanus occidentalis L.

Polemoniaceae

Phlox divaricata L. ssp. laphamii (Wood) Wherry

Polygonaceae

Polygonum scandens L.
Polygonum virginianum L.
*Rumex crispus L.

Portulacaceae

Claytonia virginica L.

Primulaceae

Dodecatheon amethystinum Fassett

Ranunculaceae

Anemone virginiana L.
Ranunculus abortivus L.

Rosaceae

Agrimonia gryposepala Wallr.
Agrimonia pubescens Wallr.
Amelanchier arborea (Michx. f.) Fern.
Geum canadense Jacq.
Potentilla simplex Michx.
Prunus serotina Ehrh.
Prunus virginiana L.
Rubus allegheniensis Porter
Rubus flagellaris Willd.
Rubus occidentalis L.
Rubus pensylvanicus Poir.

Rubiaceae

Galium aparine L.
Galium circaezans Michx.
Galium concinnum Torr. & Gray

Rutaceae

Xanthoxylum americanum Mill.

Salicaceae

Populus deltoides Marsh.
Salix interior Rowlee

Saxifragaceae

Ribes missouriense Nutt.

Scrophulariaceae

Mimulus ringens L.
Scrophularia marilandica L.
*Verbascum thapsus L.

Simaroubaceae

*Ailanthus altissima (Mill.) Swingle

Solanaceae

Physalis heterophylla Nees
Solanum carolinense L.

Tiliaceae

Tilia americana L. var. neglecta (Spach) Fosberg

Ulmaceae

Celtis occidentalis L.
Ulmus rubra Muhl.

Umbelliferae

Osmorhiza claytonii (Michx.) Clarke
Sanicula gregaria Bickn.

Urticaceae

Pilea pumila (P.) Gray

Verbenaceae

Verbena stricta Vent.
Verbena urticifolia L.

Violaceae

Viola sororia Willd.

Vitaceae

Parthenocissus quinquefolia (L.) Planch.
Vitis riparia Michx.
Vitis vulpina L.

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MESOAMERICAN CELASTRACEAE -- II

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CROSSOPETALUM DENSIFLORUM Lundell, sp. nov. -- Arbor parva, 2 m. alta; ramuli 4-angulati, graciles, apice minute puberuli, glabrati; folia parva, supra minute puberula, subtus glabra, petiolata, petiolo 2.5--3.5 mm. longo, canaliculato, minute puberulo; lamina membranacea, lanceolata vel elliptica, 5--8.5 cm. longa, 2--3 cm. lata, apice subabrupte acuminata, basi acuta, subintegra; inflorescentia parva, gracilis, cymosa, 1--2 cm. longa, pedunculata, minute puberula; flores subcapitati, 4-meri; pedicelli ad 1.4 mm. longi; sepala parva, late ovato-rotundata, ca. 1 mm. lata, 0.7 mm. longa, apice rotundata, minute et dense puberula; petala 4, suberecta, glabra, obovata, ca. 2 mm. longa, basi late unguiculata, apice minute erosa, rotundata; filamenta filiformis, ca. 1 mm. longa, erecta; antherae late rotundatae, ca. 0.2 mm. longae, apice emarginatae; ovarium 2-loculare, glabrum; stigma biloba.

Mexico: Veracruz, Municipio Hidalgotitlan, 16.5 km. al O de Hermanos Cedillo, sobre terraceria a Boca del Monte, entre Poblada 1 y Rio Chachijalpa; borde de selva karstica de Terminalia, Dialium, etc., elev. 90 m., April 16, 1981, Tom Wendt, E. Lott y F. Chiang 3197 (holotype, LL), arbolito de 2 m.; flores amarillo-verde palidas, frutos verde palidos; frequente en selva.

Referable to the complex of taxa with 4-ribbed stems, C. densiflorum is notable for its subcapitate flowers with pedicels less than 1.4 mm. long in the small densely flowered cymes. Its small thin obovate petals are broadly unguiculate, the filaments are thread-like, and the densely puberulent calyx has thin broadly ovate-rounded sepals.

CROSSOPETALUM GLABRUM Lundell, sp. nov. -- Arbor, 4--6 m. alta, omnino glabra; ramuli 4-angulati, graciles; folia coriacea, petiolata, petiolo 3--6 mm. longo, canaliculato; lamina elliptica vel lanceolata, 6--12 cm. longa, 3--5.3 cm. lata, apice subabrupte acuminata vel caudato-acuminata, basi rotundata et acutiuscula, margine minute crenulato-serrulata; inflorescentia parvissima, cymosa, axillaris, 5--10 mm. longa, pauciflora; flores 4-meri; pedicelli graciles, 2--4 mm. longi; sepala late ovato-rotundata, 1--1.4 mm. lata, apice rotundata; petala late rotundata vel ovato-rotundata, ad 2.5 mm. longa, 2 mm. lata, subintegra vel minute dentato-erosa; filamenta 0.3--0.5 mm.

longa; antherae ovatae, ca. 0.4 mm. longae, obtusae; ovarium glabrum.

Mexico: Veracruz, Municipio Hidalgotitlan, brecha Hnos. Cedillo, la escuadra, selva alta perennifolia, alt. 200 m., March 7, 1974, Mario Vazquez et al. V-117 (holotype, XAL), arbusto, 6 m., flor verde. Municipio Catemaco, 8 km. al Este de Tebanca, camino que va al Bastonal, selva alta perennifolia, March 22, 1973, Refugio Cedillo Trigos, J. Ismael Calzada 149 (paratype, XAL), arbusto, 4 m., flor verde.

In being completely glabrous, having sharply 4-angled stems, with very small mostly 3-flowered cymes aggregated in leaf axils, and in its rather large coriaceous leaves, C. glabrum is notable among the Mexican taxa. Its sepals and petals are thin and unequal in size.

CROSSOPETALUM LANCEIFOLIUM (Lundell) Lundell, comb. nov. Rhacoma lanceifolia Lundell, Field Lab. 13: 6. 1945.

CROSSOPETALUM LOBATUM Lundell, sp. nov. -- Arbor parva, ad 4 m. alta; ramuli minute puberuli, subteres; folia petiolata, petiolo 2--3.5 mm. longo, canaliculato, minute puberulo; lamina membranacea, utrinque reticulata, subintegra, elliptica vel oblanceolata, 6.5--9.5 cm. longa, 2.5--4 cm. lata, apice subabrupte acuminata, basi acuta; inflorescentia axillaris, cymosa, subsessilis vel pedunculata, ad 2.5 cm. longa, minute puberula; flores 4-meri; pedicelli 1.8--2.5 mm. longi; sepala suborbicularia, 0.75--1 mm. longa, apice rotundata vel subtruncata, margine minute erosa, extus minute puberula; petala basi rubra, obovata, ad 2.6 mm. longa, 2 mm. lata, apice rotundata, basi late unguiculata; filamenta ad 1.2 mm. longa; antherae parvae, late orbiculatae, ca. 0.2 mm. longae, apice emarginatae; discus lobatus; ovarium basi immersum; stylo ca. 0.4 mm. longo, apice minute bifido.

Panama: Province of Panama, forest along small streams near the headwaters of the Rio Pirati, foothills of the Serrania de Maje, tropical wet forest, 100--150 m., May 16, 1982, S. Knapp & J. Mallet 5135 (holotype, LL), treelet 3--4 m., flowers pale yellow green, centers red.

Related to the species of Mesoamerica with subterete internodes, C. lobatum is noteworthy for its essentially glabrous leaf blades which are reticulate-veined on both surfaces, small cymes subsessile or short pedunculate, thin depressed-orbicular sepals, large obovate petals up to 2.6 mm. long and reddish at base, slender erect filaments, and lobed disk for which the taxon is named.

CROSSOPETALUM MANAGUATILLO (Loes.) Lundell, Wrightia 3: 8. 1961. Rhacoma Managuatillo Loes., Repert. Sp. Nov. Fedde 8: 294. 1910.

Mexico: Michoacan, Municipio Aquila, Cerro de la Ticla, selva baja caducifolia, alt. 60 m., Aug. 27, 1979, B. Guerrero C. et al. 109 (LL, XAL), arbusto, 3 m., flor rosa.

CROSSOPETALUM MINIMIFLORUM Lundell, sp. nov. -- Arbor parva, 2--3 m. alta; ramuli subteres, graciles, minute puberuli; folia parce minute puberula, petiolata, petiolo 3--5 mm. longo, canaliculato; lamina membranacea, minute crenulato-serrulata vel subintegra, lanceolata, 3--7 cm. longa, 1--3 cm. lata, apice acuminata vel caudato-acuminata, basi acutiuscula; inflorescentia cymosa, axillaris, parva, 1--1.5 cm. longa, pedunculata, tenuis, minute puberula; pedicelli 1--1.5 mm. longi; flores 4-meri; sepala ovato-elliptica, ca. 0.8 mm. longa, minute puberula; petala suberecta vel reflexa, late obovato-elliptica, 1.2--1.4 mm. longa, glabra, apice rotundata, minute erosa; stamina suberecta; filamenta gracilis, ca. 0.6 mm. longa; antherae minutae, rotundatae, ca. 0.2 mm. longae, apice emarginatae; ovarium glabrum.

Mexico: Veracruz, Municipio Minatitlan, 13.7 km. al E de La Laguna, sobre terraceria a Expanapa, luego 7.2 km. al N sobre camino nuevo a Belisario Dominguez, selva perennifolia de Dialium, Brosimum, Bursera, etc., en area karastica muy pedregosa, elev. 130 m., April 7, 1981, Tom Wendt, A. Villalobos C. & I. Navarrete 3153 (holotype, LL), arbolito de 2.5 m., flores blancas. Municipio Minatitlan, 1 km. al NO de Pob. 12 en el camino a Uxpanapa (Pob. 12), area de selva alta perennifolia, en orilla de arroyo pedregoso seco, elev. 130 m., May 16, 1983, Wendt et al. 4088 (paratype, LL), arbusto de 2--3 m., flores color crema.

The branchlets are compressed and angled at the nodes, but the internodes are subterete, not quadrangular. Although C. densiflorum Lundell has sharply 4-angled internodes, much larger flowers, unguiculate larger petals, slender much longer filaments, it and C. minimiflorum appear to be closely related.

The flowers of C. minimiflorum are in solitary, small, open, axillary cymes, and not congested although the pedicels are only 1--1.5 mm. long. Its small petals are not unguiculate.

The fruits are ellipsoid, about 1.5 cm. long when ripe, red [Wendt et al. 2763 (LL), 4239 (LL)].

MAYTENUS STAMINOSA Lundell, sp. nov. -- Arbor parva, 6--7 m. alta, omnino glabra; ramuli apice 4-angulati; folia alterna, petiolata, petiolo 4--5 mm. longo, canaliculato; lamina subcoriacea, integra, glabra, elliptica, 5--9.3 cm. longa, 2.5--3.8 cm. lata, apice subabrupte late acuminata, obtusiuscula, basi acutiuscula; flores 5-meri, fasciculati, pedicellis 3--4 mm. longis; calyx quinquifidus, lobis late ovatis, ca. 0.5 mm. longis; stamina 5; filamenta tenuis, erecta, ca. 1.4 mm. longa; antherae late ovatae, 0.5 mm. longae; petala ovato-elliptica, ca. 2.2 mm. longa, late obtusa, minute erosa; discus crassus,

ca. 2.3 mm. diam.; ovarium in discum subimmersum, biloculare, loculis biovulatis; fructus ca. 1.2 cm. longus, anguste obovoideus.

Mexico: Tabasco, Municipio Nacajuca, a 6 km. carretera a Tecoluta, selva mediana subcaducifolia, alt. 26 m., Oct. 9, 1978, J. I. Calzada 4964 (holotype, XAL), arbol, 6--7 m. high, flor verde, fruto anaranjado.

Related to M. Purpusii Lundell of Veracruz, M. staminosa has 4-angled branchlets, larger flowers, slender filaments about 1.4 mm. long, and longer pedicels fasciculate in the leaf axils. The filaments of M. Purpusii are less than 0.5 mm. long, and the larger leaves mostly lanceolate.

MAYTENUS STIPITATA Lundell, sp. nov. -- Arbor, 8 m. alta, glabra; folia pallida, glabra, petiolata, petiolo crasso, 3--4 mm. longo, canaliculato; lamina coriacea, crenulata, lanceolata vel oblanceolata, 7--9 cm. longa, 2--4 cm. lata, apice obtusa, basi obtusa et acutiuscula; pedicelli fructiferi axillares, crassiusculi, ca. 5 mm. longi; capsula obovoidea, ca. 1.4 cm. longa, stipitata.

Mexico: Chiapas, Municipio Ocozocuatla, Canyon of Rio de la Venta at Cascada El Aguacero, tropical deciduous forest on steep limestone slopes, elev. 2500 ft., March 27, 1983, David Neill 5572 (holotype, LL), tree, 8 m. tall, immature fruits green.

The rigidly coriaceous pallid leaves broadly obtuse at apex and the stipitate capsules appear to set this taxon apart from the species of Maytenus in Mesoamerica. The only other species with stipitate fruits is M. guatemalensis Lundell, a shrub of Guatemala and Belize with sharply quadrangular branchlets. The branchlets in M. stipitata are terete.

QUETZALIA PAUCIFLORA Lundell, sp. nov. -- Arbor parva, 7 m. alta, omnino glabra; ramuli angulati; folia petiolata, petiolo 4--7 mm. longo, canaliculato; lamina chartacea, anguste elliptica vel lanceolata, 4--7 cm. longa, 1.4--3 cm. lata, apice et basi acuta, margine integra; inflorescentia axillaris, ca. 8 mm. longa, cymosa, triflora; sepala late rotundata; capsula subsessilis, ca. 1.3 cm. longa.

Mexico: Veracruz, Municipio Yecuatla, Congregacion la Paz, de Enriquez, carretera Naolinco, alt. 1500 m., J. I. Calzada 5432 (holotype, LL), arbol, 7 m.

The solitary, small, axillary, 3-flowered cymes are unique in the genus. Only flower buds and immature capsules are available.

NEOTROPICAL MYRSINACEAE -- XIII

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ARDISIA TUXPANENSIS Lundell, sp. nov. -- Arbor parva, 4 m.; ramuli crassiusculi, minute ferrugineo-tomentelli; folia parva, coriacea, subsessilis, petiolo crasso, marginato, ad 3 mm. longo; lamina glabrata, dense et minute punctata, margine integra, revoluta, oblanceolata, 4--6.5 cm. longa, 1.8--2.5 cm. lata, apice obtusa, basi acuta; inflorescentia terminalis, sessilis, paniculata, pyramidalis, ad 7.5 cm. longa, basi dense et minute ferrugineo-tomentelli; flores spicati, sessiles, 5-meri; sepala parva, coriacea, late ovata, 1.2--1.4 mm. longa, nigropunctata, margine hyalina, ciliata, apice late obtusa vel rotundata, intus basi glandulosa; corolla glabra, lineato-nigropunctata; antherae lanceolatae; ovarium glabrum; placenta ovoidea, apiculata.

Mexico: Veracruz, Municipio Tuxpan, en la ciudad de Tuxpan, antes de cruzar al puente del Rio Tuxpan, selva alta perennifolia, primaria, alt. 50 m., Sept. 11, 1980, J. I. Calzada, M. Ayala & J. Alvarado 6333 (holotype, F; xerox, LL), arbol, 4 m., flor botones verdes.

In bud only, the flowers are spicate in a terminal, sessile panicle, with coriaceous sepals transparent marginally, ciliate, thick, black punctate medially, and glandular within at base. The corolla in bud is small, lineate and glabrous. The stamens are subsessile in bud, with lanceolate anthers longitudinally dehiscent. Leaves of A. tuxpanensis are rigidly coriaceous, small, and crowded at the ends of branches.

A. tuxpanensis is a remarkably distinct species related to A. densiflora Krug & Urban.

ICACOREA ALAJUELAE Lundell, sp. nov. -- Frutex; ramuli dense ferrugineo-lepidoti; folia parva, petiolata, petiolo lepidoto, 3--5 mm. longo; lamina chartacea vel subcoriacea, glabrata, elliptica, 3--7.5 cm. longa, 1.5--3 cm. lata, apice subacuminata, obtusiuscula, basi acuta, utrinque venosa; inflorescentia axillaris, parva, subsessilis, paniculata, ca. 2.5 cm. longa, parce lepidota, basi dense ferrugineo-lepidota; flores corymbosi; pedicelli 4--5 mm. longi, parce lepidoti; sepala parva, ovata, 1--1.4 mm. longa, apice obtusa, minute aurantiaco-punctata; corolla ca. 5.5 mm. longa; petala basi connata, anguste lanceolata, aurantiaco-lineato-punctata; stamina ca. 4.2 mm. longa; filamenta ca. 1.6 mm. longa; antherae lineari-lanceolatae, ca. 3.2 mm. longae, apice

birimosae; ovarium glabrum, stylo ca. 4 mm. longo; placenta apiculata, ovula 16, parva, pluriseriata.

Costa Rica: Province of Alajuela, San Pedro de San Ramon, March 12, 1932, Alberto M. Brenes 15091 (holotype, NY; fragments and xerox, LL).

A typical species of Icacorea with the anthers and other characteristics of the I. compressa (H.B.K.) Standl. complex. There are a multitude of distinct but closely related taxa.

I. alajuelae is notable for its small axillary inflorescences, small calyx punctate with minute orange glands, and numerous pluriseriate ovules.

PARATHESIS TENORIOI Lundell, sp. nov. -- Arbor parva; ramuli crassiusculi, rufo-stellato-tomentosi; folia supra glabrata, subtus subadpresse rufo-stellato-pubescentia, petiolata, petiolo ca. 1.2 cm. longo, canaliculato; lamina chartacea, lanceolata, ad 27 cm. longa, 7.5 cm. lata, apice late acuminata, supra basi constricta, acuminata, utrinque reticulato-venosa, integra; inflorescentia terminalis, anguste paniculata, ad 17 cm. longa, rufo-stellato-tomentella; flores 5-meri, corymbosi, minute rufo-stellato-tomentelli; pedicelli ad 4 mm. longi; sepala anguste lanceolato-triangulata, subulata, ad 2 mm. longa; corolla 5.5 mm. longa, extus minute rufo-stellato-pubescentia; petala anguste lanceolata, ca. 5.5 mm. longa, margine intus minute villosa, nigro-lineato-punctata; stamina ca. 3.4 mm. longa; filamenta ca. 1 mm. longa; antherae elliptico-lanceolatae, ca. 3 mm. longae, apiculatae, dorso nigropunctatae; ovarium glabrum, apice puberulum; stylo ca. 5.4 mm. longo; ovula 8, erecta, uniseriata.

Mexico: Guerrero, Municipio de Atoyac, loc. 41 km. al NE de Atoyac y 18 km. al NE de Vicente de Benitez, selva mediana perennifolia alterada, alt. 950 m., May 23, 1982, P. Tenorio L. 447, E. Martinez S. y C. Romero de T. (holotype, LL), arbusto 1.50--2.0 m., flores rosas; escaso.

P. Tenorioi is closely related to P. chiapensis Fernald, a taxon known only from Chiapas and Guatemala. Its leaves are not denticulate but entire or inconspicuously undulate, and they are constricted about 3 cm. above base, tapering below into the petiole. The pubescence is appressed and stellate on the lower bizonal leaf surface with the rays slender and elongate, whereas in P. chiapensis the lower surface is densely and uniformly pubescent with fine red, stipitate, short-rayed, stellate trichomes.

Only mature flower buds were available in the holotype, and the description of the flowers was made from these.

PARATHESIS TUXTLENSIS Lundell, sp. nov. -- Frutex, 3 m., ramulis crassiusculis, minute peradpresse tomentellis; folia pallida, petiolata, petiolo 1--2.3 cm. longo, apice anguste marginato; lamina chartacea, pallida, glabrata, anguste

oblanceolata, 6.5--12 cm. longa, 1.8--3 cm. lata, apice subacuminata, obtusiuscula, basi acuminata, dense et minute punctata, integra; inflorescentia axillaris et pseudoterminalis, pallida, minute puberula, subsessilis, paniculata, ad 11 cm. longa, densiflora, tenuis; flores subcorymbosi, 5-meri; pedicelli ad 4 mm. longi; sepala valvata, anguste lanceolata, acuminata, ca. 1 mm. longa, parce puberula, parce aurantiaco-punctata; corolla parva, aurantiaco-lineato-punctata, parce et minute puberula, margine intus villosa; antherae lanceolatae, basi sagittatae, dorso minute 1- vel 2-punctatae; ovarium glabrum; ovula 9.

Mexico: Veracruz, Municipio San Andres Tuxtla, SE slopes of Volcan San Martin Tuxtla, 12 km. N of San Andres Tuxtla, in forest, alt. 1100 m., July 1, 1982, C. Diggs, M. Nee & G. Schatz 2703 (holotype, LL), shrub, 3 m. tall, inflorescence white, buds pale yellowish.

P. tuxtlensis is an unusual species with its white inflorescence and very small yellowish flower buds. The measurements were made from the buds.

The taxon is closely related to P. subcoriacea Lundell which was described from Eizi Matuda collections in the Sierra Madre of western Chiapas.

NOTES ON NEW AND NOTEWORTHY PLANTS. CLXXVII

Harold N. Moldenke

AEGIPHILA VOLUBILIS Mold., sp. nov.

Frutex volubilis, ramis ramulisque gracilibus obtuse tetragonis dense pilosulis vel pilosis, foliis decussatis breviter petiolatis, petiolis 5--10 mm. longis densissime patenteque pilosis, laminis chartaceis, lanceolato-ellipticis 9--15 cm. longis 4--5.5 cm. latis apicaliter longe acuminatis, marginaliter integris, basaliter obtusis vel subacutis, supra in costa venisque majoribus patente piloso-hispidulis, subtus ubique dense pubescentis, inflorescentiis terminalibus racemiformibus elongatis, sympodiis gracilibus dense pubescentibus, cymis distincte pedunculatis subcapitatis.

Scandent vine or sprawling shrub; branches and branchlets slender, obtusely tetragonal, gray, densely pilose or pilosulous with apparently soon deciduous hairs; leaves decussate-opposite; petioles short, 5--10 mm. long, densely spreading-pilose or hirsutulous; leaf-blades thinly chartaceous, rather uniform in color (when dried), elliptic or elliptic-lanceolate, 9--15 cm. long, 4--5.5 cm. wide, apically long-acuminate, marginally entire, basally obtuse to rounded or subacute, pilose-hispidulous along the midrib and larger venation above, much more densely pubescent throughout beneath with brownish pubescence; inflorescence terminal, racemiform, elongate, about 20 cm. long, long-stalked, the sympodia and branches quite slender, densely spreading-pubescent or hispidulous; cymes distinctly stalked, more or less subcapitate, few--many-flowered, the stalks to 15 mm. long, densely spreading-pubescent; calyx very small, hispidulous, distinctly 4-lobed, campanulate, 1.5--2 mm. long in all; corolla small, yellowish-white, the slender tube 4--5 mm. long, the 4 lobes each about 3 mm. long.

The species is based on *Linda Albert de Escobar 795* from along the river bank at 300 feet altitude in the zone of Dry Tropical Forest near El Carmen, El Oro, Ecuador, collected between November 23 and December 16, 1978, and deposited in the Lundell Herbarium at the University of Texas. The species was hitherto confused with the quite similar *A. chrysantha* Hayek.

CITHAREXYLUM PACHYPHYLLUM var. *PESQUEDENSE* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum parvioribus oblongis vel anguste ellipticis 1--2 cm. longis 5--10 mm. latis marginaliter integerrimis utrinque glabris recedit.

This variety differs from the typical form of the species in its leaf-blades being smaller, very short-petiolate, oblong or narrowly elliptic, only 1--2 cm. long and 5--10 mm. wide, marginally entire, glabrous on both surfaces, apically obtuse and often slightly mucronulate, basally acute.

The variety is based on *J. Hudson 1062* from a rocky mountainside about 1 km. north of Trujillo, in the Cerro Pesqueda, La Libertad, Peru, collected on November 30, 1974, and deposited in the herbarium of the Missouri Botanical Garden at St. Louis, Missouri.

COMBINED EFFECTS OF ENVIRONMENTAL AND AGRONOMIC FACTORS ON THE INVASION PATTERNS OF SPHAERALCEA COCCINEA (NUTT.) RYDB. (MALVACEA)[1]

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ABSTRACT

The invasion of scarlet globemallow (Sphaeralcea coccinea (Nutt.) Rydb. (Malvacea)) onto an area of reseeded vegetation was studied. A chi-square analysis was used to determine the effect of certain agronomic and environmental factors. The environmental factors of SAR and available soil moisture, and the agronomic factor of seed mixture, were shown to have a significant effect on the invasion of this species.

INTRODUCTION and LITERATURE REVIEW

Scarlet globemallow or red falsemallow (Sphaeralcea coccinea (Nutt.) Rydb. (Malvacea)) is a native, perennial forb of the Malvacea family (LaDuke and Northington 1978). Early taxonomists referred to this species as Malvastrum coccineum (Pursh.) A. Gray (Britton and Brown 1897). Britton and Brown also cite earlier references to this species: Malva coccinea Nutt. in Fraser's Cat. Name Only. 1813: and, Cristaria coccinea Pursh. Fl. Am. Sept. 454. 1814.

The genus name Sphaeralcea was derived from the Greek sphaira, a sphere and alkea, mallow, referring to the rounded head of the fruit (Gleason 1952). Plants are between 7 and 30 cm in height and arise from a woody taproot (Rydberg 1922, Taylor 1972). The leaves are greyish-green in color (South Dakota State University 1970), alternate with palmately lobed or dissected blades (Gleason 1952), and are covered with stellate silvery hairs (Rydberg 1965). Rydberg (1965) also described the flowers as subtended by one to three bractlets, with five partially united sepals, and five petals. He further stated that the flowers generally occur in terminal spike-like racemes and can appear in a range of colors from light pink to brick red.

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[1]This study was conducted as an adjunct to a study funded by the United States Department of Energy under Contract No. DE-AS02-76EV04018.

Most authors agree with Rydberg's (1906) description of the geographic distribution of this species. He reported that this species occurred from Saskatchewan and Oregon to across the Great Plains into Iowa, and south to Texas and Mexico. It could generally be found in these areas at an altitude between 1300 and 3000 m in dry, sandy soils and in habitats ranging from pastures to sagebrush-juniper sites.

Chromosome studies of this species have shown polyploids of 2n=20 and 30 (LaDuke 1982). It was also stated that literature on this species was lacking because of its high degree of morphological variation, polyploidy, and hybridization. Scarlet globemallow is generally known to display ecotypic variation. Ward et al. (1982), however, stated that plants collected from different elevations in the Piceance Basin of Colorado did not display significantly different ecotypic variation.

Flowers appear between May and August, although flowering will continue into late September (South Dakota State University 1970). The carpels occur on racemes and are arranged in groups of five to nine and form a sphere that measures 2-4 mm in diameter (Britton and Brown 1897, Gleason 1952, Rydberg 1965).

This species is considered to be highly drought resistant and will shed its leaves during these dry periods (South Dakota State University 1970). It has also been noted that this species has a tendency to increase during periods of drought and overgrazing (South Dakota State University 1970).

Scarlet globemallow has been rated fair to poor in palatability although it is commonly eaten by livestock and is considered an important forage species in some arid regions (South Dakota State University 1970, Regelin et al. 1976, Vavra et al. 1977). Hansen (1980) indicated that almost all species of range herbivores have been shown to eat these plants, and even though it does not comprise a major portion of the diet it is still considered to be an important forage species. Flinders (1971) reported that this species comprised an important part of the diet of insects, small mammals, antelope, sheep, and cattle. It is highly digestible and fulfills the requirements of digestible energy and digestible protein for livestock (Taylor 1972). Taylor further reported that the vitamin A content of this species is high during early growth (256,740 I.U./kilogram) and when in bloom (48,180 I.U./kilogram). He also indicated that the magnesium and calcium content of plants has been shown to be low to deficient.

A defoliation study of this species has shown no significant difference between herbage yields of defoliated plants after a 14-month rest period, when compared with control plants (Buwai 1975). This species was further shown to be highly resistant to multiple heavy defoliations. The plants used in the experiment by Buwai showed an excellent recovery after three or six heavy

defoliations and then 14 or 26 months of rest. Hyder et al. (1975) reported that the most detrimental response to grazing occurred in May or June, but that the plants appeared to benefit from grazing in August or December. In addition to its value as a forage plant, it is imbued with medicinal properties. Gilmore (1977) referred to scarlet globemallow as the "... medicine of the heyoka." He reported that the Dakota Indians were known to chew certain parts of the plant to form a paste, and then apply this paste to flesh wounds. Application of this same paste to the hands would enable the user to immerse his fingers into boiling water to retrieve meat without scalding his fingers.

MATERIALS and METHODS

Scarlet globemallow was selected as one of 10 invading species to be studied on a reseeded site in the Piceance Basin of northwestern Colorado (Grygiel 1983). The Piceance Basin is a semiarid tract of land of approximately 3200 km^2. The study was conducted on the Shallowly Disturbed Successional Study located at the Colorado State University Intensive Study Site in the Piceance Basin. Elevation at the study site was 2040 m. Annual precipation for the years studied was: 22.33 cm in 1979, 28.65 cm in 1980, and 33.49 cm in 1981. The soil present on the site was classified by a representative of the Soil Conservation Service as belonging to the Yamac Series.

The Shallowly Disturbed Successional Study site was established in September and October of 1976. The disturbance consisted of scalping the site with a D-8 Caterpillar tractor and then ripping the soil to a depth of 30 cm. The 2.5-ha study area was divided into 108 subplots, which were drill seeded with one of six seed mixtures as follows: Native grass seed mixture, Introduced grass seed mixture, Native grass-forb seed mixture, Introduced grass-forb seed mixture, Native grass-forb-shrub seed mixture, and Native and Introduced grass-forb-shrub seed mixture. Three levels of nitrogen and phosphorus fertilizer were applied at the following rates: 112 kg N/ha and 56 kg P/ha, 56 kg N/ha and 28 kg P/ha, and 0 kg N/ha and 0 kg P/ha. Each subplot had dimensions of 9x18 m.

The data were analyzed with detrended correspondence analysis (DCA) (Hill 1979) which identified the environmental factors of SAR (sodium absorption ratio) of the soil, available soil moisture, and wind dispersal of reproductive propagules (wind drift). Chi-square analysis was then employed to determine if invasion was evenly distributed among the agronomic factors of fertilizer and seed mixture, as well as the environmental factors of SAR level of soil, available soil moisture, and wind dispersal of plant propagules.

Thirty-six subplots were mapped each year during the sampling periods of 1979, 1980, and 1981. Eighteen of the mapped subplots had been seeded with the Native grass-forb-shrub seed mixture and eighteen had been seeded with the Native and Introduced grass-forb-shrub seed mixture.

Invasion pattern mapping consisted of dividing the subplots into 1-m^2 sections, by means of a string grid, and mapping the area occupied by the invading species which occurred in the 1-m^2 area. The area occupied by the plants was then sketched to scale onto a grid that corresponded to the 1-m^2 divisions of the subplot. The express purpose of this technique was to record the change in distributional pattern of the plants through time. The method used in this study was a modification of a mapping procedure described by Pickford and Stewart (1935).

RESULTS and DISCUSSION

Fertilizer was not shown to be a significant ($p < 0.05$) factor. Seed mixture and certain environmental factors were all shown to have a significant effect on the biomass production of scarlet globemallow.

The biomass production of scarlet globemallow was uniformly distributed among all seed mixtures during the 1978 sampling period. During the 1979 sampling period, however, it was shown to have significantly lower ($p < 0.05$) biomass levels in the Introduced grass seed mixture, Native grass-forb seed mixture, and Introduced grass-forb seed mixture as compared with the other three seed mixtures.

The 1981 sampling period also showed a significant difference ($p < 0.05$) in biomass production among seed mixtures. The Introduced grass seed mixture showed the lowest evidence of invasion by this forb on the study site. The Native grass seed mixture was readily invaded by scarlet globemallow and especially in those subplots which were located in areas of high moisture. Invasion levels of the Native grass-forb seed mixture and the Introduced grass-forb seed mixture were not significantly different ($p > 0.05$) from each other. The Native grass-forb-shrub seed mixture had an invasion level comparable to the Native grass seed mixture for 1981. Invasion in this seed mixture was a reflection of the presence of native grasses and the small patches of open areas which occurred around seeded fourwing saltbush (*Atriplex argentea*) Nutt. plants.

The relatively high levels of biomass production that occurred in 1981 in the Native grass-forb-shrub seed mixture was the result of biomass production in a few, isolated subplots. These particular subplots were subject to the influence of the high soil moisture levels. In addition, the Native grass-forb-shrub seed mixture supported the highest level of invading species for 1979. The comparatively high incidence of invasion that occurred in the Native grass-forb-shrub seed mixture may have resulted from spaces left open by those seeded shrub and forb species which showed a poor response. Seeded species which showed a relatively poor response in this mixture were emerald crownvetch (*Coronilla varia* L.), Stansbury cliffrose (*Cowania mexicana stansburiana* (Torr.)), and green ephedra (*Ephedra viridis* (Colville)).

Soil moisture was shown to be the most important environmental factor during all three sampling periods (Table 1). The data also illustrated the propensity for scarlet globemallow to be located in areas of high moisture. Wind dispersal was not shown to be a significant factor ($p < 0.05$) because the species showed a tendency to reproduce by rhizomes and its seeds are not morphologically designed for wind dissemination. A high SAR level in the subplots did not result in a significant biomass production of this species.

The maps selected for discussion in this paper are representative of the invasion pattern of scarlet globemallow as these patterns occurred over the study site in the Native grass-forb-shrub seed mixture and in the Native and Introduced grass-forb-shrub seed mixture. The map shown is of an individual subplot, but it typifies the distribution pattern of this species in these seed mixtures (Figure 1.). The 1979 distribution of scarlet globemallow took the form of seedlings and relatively small, mature plants grouped together in the formation of islands of vegetation. These islands became smaller in size in 1980 as the less competitive seedlings relinquished territory to the larger plants. The diminutive islands of 1980 had fragmented to form colonies of parent plants and their progeny during the 1981 growing season. This species was shown to be prolifically rhizomatous in its reproductive strategy. It was not unusual to excavate seedlings connected by rhizomes to parent plants which were located at a distance of up to 1 m. This species has a woody taproot, and seedlings will have a great portion of their biomass concentrated beneath the soil surface.

Scarlet globemallow was shown to be an early invading species capable of infiltrating recently disturbed reseeded areas. Additional observations of the species as it occurred in the native vegetation showed a similar response. In disturbed, non-seeded areas scarlet globemallow appeared as a major early invading species. It appeared in clumps, rather than in uniform distribution. A parent plant in association with satellite progeny reflected the rhizomatous mode of reproduction. Although this species exhibited prolific seed production when moisture was abundant, fewer seeds were produced during those years when there was less available moisture.

Germination test results were poor and it was concluded that a hard seed coat was a factor which contributed to the poor germination response. Subsequent germination tests were conducted after subjecting the seed to various degrees of acid and mechnical scarification and confinement in a germinator. Although germination response was not greatly increased by any of the treatments, it was shown that a higher intensity of scarification produced a higher germination response. Greenhouse and field germination studies conducted with the scarified seed proved inconclusive at this writing.

Field observations in native vegetation and maps drawn of the reseeded site indicated that the prominence of this species becomes

Table 1. Percentage of total biomass of Sphaeralcea coccinea affected by individual environmental factors.

Sampling Period	Environmental Factor	Percent of Total Biomass†	
		Observed	Expected
1978	Moisture	59	48
1979		63	48
1981		67	48
1978	Wind drift	19	25
1979		20	25
1981		19	25
1978	SAR	14	16
1979		9	16
1981		8	16
1978	Neutral	8	11
1979		8	11
1981		6	11

†The hypothesis of "even" biomass distribution ("even" in terms of proportional to the number of sub-subplots in each sector) was rejected with $P<0.05$ for the three sampling periods.

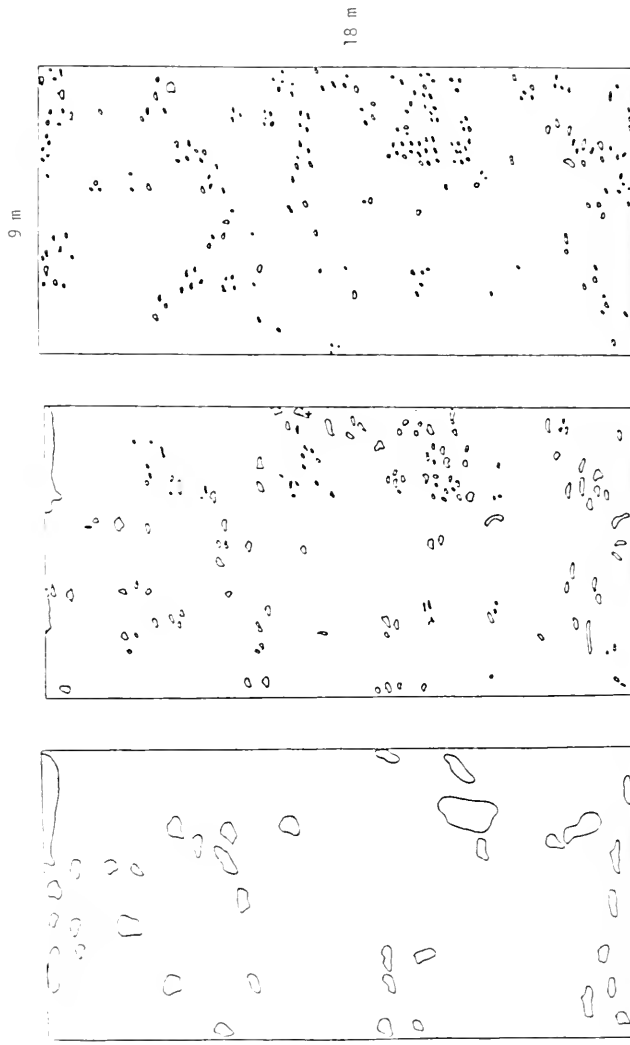

Figure 1. Distributional pattern outlines of Sphaeralcea coccinea for three data collection periods.

less as the plant community matures. This species will apparently aggressively invade an open area but it will not aggressively compete with established plants, especially grasses. Although plant density decreased and its prominence as an invading species became less apparent, scarlet globemallow maintained a constant presence in the maturing reseeded community and as a component of the native vegetation. This species, as an early invader, is suppressed although not eliminated as the community matures and is released through physical disturbances of a site.

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ADDITIONAL NOTES ON THE GENUS *GMELINA*. V

Harold N. Moldenke

GMELINA L.

Additional & corrected bibliography: Duthie in Strachey, Cat. Pl. Kumaon 138. 1906; Deb, Fl. Tripura 1: 16 & 18. 1981; Elias in Bentley & Elias, Biol. Nectaries 197 & 246. 1983; Mold., Phytologia 56: 102--126. 1984.

The *J. R. Drummond 26698*, distributed as *Gmelina* sp., actually is *Clerodendrum aculeatum* (L.) Schlecht.

GMELINA ARBOREA Roxb.

Additional & corrected bibliography: Duthie in Strachey, Cat. Pl. Kumaon 138. 1906; Deb, Fl. Tripura 1: 16 & 18. 1981; Mold., Phytologia 56: 102, 108, 125, & 126. 1984.

Thanks to the kindness of my good friend and colleague, Dr. George M. Hocking, I am able to record that Bhattacharjee & Das (1969) have reported the presence of alkaloids in the leaves of this species. Also, the correct spelling for two words inadvertently misspelled in a previous paper in this series is "Ayurvedic" and "anasarca". He also informs me that "I have read that the trunk diameter [of this species] increases to 0.4 m. in 5 years, thus showing twice the growth rate of southern pine."

GMELINA ASIATICA L.

Additional bibliography: Elias in Bentley & Elias, Biol. Nectaries 197 & 246. 1983; Mold., Phytologia 56: 102, 105, 108, 125, & 126. 1984.

GMELINA ELLIPTICA J. E. Sm.

Additional bibliography: Mold., Phytologia 56: 102--106. 1984.

Additional citations: GREATER SUNDA ISLANDS: Sumatra: *Lörzing 11192* (Bz--21242).

GMELINA HAINANENSIS Oliv.

Additional bibliography: Mold., Phytologia 56: 107--109. 1984.

The "*Liang 65341*" cited by me in a previous paper in this series is an unintentional typographic error for "*Liang 65340*".

GMELINA MOLUCCANA var. *ELLIPTICA* (Mold.) Mold.

Bibliography: Anon., Biol. Abstr. 50 (12): B.A.S.I.C. S.84. 1969; Mold., Biol. Abstr. 50: 6338. 1969; Mold., Phytologia 18: 71. 1969; Anon., Biol. Abstr. 51 (17): B.A.S.I.C. S.89. 1970; Hocking, Excerpt. Bot. A.15: 422. 1970; Mold., Biol. Abstr. 51: 9630. 1970; Mold., Excerpt. Bot. A.18: 445. 1971; Mold., Fifth Summ. 1: 340 (1971) and 2: 524 & 880. 1971; Mold., Phytol. Mem. 2: 330 & 549. 1980; Mold., Phytologia 56: 126. 1984.

This variety differs from the typical form of the species in having its leaf-blades regularly broadly elliptic, narrowed to a dis-

tinctly acute base.

The variety is based on an unnumbered R. Teona collection from a primary forest on a hillside 190 feet above sealevel along the Kolokofa river, on northwestern Ysabel island, Solomon Islands, collected on April 6, 1966, and deposited in the United States National Herbarium in Washington. The collector describes the plant as a tree, 60 feet tall, with a trunk girth of 4 feet, the bole straight, buttresses present, thick and equal, to about 2 feet wide, the bark surface light-brown, fawn-color inside, flecked with light-brown outside, pink inside.

Citations: SOLOMON ISLANDS: Ysabel: *Teona s.n.* [Herb. Brit. Sol. Isls. Prot. 6371] (Ld--photo of type, W--2578238--type).

GMELINA MOLUCCANA f. *GLABRESCENS* (Mold.) Mold., Phytologia 19: 439. 1970.

Synonymy: *Gmelina salomonensis* f. *glabrescens* Mold., Phytologia 4: 178. 1953.

Bibliography: C. T. White, Journ. Arnold Arb. 31: 113. 1950; Mold., Biol. Abstr. 27: 2026. 1953; Mold., Phytologia 4: 178. 1953; Mold., Résumé 204 & 456. 1959; Mold., Biol. Abstr. 51: 9630. 1970; Mold., Phytologia 19: 439. 1970; Mold., Excerpt. Bot. A.18: 445. 1971; Mold., Fifth Summ. 1: 340 (1971) and 2: 524 & 880. 1971; Mold., Phytol. Mem. 2: 330 & 549. 1980; Mold., Phytologia 55: 335 (1984) and 56: 124 & 125. 1984.

This form differs from the typical form of the species in having the branchlets, peduncles, inflorescence-branches, pedicels, and lower leaf-surfaces glabrous or subglabrous.

The form is based on *Kajewski 2228* from the seashore at Buin, Karngu, Bougainville island, in the Solomon Islands, collected on October 10, 1930, deposited in the Herbarium Bogoriense at Buitenzorg, Java. It is quite possible that the *Walker & White 169 & 257*, from New Georgia and San Cristoval islands, cited by White (1950) as *G. salomonensis* may represent the present taxon since he refers to the "adult leaves being glabrous or the young and half-grown leaves having [only] a slight pubescence on the midrib and main lateral nerves on the lower surface."

Citations: SOLOMON ISLANDS: Bougainville: *Kajewski 2228* (Bi--isotype, Bz--21336--type, Ld--photo of type, N--isotype, N--photo of type).

GMELINA MOLUCCANA f. *GLANDULOSA* (H. Hallier) Mold., Phytologia 56: 121. 1984.

Synonymy: *Gmelina glandulosa* H. Hallier, Meded. Rijks Herb. Leid. 37: 57. 1918.

It seems most doubtful to me that this taxon is distinct from the typical form of *G. moluccana* (Blume) Backer since Blume (1826), in his original description of the species, definitely speaks of "infra puberulis basique glandulosis".

GMELINA NEOCALEDONICA S. Moore, Journ. Linn. Soc. Lond. Bot. 45: 375--376. 1921.

Synonymy: *Gmelina neo-caledonica* S. Moore ex Mold., Résumé Suppl.

3: 32 in syn. 1962.

Bibliography: S. Moore, Journ. Linn. Soc. Lond. Bot. 45: 375--376. 1921; A. W. Hill, Ind. Kew. Suppl. 7: 104. 1929; Fedde & Schust/. Justs Bot. Jahresber. 53 (1): 1074. 1932; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 68 & 93 (1942) and ed. 2, 151 & 186. 1949; Mold., Résumé 205 & 456. 1959; Mold., Résumé Suppl. 3: 32. 1962; Mold., Fifth Summ. 1: 341 (1971) and 2: 524 & 880. 1971; Mold., Phytol. Mem. 2: 331 & 549. 1980; Mold., Phytologia 55: 333. 1984.

A large shrub, 2--3 m. tall, or small tree, to 8 m. tall; branchlets stout, the leafy tips minutely fulvous-tomentose, finally glabrescent, the bark loose, gray, longitudinally coarsely striate; leaves decussate-opposite, petiolate; leaf-blades coriaceous, ovate or rarely suborbicular, 12--17 cm. long, 8--14.5 cm. wide, apically obtuse or very obtuse, marginally slightly revolute, basally obtuse or rounded, shiny dark-green and glabrous above, pale gray-green beneath, very minutely white- or pale brownish-farinose beneath; inflorescence terminal, cymose-paniculate, oblong, 10 cm. long, densely flowered, fulvous-tomentose throughout; calyx campanulate, 6.5 mm. long, externally densely fulvous-tomentose, the rim 5-dentate; corolla white, with 2 yellow blotches on the lower lip,, externally densely fulvous-tomentose, the tube infundibular, 9 mm. long, the limb bilabiate, the posterior lobes oblong-ovate, longer than the similar suborbicular anterior lobe; stamens subincluded; style short-exserted, rather thick, subglabrous; stigma bilobed, the posterior lobe tooth-like and much shorter than the anterior one; ovary ovoid, 2 mm. long. apically setulose, 4-locular; ovules subapically pendent.

The species is based on *Compton 2158* from a riverside in a *Callitris* forest, at 200 feet altitude, on serpentine soil, at Comboui, New Caledonia.

This is the first of the two known New Caledonian species of *Gmelina* and, according to Moore (1921) "is very different from its congeners". Recent collectors have encountered it in mesophytic forests on serpentine hillsides, at 200--600 m. altitude, in flower in November.

Citations: NEW CALEDONIA: *Franc 1512* (Ca--390509, N, N), *1998* (N); *Guillaumin & Baumann-Bodenheim 13234* (N); *Hürlimann 755* (N); *McKee 3484* (Go, W--2210294).

GMELINA OBLONGIFOLIA Roxb., Hort. Beng., imp. 1, [95]. 1814; Fl. Ind., ed. 2, imp. 1, 3: 83. 1832.

Bibliography: Roxb., Hort. Beng., imp,. 1, [95]. 1814; Roxb., Fl. Indica,ed. 2, imp. 1, 3: 83--84. 1832; Voigt, Hort. Suburb. Calcut. 473. 1845; Walp., Repert. Bot. Syst. 4: 98. 1845; Schau. in A. DC., Prodr. 11: 679--680. 1847; Buek, Gen. Spec. Syn. Candol. 3: 200. 1858; Roxb., Fl. Indica, ed. 2, imp. 2, 485--486. 1874; C. B. Clarke in Hook. f., Fl. Brit. India 4: 582--583. 1885; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1040. 1893; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 173. 1895; Gamble, Man. Indian Timb., ed. 2, imp. 1, 537 & 778. 1902; Brandis, Indian Trees, imp. 1 & 2, 502 & 509 (1906) ad imp. 3, 502 & 509. 1911; H. Hallier, Meded. Rijks Herb. Leid. 37: 56. 1918; Gamble, Man. Indian Timb., ed. 2, imp. 2, 537 & 778. 1922; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 54 &

93 (1942) and ed. 2, 125, 127, & 186. 1949; Mold., Résumé 159, 163, & 456. 1959; Brandis, Indian Trees, imp. 5, 502 & 509. 1971; Mold., Fifth Summ. 1: 268 & 276 (1971) and 2: 880. 1971; Roxb., Fl. Indica, ed. 2, imp. 3, 485--486. 1971; Gamble, Man. Indian Timb., ed. 2, imp. 3, 537 & 778. 1972; Mold., Phytol. Mem. 2: 263, 270, & 549. 1980; Roxb., Hort. Beng., imp. 2, [95]. 1980.

A tall, slow-growing timber tree, to 10 m. tall at 14 years; trunk straight, the bole 4--5 m. to the first branch, to about 45 cm. in circumference at breast height (at 14 years of age); bark ash-colored, somewhat cracked; branches ascending; young branchlets somewhat tetragonal; leaves decussate-opposite, petiolate, exstipulate; petioles about 5 cm. long, canaliculate above, with several glands close to the apex; leaf-blades oval or ovate to oblong, 15--31 cm. long, 7.5--21 cm. wide, apically subobtuse, marginally entire, rather rough, with a concave glandular impression on each side of the base of the midrib; inflorescence terminal, paniculate, solitary, broadly ovate in outline, its branches decussate-opposite, tetragonal, brownish-farinose; bracts small, very early caducoud; flowers large, numerous, fragrant; calyx cyathiform, externally farinose and with a few glands, the rim truncate and entire; corolla rosy, irregular, its tube short, curvate, the throat obliquely campanulate, the limb 5-parted, 2-lipped, the lower lip longer, with a deep-yellow mark at the center of its base; anthers 2-locular; style equaling the stamens; stigma unequally 2-lobed; ovary superior, turbinate, externally glabrous, 4-locular, each locule 1-ovulate; ovules attached slightly below their apex to the upper part of the placenta; fruit drupaceous, oblong, the size of a large olive, somewhat tetragonal and apically obtuse, externally smooth and shiny, bright-crimson when ripe, containing a single pyrene which is clavate, tetragonal, 4-locular, perforated centrally from the base; seeds solitary, lanceolate; endosperm absent; embryo erect; cotyledons conforming to the seed in size and shape; radicle small, inferior.

Roxburgh (1832) states that "the seed ripens in August and September" and that the species is "a native of the eastern parts of Bengal [Bangladesh]; flowering in March and April." Clarke (1885) asserts that the description "indicates a remarkable tree that no one else has seen. There is at Kew an unpublished drawing of Roxburgh's of this tree, agreeing exactly with the description."

Hallier (1918) comments: "Seine *Gm. oblongifolia* hat Roxburgh nach einem Exemplar des botan. Gartens zu Calcutta beschrieben. Da sie nach Clarke ein ansehnlicher Baum ist, 'that no one else has seen', so lag die Vermuthung nahe, dass sie nicht, wir Roxburgh angiebt, von Ostbengalen stammt.. Sondern mit der Art von Ambon [*G. moluccana* (Blume Backer] zusammenfällt. Von dieser unterscheidet sie sich jedoch durch 'leaves somewhat rough', 'flowers large, rosy' und einen 'calyx entire'. Die beiden Arten dürften also doch wohl verschieden sein."

Nothing is known to me about this taxon beyond what is stated in its bibliography.

GMELINA PALAWENSIS H. J. Lam, Verbenac. Malay. Arch. 224--225. 1919.

Synonymy: *Gmelina palawensis* H. J. Lam ex Kanehira, Fl. Micrones.

342. 1933. *Gmelina palauensis* H. J. Lam ex Mold., Fifth Summ. 1: 524 in syn. 1971. *Gmelina palawensis* H. J. Sm. ex Mold., Phytol. Mem. 2: 408 in syn. 1980.

Bibliography: H. J. Lam, Verbenac. Malay. Arch. 216, 224--225, & 366. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 65 & 68. 1921; H. J. Lam in Diels,Engl. Bot. Jahrb. 59: 28. 1924; A. W. Hill, Ind. Kew. Suppl. 6: 92. 1926; Fedde & Schust., Justs Bot. Jahresber. 47 (2): 245. 1927; Kanehira, Fl. Micrones. 342 & 457. 1933; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 573. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 63 & 93. 1942; Hosokawa, Journ. Jap. Bot. 24: 44. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 143 & 186. 1949; Mold., Phytologia 4: 54. 1952; Saint John, Pacif. Sci. 10: 101. 1956; Mold., Résumé 184, 186, 195, 201, 427, & 456. 1959; Mold., Résumé Suppl. 1: 13 (1959), 2: 7 (1960), 3: 22 & 23 (1962), and 18: 7. 1969; Mold., Fifth Summ. 1: 317, 320, & 337 (1971) and 2: 524, 778, & 880. 1971; Fosberg, Sachet, & Oliv., Micronesica 15: 235. 1979; Mold., Phytol. Mem. 2: 311, 408, & 549. 1980; Fosberg, Otobed, Sachet, Oliv., Powell, & Canfield, Vasc. Pl. Palau 38. 1982; Mold., Phytologia 55: 335 & 493 (1984) and 56: 48 & 125. 1984.

A medium-sized tree, 6--12 m. tall; trunk to 12 cm. in diameter at breast height; branchlets cylindric, with grayish-brown bark, the lenticels numerous; leaves decussate-opposite; petioles 2.5--8 cm. long, glabrous; leaf-blades membranous or subchartaceous, dark-green above, yellow-green beneath, ovate or broadly ovate, 8--23 cm. long, 6--11 cm. wide, apically acuminate or sometimes obtuse, marginally entire, basally usually decurrent, sometimes almost rounded, glabrous on both surfaces, shiny above, basally with a few glands above and below the main veins, the secondaries 4--7 per side; inflorescence elongate, racemiform, basally foliose, 10--15 cm. long, 3--4 cm. wide; peduncles 1.5--5.5 cm. long; bracts foliaceous, 3--8 mm. long, 1--3 mm, wide, glabrous; pedicels 3--12 mm. long; flowers fragrant, snapdragon-like; calyx cupuliform, 3.5--4.5 mm. long, externally glabrous and covered with large glands, the rim entire; corolla white or white and magenta to pink or purple, 2-lipped, externally densely golden-fulvous (except for the lower part), the tube 1--1.3 cm. long, the limb 5-lobed with subequal lobes, the upper lip 5 mm. long and 2.5 mm. wide, bilobed, the lower lip 3-lobed, the lateral lobes 6.5 mm. long and 3 mm. wide, the middle lobe 8 mm. long and 3.5 mm. wide; stamens 4, included, didynamous; filaments thickened, 7--9 mm. long, basally pilose with simple hairs, apically glanduliferous; style thickened, glabrous; stigma conspicuously unequally bifid, one branch 2 mm. long, the other minute, both subulate; ovary globose, externally glabrous; fruit drupaceous, pear-shaped, lavender or magenta.

This species is based on *Ledermann 14429* & *14431* from Ngarsul, at 200--300 m. altitude, on Babelthaop island, Palau Islands, the former collected in flower on November 24, 1914, and the latter in bud on February 21, 1918, and on *Raymundus 114* & *210* from Koror island, all deposited in the Herbarium Bogoriense at Buitenzorg, Java. The native names, "blachaiösch", "blacheos", and "blaheos", are reported for the plant. The species is known also from the islands of

Amiriik, Kaiguru, Malakal, and Palau. Collectors have encountered it in open forests and valley jungles, at 5 m. altitude, in flower in February, April, and June, and in fruit in February and June. Takematsu refers to it as a "common forest tree" or "rarely found". Canfield speaks of it as an "uncommon tree at bordering forest and mangrove in volcanic clay soil along with *Calophyllum*, *Pandanus*, *Schefflera*, *Cocos*, and *Scleria*."

The corollas are said to have been "pink" on *Fisher 111*, "purple" on *Takamatsu 1639*, "lavender" on *Lane 49-156*, and "white and magenta" on *Canfield 446*.

The Lam (1924) reference in the bibliography (above) of this species is sometimes cited as "1925", but that is merely the volume titlepage date; the page here concerned was issued in 1924.

The *Ahern 461* [161] & *462*, distributed as typical *G. palawensis*, actually represent its var. *dinagatensis* Mold., the former collection being the type collection.

Citations: PALAU ISLANDS: Amiriik: *Kanehira 1923*(W--1669163). Babelthaob: *Canfield 446* (W--2828477); *Takamatsu 1561* (Bi), *1639* (Bi); *Tuyama s.n.* [28 Aug. 1937] (Bi). Kaiguru: *Takamatsu 1594* (Bi, Ca--805559, W--1992675). Palau: *T. R. Fisher 111* (Ft--7838, Ft--7839); *Hosokawa 6969* (Bi, W--2036324); *Kanehira 387*(Bi, N), *1923* (N), *2280* (N), *s.n.* [Feb. 1929] (Ca--203935); *Lane 49-156* (Ba--385391).

GMELINA PALAWENSIS var. *CELEBICA* Mold., Phytologia 3: 417--418. 1951.

Bibliography: Mold., Phytologia 3: 417--418. 1951; Mold., Résumé 195 & 456. 1959; Mold., Fifth Summ. 1: 325 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 315 & 549. 1980; Mold., Phytologia 55: 335. 1984.

This variety differs from the typical form of the species in having subcoriaceous or coriaceous leaf-blades which are mostly obovate in shape, to 21 cm. long and 8.7 cm. wide, and basally attenuate-cuneate.

This apparently endemic Celebesian plant is based on *G. Kjellberg 2001* from sealevel at Malili, Celebes, collected on August 2, 1929, and deposited in the Herbarium Bogoriense at Buitenzorg, Java.

Collectors describe the plant as a tree, to 30 m. tall, often 5--25 m. to the first branch and 75 cm. in diameter at 0.5 m., 60 cm. at 1 m., 41 cm. at 1.5 m., and 35--45 cm. at 1.3 m. above the base, the flowers fragrant, the corolla rose-color (*Waturandang 42*), and the fruit dark-green (in March). They have found it growing at 25--600 m. altitude, in flower in January and October, and in fruit in March and December. They record the vernacular names, "longgewoewoe", "tamboerere", "woewoe", and "woeroko".

Material of this taxon has been distributed in some herbaria as typical *G. palawensis* H. J. Lam.

Citations: GREATER SUNDA ISLANDS: Celebes: *Burki 32* [Boschproef-st. bb.23574] (Bz--21312); *Hoornsha 8* [Boschproefst. bb.8560] (Bz--21307, N); *Kjellberg 2001* (Bz--21308--type, Bz--21309--isotype, Ld--photo of type, N--photo of type, S--isotype); *Reppie 93* [Boschproef-st. Cel.III.35] (Bz--21316, Bz--25580, Bz--25581), *214* [Boschproef-

st. Cel.IV.189] (Bz--21317), *377* [Boschproefst. Cel.III.167] (Bz--21311), *378* [Boschproefst. Cel.III.168] (Bz--21310, Bz--22582), *379* [Boschproefst. Cel.III.169] (Bz--21313); *Waturandang 42* [Boschproefst. Cel.III.35] (Bz--21314, Bz--21322, Bz--21323, Bz--21324, N), *133* [Boschproefst. Cel.IV.128] (Bz--21318), *134* [Boschproefst. Cel.IV.129] (Bz--21319, N), *135* [Boschproefst. Cel.IV.130] (Bz--21320), *136* [Boschproefst. Cel.IV.131] (Bi, Bz--21321).

GMELINA PALAWENSIS var. *DINAGATENSIS* Mold., Phytologia 3: 418. 1951.

Bibliography: Mold., Phytologia 3: 418. 1951; Mold., Résumé 184 & 456. 1959; Mold., Résumé Suppl. 18: 7. 1969; Mold., Fifth Summ. 1: 317 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 308 & 549. 1980; Mold., Phytologia 55: 335. 1984.

This variety differs from the typical form of the species in having the leaf-blades subcoriaceous, elliptic in shape, 7--15 cm. long, 3.5--7 cm. wide, and basally attenuate.

It is based on *Ahern 461Q* from the island of Dinagat. Philippine Islands, collected in 1901 or 1902, and deposited in the Herbarium Bogoriense at Buitenzorg, Java. It appears to be endemic to Dinagat and Mindanao islands.

Material of this variety has been distributed in some herbaria as typical *G. palawensis* H. J. Lam, *Faradaya* sp., or even *Radermachera* sp.

Citations: PHILIPPINE ISLANDS: Dinagat: *Ahern 461Q* [161] (Bz--21305--type, Bz--21306--isotype, Ld--photo of type, N--isotype, N--photo of type, W--445766--isotype). Mindanao: *Ahern 462* (W--445519).

GMELINA PALAWENSIS var. *NOVOGUINEENSIS* Mold., Phytologia 4: 54--55. 1952.

Bibliography: Mold., Phytologia 4: 54--55. 1952; Mold., Résumé 201 & 456. 1959; Mold., Fifth Summ. 1: 337 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 327 & 549. 1980; Mold., Phytologia 55: 335. 1984.

This variety differs from the typical form of the species in having its leaf-blades firmly coriaceous, elliptic, basally rounded, and marked at the very base with 2 very large and prominent orchidaceous glands.

The variety is based on *Womersley, Herb. Dept. For. N. Guin. NGF. 2922* from Morobe, Morobe District, Territory of New Guinea, deposited in the Herbarium Bogoriense at Buitenzorg, Java.

Recent collectors describe the plant as a small tree, 6 m. tall, the outer bark gray and fissured, the inner bark straw-green, the wood creamy-straw, the leaf-blades dark-green and smooth above, pale-green and rough beneath, the corollas "cream with purple", and the fruit green (in March). They have found it growing in secondary forests, on rocky slopes above the mangrove forest, and also within the mangrove zone itself, at altitudes of sealevel to 40 m. in fruit in March. They report the native vernacular name, "boa".

Citations: NEW GUINEA: Territory of New Guinea: *Kerenga & al. LAE.73871* (Mu); *Womersley, Herb. Dept. For. N. Guin. NGF.2922* (Bz--72674--type, Ld--photo of type, N--photo of type, Ng--6602--isotype).

GMELINA PANICULATA Fletcher, Kew Bull. Misc. Inf. 1938: 204. 1938.

Bibliography: Fletcher, Kew Bull. Misc. Inf. 1938: 204 & 422. 1938; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 60 & 93. 1942; Hill & Salisb., Ind. Kew. Suppl. 10: 100. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 137 & 186. 1949; Anon., Kew Bull. Gen. Ind. 134. 1959; Mold., Résumé 178 & 456. 1959; Mold., Fifth Summ. 1: 296 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 286 & 549. 1980; Mold., Phytologia 55: 335 & 497. 1984.

A small tree; branches terete or obtusely tetragonal, brown, spinose, at first slightly pubescent with the hairs more numerous at the nodes, eventually glabrous; lenticels few; spines axillary, 8--10 mm. long; leaves decussate-opposite; petioles 1.5--3 cm. long, brown in drying, canaliculate above, pubescent especially apically above; leaf-blades chartaceous, broadly ovate or elliptic, 7--13 cm. long, 5--8 cm. wide, apically subacuminate, marginally entire or slightly revolute, basally subcuneate, reddish-brown on both surfaces when dried, glabrous or slightly pubescent above, glabrous and with numerous, white, rounded or quadrangular glands beneath; midrib conspicuous above, prominent beneath; secondaries 4 or 5 pairs, parallel, prominulent beneath; tertiaries numerous, parallel; inflorescence terminal, 2--4 cm. long, glandular-tomentose with fulvous hairs; bracts ovate or lanceolate, 2.5--10 mm. long, 1--5 mm. wide; calyx externally glandular-pubescent and marked with large black glands, the tube 3 mm. long, internally smooth, the rim 4-dentate, the teeth 1 mm. long and 1.5 mm. wide; corolla externally glandular-pubescent, the tube 2.5 cm. long, internally glabrous, the limb 2-lipped, the posterior lip 5 mm. long and 5 mm. wide, the lower lip 3-lobed, 10 mm. long and 18 mm. wide, the lobes all apically rounded; stamens 4, 2 filaments 14--15 mm. long and attached 13.5 mm. above the base of the corolla-tube, the other two 7.5 mm. long and attached 12.5 mm. above the base; anthers 2.5 mm. long; style shortly bilobed; ovary obovoid, 2.8 mm. long and wide, externally glabrous; fruit ovoid, 1.5--2 cm. long, 1 cm. wide, externally slightly pubescent.

This apparently endemic species is based on *Put 2086* from Krabin, Aranya, Prachinburi District, Thailand, and is known only from the original collection. It is known to me only from the bibliography (above).

GMELINA PHILIPPENSIS Cham., Linnaea 7: 109 [as "*[asiatica ?] philippensis*"]. 1832; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1040. 1893.

Synonymy: *Gmelina asiatica* Lour., Fl. Cochinch., ed. 1, 376. 1790 [not *G. asiatica* Kurz, 1902, nor L., 1753, nor Wall., 1831. *Gmelina? finlaysoniana* Wall., Numer. List 215, no. 6317 hyponym. 1832; Schau. in A. DC., Prodr. 11: 680. 1847. *Gmelina asiatica?* Blanco, Fl. Filip., ed. 1, 492--493. 1837. *Gmelina inermis* Blanco, Fl. Filip., ed. 1, 493. 1837. *Gmelina asiatica* L. var. Cham. ex D. Dietr., Syn. Pl. 3: 613 in syn. 1843. *Gmelina hystrix* Schult. ex Kurz, Journ. Roy. Asiat. Soc. Beng. 39 (2): 81. 1870. *Gmelina hystrix* Kurz ex Benth. in Benth. & Hook. f., Gen. Pl. 2 (2): 1153. 1876. *Gmelina inermis*

Naves ex Fern.-Villar in Blanco, Fl. Filip., ed. 3, 4: Nov. App. 159 in syn. 1880 [not *G. inermis* Wight, 1831]. *Gmelina histryx* Kurz ex Vidal, Phan. Cuming. Philip. 134. 1885. *Gmelina bracteata* Burck, Ann. Jard. Bot. Buitenz. 10: 98, pl. 7, fig. 5 & 6. 1891. *Gmelina finslaysoniana* Wall. ex Kuntze, Rev. Gen. Pl. 2: 507. 1891. *Gmelina finslaysoniana* var. *silvestris* Kuntze, Rev. Gen. Pl. 2: 507. 1891. *Gmelina finslaysoniana* var. *silvestris* f. *viridibracteata* Kuntze, Rev. Gen. Pl. 2: 507. 1891. *Gmelina finslaysoniana* var. *silvestris* f. *colorata* Kuntze, Rev. Gen. Pl. 2: 507. 1891. *Gmelina finslaysoniana* var. *hystrix* Kuntze, Rev. Gen. Pl. 2: 507. 1891. *Gmelina asiatica* Schau. ex H. Hallier, Meded. Rijks Herb. Leid. 37: 60 in syn. 1918. *Gmelina philippinensis* Cham. ex H. J. Lam, Verbenac. Malay. Arch. 222. 1919. *Gmelina asiatica* var. *philippinensis* (Cham.) Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 70. 1921. *Gmelina asiatica* var. *philippinensis* Bakh. ex E. D. Merr., Enum. Philip. Flow. Pl. 3: 399 in syn. 1923. *Gmelina asiatica* Lam ex Fletcher, Kew Bull. Misc. Inf. 1938: 405 in syn. 1938. *Gmelina hystrix* "Schult. ex Kurz" apud Anon., Kew Bull. Gen. Ind. 134. 1959. *Gmelina phillippensis* Hall & Gooding, Fls. Islands Sun 11, 41, 47, & 133. 1966. *Gmelina philippensis* Cham. & Schlecht. ex Mold., Résumé Suppl. 18: 12 in syn. 1969. *Gmelina philippinensis* Cham. & Schlecht. ex Mold., Résumé Suppl. 18: 12 in syn. 1969. *Gmelina filipensis* Cham. ex Mold., Phytologia 23: 432 in syn. 1972. *Gmelina filippensis* Cham. ex López-Palacios, Pittieria 6: 13 & 17. 1974. *Gmelina hystris* Schult. ex López-Palacios, Pittieria 6: 17 in syn. 1974. *Gmelina phillipensis* Cham. ex López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 24. 1979. *Gmelina hystrix* var. *silvestris* Kuntze ex Mold., Phytol. Mem. 2: 408 in syn. 1980. *Gmelina asiatica* var. *hystrix* H. J. Lam ex Mold., Phytol. Mem. 2: 408 in syn. 1980. *Gmelina finslaysoniana* var. *viridibracteata* Kuntze ex Mold., Phytol. Mem. 2: 408 in syn. 1980. *Gmelina philippense* Cham. ex Mold., Phytologia 54: 243 in syn. 1983. *Gmelina philippensis* f. *colorata* (Kuntze) Mold., Phytologia 55: 234. 1983. *Gmelina philippensis* f. *viridibracteata* (Kuntze) Mold., Phytologia 55: 234. 1983.

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ios, Fl. Venez. Verb. [320]. 1977.

A moderately sized to large, dense, attractive, straggling or scandent (if shaded), usually spinose shrub, stout bush, undershrub, or small shrubby tree with the habit of a *Bougainvillea*, 3--7 m. tall, sometimes sprawling or prostrate; trunk (when formed) often armed with spines to 5 cm. long; stems usually several from ground level, arching, with long shoots arising from the arch, lenticellate; lenticels scattered on older wood, pustulate; branches arching, the ultimate lateral ones rather short, divaricate, sharp-pointed, drooping or subscandent, forming more or less flattened masses; dwarfed branchlets spinescent, the spines horizontal, short, 0.25--1.5 cm. long, or absent; youngest branchlets hispid-pubescent; bark yellowish-lenticellate; wood soft, white; leaves decussate-opposite, ascending, dimorphic, mostly anisophyllous; petioles 0.5--4 cm. long; leaf-blades chartaceous and fleshy or subcoriaceous when fresh, submembranous in drying, ovate, oblong, or elliptic to rhomboid-elliptic or obovate, 1.5--10 cm. long, 1.5--6 cm. wide, apically obtuse or subacute, marginally entire and often slightly recurved or distantly coarse-toothed to slightly few-lobed, glabrous and shiny above, pale and often glaucous beneath, puberulent only on the larger venation, the intervening spaces covered by many peltate scales (the leaves in one form are mostly 10--15 cm. long, elliptic-oblong, subacute and entire; in the other form they are shorter, broader, and shallowly lobed, a variation perhaps connected with the dampness or dryness of the site, an environmental character which may also play a part in the general habit and spinescence of the plant); inflorescence terminal, cymose, strobiliform, 10--20 cm. long, dense, pendulous, many-flowered, the cymes arranged in racemiform clusters in the axils of large, persistent, foliaceous, and very conspicuous, rather petaloid, showy bracts which are membranous, broadly oval or ovate to obovate or orbicular and concave, yellow (in the typical form), permanently green or yellowish-green [in f. *viridibracteata* (Kuntze) Mold.], or maroon, purplish, reddish-purple, or purple to red or brownish-red [in f. *colorata* (Kuntze) Mold.], sometimes striped or purple-veined, brunnescent in drying, 1.5--4 cm. long, 1--3.5 cm. wide, apically obtuse to mucronate or short-apiculate, shortly ciliate-hairy only along the margins, 5-venose, the veins often red or purple; flowers pendulous, slightly fragrant, in 1-flowered cymules, sessile or subsessile, easily detached, 5--7.5 cm. long; calyx green, campanulate, short, esternally strigose-hirtous, marked with 2--4 external glands, the rim 4- or 5-dentate; corolla bright-yellow or light lemon-yellow to orange-yellow, the tube irregularly narrow-campanulate, curiously curvate and inflated upwards, 4.5--5.5 cm. long, externally moderately densely pubescent or glabrous, the limb about 5 cm. wide, concave, globose, 4-parted, the "upper lip like the head of a duck" [Qureshi], 3-lobed, the lobes short, broadly ovate-rotund, reflexed, the lower lip longer, ovate, obtuse, the 2 lateral lobes much smaller; stamens inserted at the middle or near the top of the corolla-tube, didynamous, the filaments yellow, the 2 longer (anterior) stamens with equal yellow (maturing brown) anthers and their filaments often apically with

tiny gland-tipped hairs, the subreniform anthers on the much shorter (posterior) stamens smaller and differently colored, their filaments glabrous throughout; pollen grains prolate, 49 x 37 mu (range 42--53 x 35--39 mu), the endocolpium faint, the ectine surface areolate, the areoles of various shapes; style equaling the stamens, yellow; stigma bilobed, one lobe much shorter than the other; ovary obtuse; fruit drupaceous, obovoid, fleshy, pendulous, about 2.5 cm. long, yellow or yellowish, externally smooth, the pericarp soft and watery when mature; pyrenes very hard, 5-celled, with one seed per cell or by abortion less; chromosome number: 2n = 38.

This rather *Bougainvillea*-like shrub is native to the Philippine Islands; also (perhaps originally introduced) from India eastward through Thailand, Burma, and Indochina to Indonesia; rather widely cultivated for ornament in private gardens and public parks in many parts of tropical Asia, Africa, and America. It is based on a Philippine collection from Luzon, collector and number not designated, originally deposited in the Berlin herbarium, now lamentably destroyed.

Gmelina philippensis is a very quick-growing plant and usually requires severe pruning when in cultivation. It may be propagated by cuttings. The pollen is described in detail and illustrated by Nair & Rehman (1962).

In the Philippines the juice of the ripe fruit of this plant is used in treating soreness of the toes due to excessive wetness. In Malaya the leaves and fruit are pounded with lime and applied to the throat as a poultice in treating coughs. In Indonesia the juice of the roots is employed as a purgative and in the treatment of overfatigue. In Indochina an extract of the roots (used internally) and of the leaves (used externally) is employed as an excitant, discutient, and in treating diseases of the joints and nerves.

The *Jambosa sylvestris* Rumpf, *J. sylvestris parvifolia* Rumpf, *Radix deiparae* Rumpf, and *R. deiparae spuria* Rumpf, often cited [e.g., by Naves (1880)] as synonyms of this species, actually apply to the juvenile form of *G. elliptica* J. E. Sm.

Gmelina philippensis is sometimes attacked by the fungus, *Meliola clerodendricola* var. *micromera* (Syd.) Hansf.

Vernacular names recorded as applied to *G. philippensis* include the following: alipung, alipúng, alipunga, alipúnga, bristly bushbeach, bristly bushbeach, baga-babui, bagaboboi, balabalayan, betebet, bosel-bosel, bulang, bulangan, bulangan duri, cây gang tu hú, ching chai, găng tu hú, gmelina de Asia, kalulut, kălûlŭt, kibana-yôraku, kumbil, paniktik, pekan, Philippine shihmu [=stone-wood], purple bulang, snapdragon tree, sousou, sowsow, talungun, tulongan, & tulóngau.

Chamisso's (1832) original description of this plant is: "foliis ellipticis, utrinque breviter acuminatis, apice obtusis, subcoriaceis nitidis, subtus in nervo et venis pilosis, caeterum nudus, bracteis ellipticis membranaceis pilosis calyce ter quaterque longioribus. E Luçonia retulimus specimina vix sufficientia, ramulum floriferum, aliumque fructiferum. A vulgari caldariorum nostrorum hispite notis allatis diversa, caeterum simillima. An species an varietas sit, doceant nos, quibus stirpem in vivis recognoscere erit

datum. Folia supra nitida, subtus opaca, leviter glaucescentia, in nervo et venis pilis longiusculis laxis antrorsis munita: margine reflexo, longitudine bipollicari, latitudine 14 linearum, petiolo semipollicari. Calyx callis glandulosis nigris pariter infectus major, corolla minor quam in *G. asiatica* culta; ramulus florifer pariter spinis expers. Fructus nondum maturus axi semipollice breviori."

In the opinion of E. D. Merrill, as noted in pencil on the margin of his personal copy of Blanco's 1837 work, both Blanco's *G. asiatica* and *G. inermis* represent *G. philippensis*. Blanco's description actually is quite ample: "Tronco llemo de puntos prominentes, y con espinas axilares en las ramas. Hojas á veces opuestas, y á veces amontonaditas en un punto, que se acercan á la figura eliptica, enteras lampiñas por la pagina superior, y pelosas en el peciolo y venas inferiores. Flores terminales en racimos, con una hojuela floral aovada en la base de cada florecita. Cal. persistente lampiño mui pequeño, con cuatro ó cinco dientes apenas notables, y con tres hasta cinco glandulas, colocadas en la parte de afuera, y á un lado cerca del borde. Cor. mui grande: el tubo largo de figura de ambudo con la garganta abierta, y el limbo mui grande concavo, globoso, y ligeramente hendido en cuatro partes: la de arriba arqueda acia adelante: las dos laterales mas pequeñas, y la de abajo igual á ellas. Estam. fijos en medio de la corola: los dos, dos veces mas largos y gruesos que los otros dos. Ant. hechadas y todas cuatro hendidas en ls base: las de los estambres mas cortos, mas pequeñas y de otro color. Estilo del largo de los estambres. Estigma en dos partes: la una mui corta, y la otra larga y alesnada. Drupa superior grande, aovada, carnosa, con una nuez durisima, que contiene desde dos hasta cinco aposentos, y en cada uno una semilla. = Este arbol cuyal flores son amarillas del largo de una pulgada, se eleva á la altura de tres varas. El fruto es oloroso, y parece una manzanita. Son dignas de notarse las glandulas del caliz. Flor. en Jul." For his *G. inermis* he says merely: "Ramas sin espinas. Hojas anchas lanceoladas. = En lo demas como en la especie anterior [*G. asiatica*]". Fernandez-Villar regarded this as representing *G. villosa* Roxb. [now known as *G. elliptica* J. E. Sm.], but Merrill (1918) states categorically that "There is no justification for this reduction.....he merely described a thornless or nearly thornless form of *G. philippensis*."

Kuntze (1891) describes his var. *silvestris* as having "folia duplo minora vix pollicaria parte superiore obtusangula"; his f. *colorata* with "bracteae brunneae. Cap St. James"; his f. *viridibracteata* as having "Bracteae virides. Cap St. James"; and his var. *hystrix* "hat 1½--3 Zoll. lange, oval lanzettliche, nicht stumpfeckig angedeutet gelappte Blätter und ist bei jetzt vorangsweise nur aus Gärten bekannt."

Gmelina philippensis is the type and only species in Briquet's Section *Bracteosae* Briq., which he characterizes as having the "Bracteen sehr gross, netzig-adrig, coloriert". All other species of the genus are placed by him in Section *Microstromatae* Briq. with the "Bracteen lanzettlich, öfters schmal, anfällig".

Hallier (1918) notes that *G. philippensis* "hat auf der Unterseite

des Blattes etwas entfernt vom Mittelnerven jederseits eine Reihe grösserer Drüsen (ausser kleinen zerstreuten Drüsenköpfchen) wie sie an gleicher Stelle auch bei Simarubaceen, Linaceen (Humirieen und *Ancistrocladus*), Malpighiaceen, Polygalaceen (*Diclidanthera* und *Xanthophyllum*), Chrysobalanaceen (Chrysobalaneen, *Trigoniastrum* und *Dichapetalum*), Marcgraviaceen (auch *Tetramerista*) und Ebenaceen (*Diospyrus*- und *Maba* -arten) vorkommen."

Jafri & Ghafoor (pers. comm.) distinguish this species from the only other one known to them in Pakistan as follows:

Spinose scandent shrub; leaves rhomboid-elliptic; petioles 2--2.5 cm. long; bracts large, foliaceous, petaloid.....*G. philippensis*

Unarmed tree; leaves broadly ovate; petioles over 5 cm. long; bracts small, neither foliaceous nor petaloid.....*G. arborea*

Hooker (1894) gives an interesting account of the early history of *Gmelina philippensis*, calling it "A very little known plant, of which the first published description is by the late S. Kurz, a firstrate Indian Botanist, and author of 'The Forest Flora of Burma', who was for some time an employé in the Herbarium of the Botanic Garden of Buitenzorg (Batavia), and latterly Curator of that of the Calcutta Gardens. Kurz's description of it is apparently made from specimens grown in the gardens of Bankok, Siam, and preserved in the Buitenzorg Herbarium; and as to the name and authority of Schult, he says, 'I found it attached to the plant in the Library of the Botanic Garden, Buitenzorg, but I am unable, at present, to give a reference to the work in which it occurred'. The Kew Herbarium contains several specimens of it from Siam, collected by the late Sir R. Schomburgk, and the late Mr. Murton, when Superintendent of the Botanic Gardens of Bankok, who says of it, 'apparently wild at Bankok'. There are also specimens sent from the Natal Botanic Garden as a Siam plant. On the other hand, there are undoubtedly indigenous specimens from the Philippine Islands, from Cuming (*No. 1913*), and from Vidal, collected in the Province of Laguna (*No. 3439*), and the latter author gives, in his edition of Blanco's 'Flora de Filipinas', several localities for it in the Archipelago. I think, therefore, it may be assumed that this beautiful plant has been introduced into Siam from the Philippines; and from Siam to India and Natal.

"Plants of *Gmelina Hystrix* were sent to Kew from the gardens of H. H. the Gaekwar of Baroda, by Mr. Goldring, Superintendent of his Highness's gardens and plantations, who says of it, 'that it forms a sturdy shrub, and that the bracts there are higher coloured than those represented in the plate' [Curtis Bot. Mag. pl. 7381]. At Kew the plant is grown in the Water-Lily House, trained against the glass roof, where it has the habit of a *Bougainvillea*, and flowers freely." Actually, of course, the species was described much earlier than by Kurz in the work quoted by Hooker -- in 1790 by Loureiro from Cochinchina, in 1832 by Chamisso from the Philippines, etc., albeit not under Schultes' epithet.

Merrill (1935), in speaking of Loureiro's plant from Cochinchina, says: "Loureiro referred his material to *Gmelina asiatica* Linn. with expressed doubt. His description conforms better with the charac-

ters of *Gmelina philippensis* Cham. than with *G. asiatica* Linn., and the former is well represented by *Clemens 3152* from near Loureiro's classical locality. Loureiro describes the bracts as red, but in the Philippine form they are always yellow."

Corner (1952) differentiates this species from its close relatives as follows:

Tree, not thorny; leaves over 3 inches long, with a long tip..... *G. arborea.*

Thorny bush or small tree; leaves 3 inches long or less.

Leaves woolly-felted beneath; bracts green.....*G. elliptica.*

Leaves not woolly-felted.

Bracts large, purplish, 1--1 3/4 inches long; leaves up to 3 inches long.....*G. philippensis.*

Not as above; leaves up to 1½ inches long, often 3-lobed..... *G. asiatica.*

Petélot (1953) records *G. philippensis* from central and southern Vietnam and Cambodia.

López-Palacios (1977) distinguishes the two species known in Venezuela merely as follows:

Erect tree.....*G. arborea*

Scandent shrub.....*G. philippensis*

Recent collectors report finding *G. philippensis* growing in moist mixed forests and dense mixed forests with pines, in deciduous and open grassy forests, in forests and scrub in general, in thickets and ricefields, in clay soil of open forests, and sprawling over limestone rocks, at 4--1000 m. altitude, in flower in every month of the year, and in fruit in January, March to May, July, and November. Erlanson describes it as "a large tree" (perhaps it was growing over or on a large tree?).

The chromosomes are described by Sharma & Mukhopadhyay (1963) and the pollen by Nair & Rehman (1962) on the basis of *Nat. Bot. Gard. Lucknow 3566, slide 2695.* The species is said by Preston (1969) to have been introduced into cultivation in England from the "E. Indies" in 1894. Obviously, from Hooker's comments in that year, it was cultivated long before that elsewhere (Thailand, Natal).

The corollas are almost uniformly described by collectors (on at least 15 of the collections cited below) aS "yellow", but are said to have been "canary-yellow" on *Biegel 5461*, "golden-yellow" on *Hallier C.124 & C124a*, "bright-yellow" on *Squires 920*, and "yellow and red" on *Erlanson 5333.*

The large, very conspicuous, overlapping bracts in the hop-like, drooping inflorescences are apparently very variable in color, having been described by collectors as "yellow", "red", "maroon", "purple", "brownish", "green or brownish-red", "light-brown with mauve margins", "reddish-purple and green", "brown, red-striped", and "green outside, reddish inside". According to Merrill the Philippine plants have them "always yellow" and so that should probably be regarded as the typical wild form's color. Loureiro found them red in Cochinchina; Kuntze found both brown ones and green ones in South Vietnam and implies that the other colors occur only in cultivated material in Europe and elsewhere.

Jafri & Ghafoor (pers. comm.) lists *G. philippensis* as "Sometimes

cultivated in our gardens (in Pakistan) as an ornamental for its beautiful, paniculate cymes", flowering there from April to November. Kurz (1870) lists it as cultivated in Thailand. Williams (1949) reports it cultivated in Zanzibar, "introduced from East Indies", where it is "somewhat scandent" in habit.

Corner (1952) describes the flowers as 2 inches long, "partly concealed by the large speckled purplish bracts: the inflorescences [are] like soft purplish cones", recording the species from Perlis, Kedah, and Kelantan in Malaya, without indication if native or cultivated only in those areas.

Maheshwari (1963) asserts that the species is planted "in the hedgerows of public and private gardens and parks" in Delhi, India, where it flowers from April to August. He cites *Maheshwari 653* and distinguishes it from the only other species known (to him) in the area as follows:

Unarmed, small tree; bracts small.....*G. arborea*
Spiny shrubs; bracts large, colored.....*G. philippensis*

Sen & Naskar (1965) also report it as cultivated in India, where Bose (1965) describes it as very quick growing and therefore needing constant severe pruning. Gledhill (1962) reports it cultivated in Sierra Leone. Tingle (1967) found it in cultivation in Hong Kong, listing a vernacular name in Chinese characters; Sasaki (1928) and Hsiao (1980) report it cultivated in Taiwan, the latter author providing another vernacular name in Chinese characters. Bailey (1935) lists it as available to the world horticultural trade from Taihoku and Singapore suppliers.

Fernandez-Villar (1880) comments that he personally observed the species growing in Panay, presumably in the wild state. Cooke (1905) regarded the species as native in Thailand as well as in the Philippines, and, judging from the numerous collections from forested areas in that country, this seems entirely possible, in which case the natural indigenous distribution may well be from Thailand, through Indochina and Malaya, to the Philippines, as some writers have suggested (but others have disputed).

Bentham (1876) cites only unnumbered Teijsmann and Schomburgk collections from Thailand and *Cuming 1913* from the Philippines; Vidal (1885) cites only the same *Cuming 1913*. Williams (1905) cites *Murton 33*, *Schomburgk 197 & 331*, *Teijsmann 5946* and *Zimmermann 71* from cultivation in Thailand, as well as a preserved specimen of flowers and fruit in alcohol in the Kew Garden Museum No. 1. Murton claims that "I have seen this [plant] in places about Bankok apparently wild". Brandis (1906) lists the species from Tenasserim [Burma], Thailand, and the Philippines. Brown and his associates (1917) record it from Volcano Island in the Philippines.

Hallier (1918) cites *Zimmermann 71* from Thailand, *Hallier C.124a* from Singapore (cultivated) and *C.124* from Java (cultivated, the plant said to have come originally from Banka), and *Elmer 8934*, *Hallier 4295*, and *Lillies 16* from Luzon island in the Philippines. He describes the plant as "häufig in der Buschsteppe" on Luzon.

Bakhuizen (1921) gives its range as Thailand, Tenasserim, Cochinchina, and the Philippines, citing only *Teijsmann 5946* and *Zimmer-*

mann 71 from Thailand and *Barnes 362* from the Philippines. Merrill (1923) asserts that it is common and probably endemic in thickets and secondary forests at low and medium altitudes on at least Luzon and Panay, Philippine Islands. Fletcher (1938) cites from Thailand: *Kerr 5724, 10704, 12293, 15067,* & *s.n., Marcan 847, Murton 33, Put 1319, Rabil 145, Schomburgk 197* & *331, Teijsmann 6946* [which he regards as the type collection of *G. hystrix* Schult.], *Vanpruk 461* & *714, Winit 412* & *1653,* and *Zimmermann 71.* He lists it also, without citation of confirming specimens, from Tenasserim, Indochina, and Malaya.

López-Palacios (1977) cites *Aristeguieta 5396* & *6590* and *López-Palacios 2669* from cultivation in Venezuela. Lasser and his associates (1974) also list the species as cultivated in Venezuela.

It is worth noting here that the *Gillis 9799,* cited below, was taken from a plant grown from seed collected in Panama [presumably from cultivated material there] by B. Maguire. *Squires 920* exhibits one branch with all entire leaves and another branch with all 3-lobed leaves; *Herb. Bernhardi s.n.* exemplifies the very small-leaved 3-lobed form, while *Kienholz 269* illustrates very well the formation of short sharp terminal spines at the tips of small branchlets or twigs.

Numerous bibliographic errors occur in the literature -- for instance, the Fernandez-Villar (1880) reference in the bibliography (above) is sometimes incorrectly cited as "1918"; Merrill (1923) misdates the Walpers (1845) reference as "1844"; López-Palacios (1974, 1975) mis-dates the Chamisso (1832) reference as "1839" and (1974) cites *Wallich 6317* as "*6313*" and mis-dates the work (1832) as "1822".

Material of *G. philippensis* has been misidentified and distributed in some herbaria as "*Gmelina arborea* L.", *G. asiatica* L., *G. asiatica* var. *typica* H. J. Lam, and even as *Acanthaceae.* On the other hand, the *Sulit, Philip. Nat. Herb. 11741,* distributed as typical *G. phillipensis,* is actually the type collection of its f. *transitoria* Mold., while *Peele 1389* is *G. asiatica* L., *Niyomdham & al. 241* and *Pierce P.280* are *G. elliptica* J. E. Sm., and *Copeland 346* and *Mearns 170* are *G. elliptica* f. *lobata* (Gaertn.) Mold.

Citations: INDIA: Kerala: *Erlanson 5333* (Mi, N). Tamil Nadu: *Kuriakose s.n.* [Veli, 24-1-33] (N). THAILAND: *Kerr 4647a* (Ed), *6223a* (Ed); *Larsen, Santisuk, & Warncke 1918* (Ac); *Surapat 357* (W--2450882); *Zimmermann 70* (Br), *71* (B, B, Br, Bz--21062, Mu--3943, W--595071). VIETNAM: Annam: *Clemens & Clemens 3152* (Ca--340583, N, W--1427363); *C. B. Robinson 1344* (N); *Squires 920* (Bz--21063, Mu, N, S, W--1702762). Cochinchina: *Kuntze 3928* (N, N); *Thorel 60* (B). PHILIPPINE ISLANDS: Luzon: *Balintay, Philip. Nat. Herb. 5629* (Mi); *P. T. Barnes, Herb. Philip. Bur. For. 362* (Bz--21055, N, W--851035); *H. H. Bartlett 14557*(Mi), *14697* (Mi, N), *14723* (Mi), *15296* (Mi); *T. E. Borden, Herb. Philip. For. Bur. 1780* (N, W--1091554); *E. B. Copeland 346* (N); *Elmer 8934* (Bz--21057, N, W--854813), *18278* (Bz--21054, Ca--27077, Du--175657, N, S, Um--162, Ut--67295, W--1237692); *R. B. Fox, Philip. Nat. Herb. 4886* (Mi); *F. W. Foxworthy, Herb. Philip. Bur. Sci. 112* (Bz--21058, Gg--31096, W--626867), *1564* (N, W--627262); *Kienholz 269* (Ur); *Lete 333* (Ca--365698); *Loher 4426* (W--446873); *E. D. Merrill 1690* (W--436641), *2932* (W--437904), *7564*

(Gg--31098, S, W--901875), *Sp. Blanc. 122* (Bz--21056, N, W--903797); *Otanes, Herb. Philip. Bur. Sci. 17708* (Bi, W--1238490); *Quezon 8394* (Mi); *Quisumbing 2161* (Ok--17317); *M. Ramos 338* (Mu--4198, Ut--22252, W--1133036); *Santa Maria 8413* (Mi); *Vanoverbergh 4036* (Vi); *H. N. Whitford 395*(N, W--851580); *R. S. Williams 196* (N, W--706859). GREATER SUNDA ISLANDS: Sarawak: *Clemens & Clemens 21089* [field no. 5414] (Bz--21048, Bz--21049, N). CULTIVATED: Florida: *Gillis 9799* [Fairchild Gard. 69-388] (Ft--8763). Guyana: *D. Fairchild 2969* (W--1626026). Hong Kong: *Chan 1131* (Mi). India: *Herb. Roy. Bot. Gard. Bangalore s.n.* [April 1887] (Pd), *s.n.* [April 1889] (Pd); *Koelz 8104* (Ba); *Nayday 123* (Ba). Java: *Backer 34140* (Bz--21053); *Collector undetermined s.n.* (Bz--25577); *Herb. Bot. Bogor. X.F.17* (Bz--21050, Bz--21052, Bz--25584), *XV.F.8* (Bz--26302, Bz--26303, Bz, Bz, N), *XV.F.8a* (Bz--26304, N), *s.n.* [Febr. 1910] (Bz--21051), *s.n.* (Bz--21059, Bz--21060). Kenya: *Moldenke & Moldenke 26078* (Ld). Martinique: *Duss 4766* (N). Netherlands: *Mennega 345* (Ba). Pakistan: *Qureshi s.n.* [8.11.1961] (Kh). Pennsylvania: *Petersen J.2501* (Ba--373301). Saint Vincent: *Howard & Howard 18054* (N). Singapore: *Nur s.n.* [11 June 1924] (Ba, N). Sri Lanka: *Moldenke, Moldenke, & Jayasuriya 28140* [E.29] (Ac, Gz, Ld, Pd, W--2764415). Thailand: *Teijsmann 5946* (Bz--21061). Tobago: *L. M. Andrews 3-81* (N). Trinidad: *Bhorai B.591* (N). Venezuela: *Aristeguieta 5396* (Ld); *López-Palacios 2669* (Ac, Mu). Zimbabwe: *Biegel 5461* (Ba--390301). LOCALITY OF COLLECTION UNDETERMINED: *Herb. Bernhardi s.n.* [Caltern, 22. Febr.] (E--118648); *Herb. Torrey s.n.*[Turon] (C, T). MOUNTED ILLUSTRATIONS: Corner & Watanabe, Illust. Guide Trop. Pl. 761. 1969 (Ld); Hooker, Curtis Bot. Mag. 120 [ser. 3, 50]: pl. 7391. 1894 (Ld, N); Menninger, Flow. Vines pl. 194. 1970 (Ld); Mold., color slide 179 (Ld); Source undetermined, fig. 8627 (N).

GMELINA PHILIPPENSIS f. *COLORATA* (Kuntze) Mold., Phytologia 55: 234. 1984.

Synonymy:*Gmelina finslaysoniana* var. *silvestris* f. *colorata* Kuntze, Rev. Gen. Pl. 2: 507. 1891.

Bibliography: Kuntze, Rev. Gen. Pl. 2: 507. 1891; Mold., Phytologia 55: 234. 1984.

This form is based on an unnumbered Kuntze collection from Cape St. James in Cochinchina, South Vietnam. I regard it as including the plants whose bracts, when fresh, are maroon, purplish, reddish-purple, or purple to red or brownish-red.

GMELINA PHILIPPENSIS f. *TRANSITORIA* Mold., Phytologia 18: 210. 1969.

Bibliography: Mold., Biol. Abstr. 50: 7999. 1969; Mold., Résumé Suppl. 18: 7. 1969; Hocking, Excerpt. Bot. A.18: 444. 1971; Mold., Fifth Summ. 1: 317 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 308 & 549. 1980; Mold., Phytologia 55: 333. 1984.

This form differs from the typical form of the species in having the lower surface of the leaf-blades conspicuously brownish-pilose, the hairs straight (or almost so) and simple, not twisted nor tomentose-matted, found all over the lower surface of the lamina as well as on the venation.

The type of the form was collected by M. D. Sulit (*Philip. Nat.*

Herb. 11741) on Guimaras island, Philippine Islands, in February or March, 1950, and is deposited in the United States National Herbarium in Washington. It was originally distributed by E. D. Merrill as typical *G. philippensis* Cham., which, however, has the lower leaf-surface glabrous, subglabrous, or with hairs only on the largest veins. The present plant has definitely pubescent twigs and conspicuously spiny branches. It seems in many ways intermediate between *G. philippensis* Cham. and *G. elliptica* J. E. Sm. and may even represent a natural hybrid between them. Thus far it is known only from the original collection.

Citations: PHILIPPINE ISLANDS: Guimaras: *Sulit, Philip. Nat. Herb. 11741* (Ld--isotype, W--2125718--type).

GMELINA PHILIPPENSIS f. *VIRIDIBRACTEATA* (Kuntze) Mold., Phytologia 55: 234. 1984.

Synonymy: *Gmelina finslaysoniana* var. *silvestris* f. *viridibracteata* Kuntze, Gen. Gen. Pl. 2: 507. 1891.

Bibliography: Kuntze, Rev. Gen. Pl. 2: 507. 1891; Mold., Phytologia 55: 234. 1984.

This form is based on an unnumbered Kuntze collection from Cape St. James, in Cochinchina, South Vietnam. It differs from the typical Philippine form with yellow bracts by its green or yellowish-green bracts.

GMELINA RACEMOSA (Lour.) Merr., Trans. Amer. Phil. Soc., ser. 2, 24 (2): 336. 1935.

Synonymy: *Lantana racemosa* Lour., Fl. Cochinch., ed. 1, 2: 376--377. 1790. *Gmelina racemosa* Wight ex Wall., Numer. List 87, no. 1816E hyponym. 1831. *Gmelina lecomtei* Dop, Bull. Soc. Bot. France 61: 322, 1915.

Bibliography: Lour., Fl. Cochinch., ed. 1, 2: 376--377 (1790) and ed. 2, 457. 1793; Raeusch., Nom. Bot., ed. 3, 173. 1797; Wall., Numer. List 87, no. 1816E. 1831; D. Dietr., Syn. Pl. 3: 610. 1843; Schau. in A. DC., Prodr. 11: 608. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 253. 1858; Dop, Bull. Soc. Bot. France 61: 322 & 323. 1915; Prain, Ind. Kew. Suppl. 5, imp. 1, 115. 1921; Dop, Rev. Internat. Bot. Appliq. Agric. Trop. 13: 893--897. 1933; Dop in Lecomte, Fl. Gén. Indo-chine 4: 842, 847, & 849. 1935; E. D. Merr., Trans. Amer. Phil. Soc., ser. 2, 24 (2): 11, 336, & 426. 1935; A. W. Hill, Ind. Kew. Suppl. 9: 125. 1938; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 573. 1941; Mold., Alph. List Inv. Names 25. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 58, 59, & 93. 1942; E. D. Merr., Chron. Bot. 10: 263--264. 1946; H. N. & A. L. Mold., Pl. Life 2: 68. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 135, 136, & 186. 1949; Mold., Resume 176, 297, 306, & 456. 1959; Prain, Ind. Kew. Suppl. 5, imp. 2, 115. 1960; Vidal & Lemoire, Journ. Agr. Trop. Bot. Appl. 17: 27. 1970; Mold., Fifth Summ. 1: 301 (1971) and 2: 523, 542, 880, & 972. 1971; Mold., Phytol. Mem. 2: 290, 293, 408, & 549. 1980; Mold., Phytologia 55: 334, 337, & 499 (1984) and 56: 34, 35, 108, & 109. 1984.

A good-sized forest tree, 6--15 m. tall; young branchlets pubescent or grayish-yellow-tomentose, eventually glabrescent; bark red-

dish-brown, striate, very prominently lenticellate; wood white, durable, resistant to termites, useful in hand-construction; leaf-scars very prominent; leaves decussate-opposite; petioles 6--7 cm. long, 2--3 mm. wide, tomentellous, canaliculate above; leaf-blades subcoriaceous, broadly oval or ovate to rounded or obcordate, bicolored, brunnescent in drying, apically obtuse, marginally entire or obscurely sinuate, basally obtuse or short-cuneate, shiny and glabrous (except for the larger veins) above, glaucous and velutinous-tomentose beneath; secondaries 3 or 4 pairs, straight or slightly arcuate; tertiaries transverse, regular; inflorescence terminal, paniculate, about 20 cm. long, di- or trichotomous, yellow-tomentose throughout; cymes small, few-flowered; bracts linear-lanceolate, 5--6 mm. long, glandulose; flowers sessile or subsessile; calyx campanulate, about 1 cm. long, externally sparsely pilose and apically with numerous, small, vertical, black glands, its rim truncate and subentire or obsoletely 5-denticulate; corolla yellow and purple, infundibular, about 3 cm. long, externally pruinose, the tube apically ampliate, the limb 5-lobed, the lobes subequal, apically rounded; stamens 4, subexserted; style about 2.4 cm. long; stigma bifid; ovary ovoid, externally pubescent on the upper part; fruit drupaceous, 3--4 cm. wide, very fleshy, at first green, then yellow, and finally black, the base pedicellate and included by the fruiting-calyx, the endocarp woody, apically depressed; seeds 1 or 2.

This species is based on an unnumbered Loureiro collection from Cochinchina ["Habitat in sylvis Cochinchinae"], South Vietnam. *Gmelina lecomtei* is based on *Lecomte & Finet 421* from between Chapa and Muong-xen, Annam, Vietnam. Dop (1915) says of it: "Cette espèce se rapproche du *Gm. arborea* L. Elle s'en distingue par le calice tronqué; la corolle pruineuse et non tomenteuse, et le fruit beaucoup plus gros". In his 1933 work he continues: "*G. Lecomtei*..... Je me contenterai de signaler ici que ce bel arbre de 10 à 15 m. de haut, ne peut pas etre confondu avec le *G. arborea* Roxb. malgré une ressemblance très grande des feuilles dans leur forme et leur texture. Cette ressemblance est d'ailleurs telle que les deux espèces sont appelées par les annamites du même nom Loi tho. Un échantillon récolté par M. de Pr A. Chevalier dans la réserve forestière de de Hui-la, et qui appartient indubitablement a l'espèce *G. Lecomtei*, est nommé tout comme *G. arborea*, Loi tho. Les caractères floraux très important distinguent nettement ces deux espèces. Le tableau suivant les résume. *G. arborea*: Calice a 5 lobes triangulaires-aigus, longs de 0,5 mm. Pas de glandes calicinales. Ovaire glabre. *G. Lecomtei*: Calice tronque, sans dents. Glandes calicinales très nombreuses, petites, disposées en rangées verticales sur la moitié supérieure. Ovaire pubescent dans sa partie supérieure."

He continues: "Si ces caractères éloignent nettement *G. Lecomtei* de *G. arborea*, ils le rapprochent par contre de *G. chinensis* Bentham commun en Chine, dans le Kwang tung et à Hongkong. Les deux especes ont des feuilles identiques, mais le port et les caractères floraux les distinguent aisément. *G. Lecomtei*: Arbe de 10 à 15 m. Glandes calicinales, très nombreuses et petites. Corolle à 5 lobes. *G. chinensis*: Arbuste de 2--3 m. Glandes calicinales 1--3 très larges. Corolle à 4 lobes.

"La distribution du *G. Lecomtei* est la suivante: au Tonkin, cette essence a été récoltée par Lecomte et Finet de Chapa à Muong Xen, par Balansa, au Mont Bavi près Lang Kok, par Petélot à Chogang, par H. Bon à Tren thon, par Fleury (in herb. Chevalier) à Phu tho, réserve de Trung Giap, par A. Chevalier à Tuyen Quang, réserve de Huila; et Annam au Mont Bani par Clemens, à Lien Chien, à Tourane et à Bana par Poilane; au Laos à Phon thane par Sire.....Depuis la rédaction de cette note de nouveaux et nombreus échantillons reçus par le Muséum m'ont montre qu'il existait entre ces deux espèces tous les intermédiaires et qu'il y avait lieu de réduire la deuxieme espèce au rang de variété dont la synonymie s'établira ainsi".

Merrill (1935) mistakenly reduces *G. hainanensis* Oliv. and *G. balansae* Dop to *G. racemosa*, commenting: "Loureiro's description definitely applies to *Gmelina* and to a species in the group with *G. chinensis* Benth., *G. hainanensis* Oliv., *G. balansae* Dop and *G. lecomtei* Dop. Among these it agrees best with the characters of *G. hainanensis* Oliv., from which I do not think that *G. balansae* Dop can be distinguished. *Gmelina hainanensis* Oliv. was most casually and inadequately described by Oliver in the discussion following a description of *G. chinensis* Benth.....*Clemens 3980* from Mount Bana, near Tourane.....probably represents Loureiro's species."

Recent collectors have found *G. racemosa* in flower from May to July and in fruit in July. The corollas are described as having been a "beautiful soft yellow with purple" on the Clemens collection. Vernacular names recorded for the species are "cây tlai", "cay tré", "loi tho", "mak phong", "ntoo nvshaub", "shek tzi shu", and "song tsio".

Vidal & Lemoine (1970) refer to *G. racemosa* as a tree of high dense forests, citing *Lemoine 177* & *1968* and *Yang Ts'i 77* from Laos.

Material of *G. racemosa* has been misidentified and distributed in some herbaria as *G. balansae* Dop or *G. "chinensis* L." On the other hand, the *Petélot 1941*, distributed as *G. racemosa*, actually is *G. balansae* Dop, while *Chun & Tso 43542*, *Fung 20370*, *Gressitt 1077*, *How 70453*, *70801*, & *71643*, *Lau 75* & *3664*, *McClure 9281*, and *Wang 32777* are *G. hainanensis* Oliv.

Citations: VIETNAM: Annam: *Clemens & Clemens 3980* (Ca--339429, Gg--156305, Gg--156306, Ln--69972, N, Ut--99961, W--1427778, W--1427779); *Lecomte & Finet 421* (Ca--53723). Tonkin: *Petelot 1941* (W--1759241, W--1717113).

GMELINA SESSILIS White & Francis ex Lane-Poole, Rep. For. Resources Terr. Papua N. Guin. 136. 1925; Proc. Roy. Soc. Queensl. 38: 257--258, fig. 18. 1927.

Bibliography: Lane-Poole, Rep. For. Resources Terr. Papua N. Guin. 136. 1925; White & Francis, Proc. Roy. Soc. Queensl. 38: 257--258, fig. 18. 1927; A. W. Hill, Ind. Kew. Suppl. 7: 104 (1929) and 8: 102. 1933; Mold., Known Geogr. Distrib., Verbenac., ed. 1, 67, 69, & 93 (1942) and ed. 2, 149, 153, & 186. 1949; Mold., Résumé 201 & 456. 1959; Mold., Fifth Summ. 1: 337 (1971) and 2: 880. 1971; Mold., Phytologia 31: 390 & 398. 1975; Mold., Phytol. Mem. 2: 327, 408, & 549. 1980; Mold., Phytologia 55:

334. 1984.

Illustrations: White & Francis, Proc. Roy. Soc. Queensl. 38: 258, fig. 18. 1927.

A large tree, to 34 m. tall; bole to 21 m. long, with a girth of 2.4 m., more or less buttressed to 2.4 m.; branchlets densely ferruginous-pubescent, sulcate, 5 mm. in diameter about 10 cm. below the inflorescence; leaves decussate-opposite; petioles 2--3 cm. long, concave above, convex beneath, densely pubescent; leaf-blades coriaceous, ovate-orbicular, 12--22 cm. long and about equally wide, but the narrow ones 1½ times as long as wide, apically obtuse or rarely obtusely acuminate, marginally broadly sinuate or entire, basally cordate or rounded, sparsely pubescent above, densely pubescent beneath and with 1--3 glands at the base on each side of the midrib; secondaries 7--9 on each side, along with the veinlets conspicuous on both surfaces, impressed above and elevated beneath; inflorescence terminal, spiciform, narrow, 10--12 cm. long, 4 cm. wide, basally foliose; cymules opposite or whorled, considerably separated in the lower portions of the inflorescence, dense in the upper portion; exterior bracts foliaceous, large, concave, ovate, axially glabrous, abaxially densely pubescent and dotted with black glabrous glands; interior bracts similar but smaller; bractlets ovate-lanceolate, about 7 mm. long, abaxially densely pubescent; calyx campanulate, externally ferruginous-pubescent and dotted with small glabrous glands, internally glabrous, obscurely bilabiate or the rim sinuate to 3- or 4-lobate, the lobes broad; corolla about 1.7 cm. long, the exterior of the tube basally glabrous, apically densely pubescent, about 1 cm. long, the limb bilabiate, the upper lip 2-lobed, the lower lip 3-lobed; filaments 7 and 9 cm. long, pubescent; anthers basally cordate, 1.5 cm. long, 1 mm. wide, dorsifixed near the apex; style 1--6 cm. long, apically recurved; ovary obovoid, externally glabrous, apically depressed around the style-base.

This species is based on *Lane-Poole 303* from Baroi, Papua, New Guinea. White (1927) comments that it is "Allied to *G. Dalrympleana* (F. v. M.) H. J. Lam and to *G. macrophylla* Wall. From the latter it differs in its narrow inflorescence, and from the former in its dense inflorescence." It has been collected in flower in March.

Fedde & Schuster (1937) mis-cite this species to volume "39" of the Proceedings of the Royal Society of Queensland, published in 1928, instead of to volume 38 (1927).

Citations: NEW GUINEA: Papua: *Lane-Poole 303* (Bz--21333--isotype, Ld--photo of isotype, N--photo of isotype). Territory of New Guinea: *Collector undetermined N.G.F.2005* (Ng--6599, Ng--16897, Ng).

GMELINA SESSILIS var. *PAPUANA* (Bakh.) Mold., Phytologia 4: 178. 1953.

Synonymy: *Gmelina papuana* Bakh., Journ. Arnold Arb. 10: 71--72, pl. 16 & 17. 1929. *Gmelina papuana* Scheff. ex Mold., Known Geogr. Distrib. Verbenac., ed. 2, 186 sphalm. 1949.

Bibliography: Nieuwenhuis, Ann. Jard. Bot. Buitenz. 21: pl. 26. 1907; Bakh., Journ. Arnold Arb. 10: 68/69 & 71--72, pl. 16 & 17. 1929; Bakh. in C. T. White, Journ. Arnold Arb. 10: 264. 1929; A. W.

Hill, Ind. Kew. Suppl. 8: 102. 1933; Wangerin, Justs Bot. Jahresber. 57 (1): 696. 1937; Fedde & Schust., Justs Bot. Jahresber. 57 (2): 401. 1938; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 67 & 93 (1942) and ed. 2, 149 & 186. 1949; Mold., Biol. Abstr. 27: 2026. 1953; Mold., Phytologia 4: 178. 1953; Mold., Resume 201 & 456. 1959; Whitmore, Gard. Bull. Singapore 32: 20. 1967; Mold., Fifth Summ. 1: 337 (1971) and 2: 880. 1971; Altschul, Drugs Foods 247. 1973; Mold., Phytologia 25: 233 (1973) and 31: 390 & 398. 1975; Mold., Phytol. Mem. 2: 327, 408, & 549. 1980; Mold., Phytologia 55: 339. 1984.

Illustrations: Nieuwenhuis, Ann. Jard. Bot. Buitenz. 21: pl. 26. 1907; Bakh., Journ. Arnold Arb. 10: 68/69 & 71/72, pl. 16 & 17. 1929.

A medium-sized, slender tree, to 25 m. tall, the clear bole to 13 m. high, obscurely angular, not buttressed, to 45 cm. in diameter at breast height, the bark about 12 mm. thick; outer bark pale-brown, longitudinally fissured and tending to form scales, with a few, large, coarse, pustular lenticels present, about 4 mm. thick; inner bark with alternating yellow and white layers; wood very soft, the sapwood 5--7.5 cm. thick, pale-straw, the heartwood pinkish-brown; branchlets thick, obtusely tetragonal, sparsely lenticellate, the youngest ones densely tomentose, eventually glabrescent; leaves decussate-opposite; petioles semi-terete, 2--4 cm. long, slightly canaliculate above, at first densely tomentellous, eventually glabrescent; leaf-blades large, coriaceous, obovate-subrotund, 10--17 cm. long, 9--16 cm. wide, shiny dark-green and glabrous above, much paler beneath, apically rounded, marginally entire or irregularly repand, basally cuneate to short-acuminate and subdecurrent or subobtuse, sparsely puberulent especially on the venation beneath, basally with 2 rather large glands which are concave beneath and bullate above, penninerved but basally subplinerved; midrib impressed and glabrous above, prominent and short-puberulent beneath; secondaries 5--9 per side, ascending, marginally anastomosing, impressed and glabrous above, prominent and sparsely puberulent beneath, the basal ones much longer than the others, giving rise on the outer side to pinnate veinlets; veinlet reticulation dense, prominent beneath; inflorescence terminal, conspicuous, pyramidal, pedunculate, bracteate, about 15 cm. long and 10--12 cm. wide, densely hirsute-tomentellous throughout, the lower portion branched, the 7--9 opposite branches long-stalked; peduncle and rachis depressed-quadrangular, 2.5--3.5 cm. long; flowers conspicuous, sessile, 3--5-fasciculate in the axils of bracts; bracts sessile, ovate-oblong or subrotund, concave, 5--7 mm. long, about 5 mm. wide, internally (axially) glabrous, externally (abaxially) tomentellous; calyx cupuliform, about 5 mm. long (in bud), externally densely villous and with 2--4 small discoid glands, internally glabrous and rather shiny, subtruncate, the rim unequally and obtusely 5-dentate, not much enlarged in fruit; open corolla not seen, but in bud externally densely villous, internally partially pubescent; stamens 4, didynamous; ovary oval, sessile, externally pubescent but soon glabrescent; fruit drupaceous, subglobose, fleshy, 2.5--3 cm. wide, apically depressed, glabrous, shiny, blue when mature, the endocarp thickly woody.

This variety is based on *Brass 695* from a riverine forest, at 1000 feet altitude, at Iawarere, Papua, New Guinea, collected on November 25, 1925, and deposited in the Herbarium Bogoriense at Buitenzorg, Java. Bakhuizen (1929) reports that the fruit of this plant is eaten by cassowaries and that the taxon "is closely related to *Gmelina moluccana* (Bl.) Backer, from which it differs in its sessile cymes, globose fruits and rounded leaves with shortly acuminate, subdecurrent base".

Smith collected what appears to be this plant in an oak forest on ridges at 1500 feet altitude, reporting the vernacular name, "along-aya". The variety has been collected in fruit in November.

Citations: NEW GUINEA: Papua: *Brass 695* (Bz--21325--type, Bz--21326--isotype, Bz--25583--isotype, Ld--photo of type, N--photo of type); *L. S. Smith 1345* (Ng--6595). MOUNTED ILLUSTRATIONS: Bakh., Journ. Arnold Arb. 10: pl. 16 & 17. 1929 (Ld, N); Nieuwenhuis, Ann. Jard. Bot. Buitenz. 21: pl. 26. 1907 (Ld).

GMELINA SESSILIS f. *RAMIFLORA* (Mold.) Mold., stat. nov.

Synonymy: *Gmelina sessilis* var. *ramiflora* Mold., Phytologia 4: 178--179. 1953.

Bibliography: Mold., Biol. Abstr. 27: 2026. 1953; Mold., Phytologia 4: 178--179. 1953; Mold., Résumé 201 & 456. 1959; Whitmore, Gard. Bull. Singapore 32: 20. 1967; Mold., Fifth Summ. 1: 337 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 327 & 549. 1980; Mold., Phytologia 55: 334. 1984.

This form differs from the typical form of the species in having conspicuously branched inflorescences, the branches 3--4.5 cm. long, the individual flowers on stout pubescent pedicels about 2 mm. long, conspicuously bracteate.

The form is based on *Ebertus Meijer Drees 371* from Bernhard Bivak, Hollandia, West Irian, New Guinea, collected on July 26, 1938, and deposited in the Herbarium Bogoriense at Buitenzorg, Java.

Collectors describe this plant as a large tree, to 140 feet tall, the crown narrow, dark, leafy, the clear bole to 80 feet high, narrowly buttressed and channeled to 5 feet up, 40--90 cm. in diameter at the base, the bark 1.5 cm. thick, the outer bark gray-brown, very slightly longitudinally fissured, otherwise fairly smooth, the inner bark pale yellow-brown tinged with green beneath the fissures on the back, pale-brown flecks on a cream background within, rapidly staining pinkish-brown on exposure, the sapwood 7.5--10 cm. deep, whitish, the heartwood very pale yellow-brown, the leaves rather thick, dull dark-green above, pale brownish-hairy beneath, with a few, small, flat glands present on the under surface near the apex of the petiole, the inflorescence dark brown-hairy (including the outside of the corolla in bud), the corolla pale-purple or pale-blue and whitish, with a yellow streak down the center of the lower lip, the mature fruit bluish, subglobular, about 2.5 cm. in diameter, apically flattened when immature.

The plant has been collected at 1400 m. altitude, growing as a canopy rainforest tree, in fruit in February, but was encountered by Smith at only 25 m. altitude. The vernacular name, "kalo", has been reported for it on *Anang 53*, a collection, however, which is sterile,

exhibiting only leaves.

That this plant may represent only a form, rather than a true variety, of *G. sessilis* seems to be indicated by Whitmore's assertion (1967) that "The difference between *G. sessilis* and *G. moluccana* is slight and not absolute; for instance the Lae sheet of *NGF 10883* has simple spikes, and the Leiden sheet [has] branching ones, and both sheets have big foliaceous bracts partially enclosing the flower". He differentiates the 3 taxa as follows:

Leaf-blades densely velvety-hairy beneath, without conspicuous glands; inflorescence axes stout.
Flowers sessile, partially covered by large triangular bracts about 12 mm. long; inflorescence a simple spike...*G. sessilis*.
Flowers stalked, not covered; bracts smaller, lanceolate; inflorescence usually branched, paniculate.....*G. moluccana*.
Leaf-blades glabrous and shiny beneath, with a pair of conspicuous glands at the base of the midrib; inflorescence axes slender.....*G. dalrympleana*.

Citations: NEW GUINEA: Territory of New Guinea: *Schlechter 16441* (S); *L. S. Smith 1221* (Ng--6600, Ng). West Irian: *Anang 53* [Boschproefst. bb.28955] (Bz--21311); *Brass 12751* (A); *Meijer Drees 371* [Boschproefst. bb.25693] (Bz--21332--type, Ld--photo of type, N--isotype, N--photo of type).

GMELINA SINUATA Link, Enum. Hort. Berol. 2: 128. 1822.

Synonymy: *Gmelina sinuata* Hort. ex Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1040. 1893. *Gmelina sinuata* Herrench. ex Mold., Alph. List Inv. Names Suppl. 1: 10 in syn. 1947.

Bibliography: Link, Enum. Hort. Berol. 2: 128. 1822; Sweet, Hort. Brit., ed. 1, 323 (1826) and ed. 2, 417. 1830; G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; Schau. in A. DC., Prodr. 11: 680. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 200. 1858; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1040 (1893) and imp. 2, 1: 1040. 1946; Mold., Alph. List Inv. Names 10. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 127, 160, & 186. 1949; Mold., Résumé 163, 218, 297, & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1040. 1960; Mold., Fifth Summ. 1: 276 & 363 (1971) and 2: 524 & 880. 1971; Mold., Phytol. Mem. 2: 263, 354, & 549. 1980; Mold., Phytologia 55: 335 & 471. 1984.

Link's (1822) original description of this taxon is merely "*Gm. sinuata*. Hort. Herrenh. Hab..... C. Folia juniore acute angulata subtus glabra rotundata". The type, obviously, was from a cultivated plant, probably deposited in the Berlin herbarium and now destroyed.

Jackson (1893) gives the origin of this plant as "Ind. or.?" [=eastern India], but Sweet (1830) and Loudon (1832) assert without question that it was introduced from "E. Indies" [East Indies, now Indonesia] into British gardens in 1824. The only common name listed for it is "sinuated gmelina".

The Munich specimen, cited below, was probably taken from a cutting of the type plant in Berlin -- it is sterile, exhibiting only what appears to be a very young shoot or seedling sprout, whose leaves are not sinuate but very coarsely dentate with 2 or 3 very ir-

regular, almost lobe-like, triangular teeth on each side [reminiscent of Link's descriptive "acute angulata"], with apparently a detached older leaf which is actually sinuate-margined. The toothed material is a perfect match for seedling material of *Gmelina arborea* Roxb. as illustrated by Troup (1921), fig. 294 g & h, and it is my opinion that *G. sinuata* may possibly be nothing more than juvenile *G. arborea* Roxb. or *G. arborea* f. *dentata* Mold., although Link's description of glabrous leaves argues potently against any such disposition. The lack of inflorescences renders its position in the key to taxa given by me earlier in this series highly problematic.

Citations: CULTIVATED: Germany: *Herb. Klmmer s.n.* [hort. bot. monac. 1842] (Ld--photo, Mu--1369).

GMELINA SMITHII Mold., Phytologia 6: 326--327. 1958.

Bibliography: Mold., Phytologia 6: 326--327. 1958; Mold., Biol. Abstr. 33: 1215. 1959; Mold., Résumé 201 & 456. 1959; Hocking, Excerpt. Bot. A.5: 44. 1962; G. Taylor, Ind. Kew. Suppl. 13: 61. 1966; Mold., Fifth Summ. 1: 337 (1971) and 2: 880. 1971; Hartley, Dunstone, Fitzg., Johns, & Lamberton, Lloydia 36: 293. 1973; Farnsworth, Pharmacog. Titles 9 (1): xii (1974) and 9 (3): x. 1974; Mold., Phytol. Mem. 2: 327 & 549. 1980; Mold., Phytologia 55: 334. 1984.

A medium-sized to tall tree, 18--90 m. tall, with a broad crown, the clear bole rising to 30 m., hollow at the base, unbuttressed or narrowly buttressed to 2.5 m., about 1 m. in diameter [girth?] at breast height; bark 0.8--2 cm. thick, the outer bark pale blue-gray or brownish-white to gray-brown, shallowly and irregularly fissured, with scattered cracks and with large flattened pustular lenticels, the under bark green, the inner bark yellow- or yellowish-brown, occasionally streaked with green on the back, brownish within, paler inwards, with a slight odor; wood light, soft, straw- or cream-color, the heartwood brown; branchlets rather stout, obtusely tetragonal, subglabrous, brunnescent; nodes plainly annulate; principal internodes 1.5--2 cm. long; leaves numerous, decussate-opposite; petioles short, about 1 cm. long, glabrate; leaf-blades firmly chartaceous or subcoriaceous, usually irregularly wrinkled in drying, pale- or olive-green and shiny above, mostly brownish scaly beneath, glabrous on both surfaces, 7--15 or more cm. long, 4--10 or more cm. wide, apically rounded or acute, marginally entire, basally rounded or acute; midrib flat above, prominent beneath; secondaries slender, 6 or 7 per side, ascending, not much arcuate, joined in many loops near the margins, obscure above, prominulous beneath; vein and veinlet reticulation sparse, mostly indiscernible above and obscure beneath; inflorescence terminal, widely paniculate, to 30 cm. long and wide, the branches ascending or widely divaricate, densely many-flowered, densely brown-pubescent on the younger parts, glabrescent on the older parts and completely smooth in age; bractlets numerous, lanceolate or narrow-elliptic, about 5 mm. long and 2--3 mm. wide, narrowed at both ends, densely puberulent on both surfaces, mostly hiding the buds and calyxes, sometimes blackish, caducous; pedicels very slender, 3--4 mm. long, or occasionally the

basal ones to 10 mm. long, densely brown-pubescent; buds sometimes blackish in drying; flowers without fragrance; calyx campanulate, about 4 mm. long and wide, externally densely pubescent throughout, the rim 4-toothed; corolla red or pale-blue to mauve or white, bilabiate, the lower lip with a yellow blotch or 2 yellow spots drawn out into lines inwards; anthers brown; fruit at first green or "dull blackish-green", turning reddish to red.

The type of this species is *L. S. Smith 1064* from Aiyura, at an altitude of 6000 feet, in the central highlands of northeastern New Guinea, collected in October, 1944 (although the label on the type specimen gives the date as "1/12/44", apparently in error), deposited in the herbarium of the Department of Forests at Lae, Papua New Guinea.

Collectors have encountered this plant in disturbed montane forests, lower montane rainforests with *Cinnamomum*, *Elmerrillia*, and *Symplocos*, and primary forests 30--40 m. tall on rocky slopes facing the sea, at 1825 m. altitude, in flower in June and August, in fruit in July, and in both flower and fruit in October and November. The vernacular names, "kaboya" and "yabeina", have been reported.

Jacobs refers to the "innovations at first brown". The corollas are described as "red" on *LAE.62098*, "pale-blue" on *Smith 1064*, "white to mauve" on *NGF.25552*, and "white with a yellow blotch on the tip" on *Jacobs 9536*. Hartley & al. (1973) cite *Hartley 12065* from Akuna.

The species is obviously very closely related to *G. lepidota* Scheff.

Citations: NEW GUINEA: Papua: *Barrett 4167* (Ng--6601). Territory of New Guinea: *Jacobs 9536* (W--2758504); *Kairo NGF.25552* (Mu); *Katik & Eddowes LAE.62098* (Mu); *L. S. Smith 1064* (Ld--isotype, Ng--16968--type, Ng--isotype).

GMELINA TOMENTOSA Fletcher, Kew Bull. Misc. Inf. 1938: 204--205. 1938.

Bibliography: Fletcher, Kew Bull. Misc. Inf. 1938: 204--205, 422, & 423. 1938; Mold., Known. Geogr. Distrib. Verbenac., ed. 1, 60 & 93. 1942; Hill & Salisb., In. Kew. Suppl. 10: 100. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 138 & 186. 1949; Anon., Kew Bull. Gen. Ind. 134. 1959; Mold., Résumé 178 & 456. 1959; Mold., Fifth Summ. 1: 296 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 286 & 549. 1980; Mold., Phytologia 55: 334, 337, 432, 474, 480, & 497. 1984.

A shrub, 2.5--3 m. tall; branchlets obtusely tetragonal, at first conspicuously tomentose, finally glabrous, armed with a few 5.mm-long spines; leaves decussate-opposite; petioles 1.5--3.5 cm. long, densely tomentose; leaf-blades ovate (when young) or deltoid (when mature), 3--8 cm. long, 3--7 cm. wide, apically rounded or broadly obtuse, marginally entire and ciliate, basally subcuneate or deltoid, fulvous-appressed-tomentose above, fulvous-tomentose and glanduliferous beneath, the glands round or quadrangular, white, and sessile; midrib conspicuous above, prominent beneath; secondaries 4--6 pairs, conspicuous above, prominent beneath; tertiaries trans-

verse, strong, numerous, parallel; inflorescence terminal, 2--5 cm. long; bracts small, lanceolate, about 4 mm. long and 1 mm. wide, tomentose; calyx externally tomentose and glanduliferous, the glands mostly white, with a few large black ones interspersed, the calyx-tube about 3 mm. long, internally glabrous, the rim with 4 teeth about 0.5 mm. long, often almost sinuate-lobate; corolla externally tomentose and white-glanduliferous, the tube 2 cm. long, internally glabrous, the limb bilabiate, the posterior lip 10 mm. long and wide, the inferior lip 3-lobed and 18 mm. long, the lobes apically rounded; stamens 4, two 21--22 mm. long and attached 9 mm. above the base of the corolla-tube, the other two 9--10 mm. long and attached 8 mm. above the base; anthers 2.5 mm. long; style 3 cm. long; ovary 2 mm. wide, externally glabrous.

This species is based on *Noe 211* from Korat, Ban Chum Seng, Rachisima, Thailand, deposited in the Kew herbarium. Thus far, the species is known to me only from the original description. Fletcher (1938) affirms that it is related to *G. elliptica* J. E. Sm., differing in having its leaf-blades basally deltoid and tomentose above and its corollas larger.

GMELINA TONKINENSIS Mold., Phytologia 1: 419. 1940.

Bibliography: Mold., Phytologia 1: 419. 1940; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 93. 1942; Hill & Salisb., Ind. Kew. Suppl. 10: 100. 1947; Mold., Known Geogr. Distrib. Verbenac., ed.2, 136 & 186. 1949; Mold., Résumé 176 & 456. 1959; Mold., Fifth Summ. 1: 301 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 293 & 549. 1980.

A somewhat spiny shrub; branchlets very slender, the younger parts densely short-pubescent with fulvous hairs, the older parts merely densely puberulent, sparsely but prominently lenticellate; leaves decussate-opposite; petioles very slender, 0.8--6 cm. long, densely short-pubescent with fulvous hairs like the young twigs; leaf-blades thin-chartaceous or membranous, ovate, 3.7--13 cm. long, 2.5--9.1 cm. wide, apically acute or short-acuminate, marginally entire, basally cordate or truncate to abruptly acute, very sparsely strigillose-pubescent (especially along the larger venation) above, becoming glabrous in age, densely short-pubescent beneath over the lower puberulence; inflorescence terminal, racemiform; calyx small, with distinctive large glands at its apex; corolla yellow; fruit fleshy, yellow-green (immature?).

This species is based on *Benedict Balansa 3807* from along the sides of the road leading from Tuchap to the rocks of Notre Dame, Tonkin, Vietnam, collected in May or June, 1887, and deposited in the Leningrad herbarium. Material has been misidentified and distributed in some herbaria as *G. asiatica* L.

Citations: VIETNAM: Annam: *Pételot 4536* (N). Tonkin: *Balansa 3807* (K--isotype, L--type, Ld--photo of type, N--isotype, N--photo of type), *4972* (K).

[to be continued]

NOMENCLATURAL CONTRIBUTIONS TO A REVISION OF THE GENUS WISTERIA

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In a forthcoming revision of the genus Wisteria Nuttall, the genus will be divided into two separate but closely related genera. In order to facilitate timely annotations of specimens borrowed from various herbaria, this nomenclatural contribution is presented.

Rehsonia Stritch,gen. nov. (Fabaceae)

Perennis; rhizomata longa repentia. Caules lignei, sinistrorse aut dextre volubiles. Folia alterna, imparipinnata; foliola 7-17 , petiolulata, alterna, oblongo-elliptica, cuneata ad rotundatas ad basim, acuminata ad apicem, integra, glabra ad villosas, ad 8.0 (10.0) cm longa, ad 3.0 cm lata; stipulae et stipellae pusillae, caducae.

Inflorescentia racemus terminalis, 15.0 ad 90.0 cm longus, axis pubescens. Flores pedicellati, pedicellus magnior quam 1.5 cm longus; azurei, purpurei, rosei v. candidi, ostende, magni; bracteae caducae; bracteolae absentes; calyx campanulatus, bilabiatus, pubescens, lobi 5, labium superum bilobus, labium infernum trilobus lobo medio longescenti acuminato; petala subequalia, carina incurva, petala carinae unita ad apicem, auriculata ad bases, alae oblongo-falcatae, monounguiculatae, projecturis cornuatis angulatis varie, vexillum magnum, ad 2.7 (3.0) cm longum, 2.5 (2.8) cm latum, reflexum callis binis auritis ad basim; stamina decem, diadelphi, stamen unus liber vel connatus ad tubum stamineum; ovarium super gynophorum, pubescens, discus cingens gynophorum; multiovula.

Fructus legumen; legumen oblongo-ellipticum ad oblongo-lanceolatum, complanatum, elongatum, torulosum, constrictum leviter inter semina interne, pubescens, bivalve, dehiscens tarde. Semina aliquot, complanata, lenticularia, anthracina.

Type: Rehsonia floribunda (Willd.) Stritch, comb. nov. Glycine floribunda Willd., Sp. Pl. 3,2:1066. 1819.

NEW COMBINATIONS IN THE GENUS REHSONIA

Rehsonia sinensis (Sims) Stritch, comb. nov. Glycine sinensis Sims, Bot. Mag. 46:t2083. 1819.

Rehsonia venusta (Rehd. & Wils.) Stritch, comb. nov. Wisteria venusta Rehd. & Wils. in Sargent, Plantae Wilsonae 2:514. 1916.

Rehsonia villosa (Rehd.) Stritch, comb. nov. Wisteria villosa Rehd., J. Arnold Arb. 7:162. 1926.

Rehsonia brevidentata (Rehd.) Stritch, comb. nov. Wisteria brevidentata Rehd. J. Arnold Arb. 7:163. 1926.

Rehsonia brachybotrys (Sieb. & Zucc.) Stritch, comb. nov. Wisteria brachybotrys Sieb. & Zucc., Fl. Jap. 1:92, t.45. 1839.

Rehsonia Xformosa (Rehd.) Stritch, comb. nov. Wisteria Xformosa Rehd., J. Arnold Arb. 3:36. 1921.

A NEW SPECIES OF REHSONIA FROM JAPAN

Rehsonia nipponica Stritch, sp. nov. (Fabaceae)

Perennis; rhizomata longa repentia. Caules lignei, sinistrorse volubiles. Folia alterna, imparipinnata; foliola 9 - 11 (13), petiolulata, alterna ad subopositas, oblongo-elliptica, cuneata ad rotundatas ad basim, acuminata ad apicem, integra, glabra ad maturitatibus, ad 6.0 cm longa, ad 3.0 cm lata; stipulae et stipellae pusillae, caducae.

Inflorescentia racemus terminalis, 15.0 ad 22.0 cm longus, axis pubescens. Flores pedicellati, pedicellus 1.5 ad 2.3 cm longus; azurei, purpurei, v. candidi, ostende, magni; bracteae caducae; bracteolae absentes; calyx campanulatus, bilabiatus, pubescens, lobi 5, labium superum bilobus, labium infernum trilobus lobo medio longescenti acuminato, ad 6.5 mm longo; petala subequalia, carina incurva, petala carinae unita ad apicem, auriculata ad bases, alae oblongo-falcatae, monounguiculatae, projecturis cornuatis perpendicularibus aut propemodo ad unquem, vexillum magnum, ad 2.1 - 2.2 cm longum, 2.1 - 2.2 cm latum, reflexum callis binis auritis ad basim, auriculae 1.7 - 2.0 mm longae; stamina decem, diadelphi, stamen unus liber; ovarium super gynophorum, pubescens, discus cingens gynophorum; multiovula.

Fructus legumen; legumen oblongo-ellipticum ad oblongo-lanceolatum, complanatum, elongatum, torulosum, constrictum leviter inter semina interne, pubescens, bivalve, dehiscens tarde. Semina aliquot, complanata, lenticularia, anthracina.

Type: E.H. Wilson 6579. (A). April 27, 1914. Near Tokyo.

BOOK REVIEWS

Alma L. Moldenke

"ANNUAL REVIEW OF ECOLOGY AND SYSTEMATICS Volume 14, 1983" edited by Richard F. Johnson, x & 501 pp., 46 b/w fig., 14 tab. & 2 maps. Annual Reviews Inc., Palo Alto, California 94306. 1983. $27.00 U.S.A. & $30.00 foreign.

The Editorial Committee for this volume mentions that this "set of chapters is even more heterogeneous than usual" with such interesting and carefully thought-out topics as: molecular basis of adaptation, macroevolution, chromosomal aspects of evolution and speciation, group selection, chemical systematics, statistical aspects of parsimony in systematics and philosophical issues involved, cleistogamy in grasses, ecological scaling in mammals and birds, interface between ecological and behavioral genetics, classical parasitology and contemporary evolutionary theory, and the ecological impact of the Alaska pipeline. It is somewhat comforting to read this last-mentioned paper. Indeed, this book provides an outstanding treatment of these and the other 19 topics.

"THE FUNDAMENTALS OF NITROGEN FIXATION" by J. R. Postgate, x & 252 pp., 17 b/w photo., 18 fig. & 14 tab. Cambridge University Press, Cambridge & London, England, & New York, N. Y. 10022. 1982. $37.50 clothbound & $12.95 paperbound.

The author has provided in this single source for the student, lecturer or research worker entering this field "the background science which is conditioning our thinking about nitrogen fixation as research enters the 1980s". It is based upon "three fundamental scientific advances: the recognition of the oxygen sensitivity of the enzyme proteins, the discovery of the acetylene test for N_2 fixation, and the discovery of the dinitrogen [N_2] complexes" fundamental to world agriculture and the persistence of life on this planet. The ability to fix dinitrogen is fairly widely distributed among eubacteria, cyanobacteria and some streptomycetes. Some fix only in association with higher plants (e.g. many legumes). There is a very full bibliography listing mainly original information sources.

"ARBORES FRUTICESQUE EUROPAE - Vocabularium Octo Linguis Redactum" edited by Szaniszló Priszter, 300 pp. Akadémiai Kiadó, Publishing House of the Hungarian Academy of Sciences, H-1363 Budapest, Hungary. 1983. $35.00.

This is an 8-language dictionary of the vernacular names of the native trees, shrubs and subshrubs of Europe compiled from the 5 volumes of "Flora Europaea" and using its scientific nomenclature. The languages listed for each entry ar (1) Latin with the accepted sci-

entific name and authority and only those synonyms listed in "Flora Europaea", (2) English, (3) French, (4) German, (5) Hungarian, (6) Italian, (7) Spanish, and (8) Russian, with the gender of the common names indicated where needed. About 1,200 species of plants are recognized within their respective families for this continent of about 10,000,000 sq. mi. area. There are alphabetical indexes for each language, a full list of the scientific name authors and a bibliography. "It is hoped [and should well be achieved] that the present dictionary of the trees and shrubs of Europe will help all engaged in research work in clearing up nomenclatural inconsistencies, and that it will promote the establishment of standard taxonomic use."

"EXPERIMENTS IN PLANT TISSUE CULTURE" by John H. Dodds & Lorin W. Roberts, xiii & 178 pp., 23 b/w photo., 14 fig. & 12 tab. Cambridge University Press, London, England, & New York, N. Y. 10022. 1982. $29.50 clothbound & $10.95 paperbound.

"The purpose of this [probably still unique] book is to introduce a basic experimental method for.....the isolation and culture of plant cells, tissues, and organs." It is also a laboratory text book for college undergraduates, some high school biology students and research workers from various botanical fields. Aims, procedures and reactions are carefully explained. There are catechetical type questions, selected references and some additional experiments producing monoploid plantlets. There is a chapter on the use of tissue cultures for the commercial production of chemical and medicinal compounds. There is a list of source materials from firms mostly in England and the U.S.A.

"ANNUAL REVIEW OF PLANT PHYSIOLOGY Volume 35, 1984" edited by Winslow R. Briggs, ix & 736 pp., 58 b/w fig., 9 photo. & 9 tab. Annual Reviews Inc., Palo Alto, California 94306. 1984. $27.00 U.S.A. & $30.00 foreign.

In the prefatory chapter, C. Ralph Stocking, long at the University of California at Davis, gives his "Reminiscences and Reflections" directed mainly to the younger plant physiologists "in the hope that they may find a few thoughts of encouragement to pursue their chosen areas of study without fruitless wasted energy". There are 8 papers on molecules and metabolism dealing with such topics as: immunoassay of plant growth regulators, chloroplast ATPase, ethylene biosynthesis in higher plants and leghemoglobin. An example of the 5 papers on organelles and cells is "Biogenesis of Glyoxysomes" and of the 5 papers on tissues, organs and whole plants is "Phytoalexins and their Elicitors - a Defense Against Microbial Infection in Plants". An example of the 4 papers on population and environment is "Role of the Plasma Membrane in Freezing Injury and Cold Acclimation. All the papers are well presented, documented and valuable.

"PHYSIOLOGICAL ECOLOGY OF THE ALPINE TIMBERLINE - Tree existence at High Altitudes with Special Reference to the European Alps" by W. Tranquillini. Ecological Studies 31, 137 pp., 67 fig. incl. 2 color photo. & 10 b/w photo. & 20 tab. Springer-Verlag, Berlin & Heidelberg, West Germany & New York, N. Y. 10010. 1979. $34.00.

This carefully and succinctly prepared ecological study of the factors defining and limiting conifer growth in this area is based on the author's experimental work, observations since 1952 and his original research reported in 30 papers listed in the bibliography which also carries many other pertinent papers. "It has now become clear that the three possible causes for timberline, i.e., limited dry matter production, incomplete tissue maturation and inadequate climatic resistance are closely interrelated. Acting in unison they amplify the influence of each factor acting alone, and thus together ensure that above a certain altitudinal zone trees can no longer withstand the incident winter dessication."

"CONCISE ENCYCLOPEDIA OF THE SCIENCES" edited by John-David Yule, vi & 590 pp. & ca. 500 color-photo. & diag. Facts on File, Inc., New York, N. Y. 10016. 1980. $29.95.

This attractively prepared and well organized work was compiled by competent English editors and scientists as the "Phaidon" and first published in 1978, yet seems quite up-to-date. "Prepared with the reference requirements of young people, parents, students, educators, professional workers and business men in mind, it gives instant access to the facts, theories, inventions and formulas vital for mastering the complexities of the science and technology which underpin 20th century industrial society." There are 5,500 key words from the main sciences, 1,000 relevant brief biographical notes, full use of cross-referencing and many excellent illustrations.

"BIOLOGY 83 Current Titles in the Biological Sciences", 137 pp., edited by Stephen R. Edwards for the Association of Systematics Collections, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, and by Allen Press, P. O. Box 368, Lawrence, Kansas 66044. 1983. U.S.A. individual $40.00, institutions $80.00; Canada $50.00 & $90.00; other foreign $55.00 & $95.00; paperbound, quarterly.

This review is both a "Hail" and a "Farewell" to this very well organized, reasonably priced periodical "designed for the research-oriented professional in the biological sciences who wishes to keep abreast of current literature". Titles come from "solid core research periodicals" and provide immediate access to titles according to subject, higher taxa, or author with address to assist in forwarding reprint requests. It is much like "Biological Abstracts"

without the résumés, cumbersome size and price, particularly handy for various systematists, etc., without easy access to B. A. Not enough subscriptions came in to make continuing the journal economically feasible beyond the four issues of 1983. Scientific libraries that have not yet subscribed can still obtain this one set which will become a "collector's item".

"BIRD MIGRATION" by Chris Mead, 224 pp., 180 b/w migration maps, 12 tab., 41 diag., 61 photo., 6 color photo. & 16 color photo. pl. Facts on File Publications, New York, N. Y. 10016. 1983. $19.95.

The author has long been interested in birds, has been on the staff of the British Trust for Ornithology for over 20 years, and has written many scientific papers on this and related topics. It is wonderful that he shares so much of his knowledge in this interesting and readable way with amateur ornithologists, teachers, and biologists. Since this American publication follows the British one, many more folks should be enticed to read and/or study this very effectively and attractively prepared book. There are almost 200 local and worldwide migratory route maps, earliest scientific records of bird migrations, and a plausible set of reasons for the development of migration and its various patterns. This is an excellent publication.

"A CATALOGUE OF THE *ARANEAE* Described Between 1940 and 1981" by Paolo M. Brignoli & edited by P. Merrett, iv & 755 pp.. Manchester University Press for the British Arachnological Society, Manchester M-139PL, England, and Dover, New Hampshire 03820. 1983. $90.00.

This publication is indeed an efficient, scholarly "working tool for the spider taxonomist" intentionally supplementary to Fr. Roewer's well-known "Katalog der *Araneae*" in 2 volumes of 3 parts, 1942--1954, and to P. Bonnet's famous "Bibliographia *Araneorum*" in 2 volumes of 6 parts, 1945--1959. There will surely be times when entomologists are nomenclaturally interested in spiders affecting certain insects and when botanists and research agriculturalists are interested in correctly naming the spiders at work on insects which are at work on plants. This book can, therefore, be of help to more than the arachnologist. Many knowing and known taxonomists in this and other fields of the world's biota will be pleased with the author's remarks on taxonomic publications in terms of names, descriptions, language and the great value of illustrations of definitive parts. Synonomy, geographic distribution and their literature sources are reported if not already included in Roewer and in Bonnet. All is well organized and clearly printed. Perhaps a more compacted format would have made a lower price possible.

"THE BIOLOGY OF NECTARIES" by Barbara Bentley and Thomas Elias, 336 pp., 28 tab., 51 fig. & 14 b/w photo. Columbia University Press, New York, N. Y. 10025. 1983. $33.50.

This interesting collection of papers had "its conception at the AIBS symposium in 1977"; its author - editors promise "continuing research with equal fascination". There are papers on the ultrastructure of both floral and extrafloral nectaries illustrated with clear SEM photographs, the interesting patterns of nectar production and plant-pollinator coevolution, the structure and distribution of extrafloral nectaries with systematic charts of their appearances, the ecology of nectar robbing by some species of birds, bees and ants through "short-cut" holes bitten near the bases of long corolla-tubes or perianth parts avoiding anthers and stigmas. This last item and the contents of nectar are of great importance in the tropics where a very large proportion of both natural vegetation and cultivated crops are often self-incompatible and depend on insects as pollen vectors. Noted for correction in future editions of the book are *Clerodendrum* being the presently accepted correct spelling of the generic name, with *C. buchanani* as the correct name for the specific taxon mentioned and with *C. philippinum* as the correct name for what the author refer to as *C. fragrans*. All in all, this is a worthwhile publication of interest to many kinds of biologists at many levels of training and skill.

"COSTA RICAN NATURAL HISTORY" edited by Daniel H. Janzen with 174 contributors, xi & 816 pp., 12 color photo., 531 b/w photo., 67 fig., 48 tab. & 26 maps. University of Chicago Press, Chicago, Illinois 60637. 1983. $50.00 clothbound & $30.00 paperbound.

This is a needed and hopefully much to be appreciated presentation that may/could be followed by subsequent volumes with ecologically and systematically oriented studies of other Costa Rican natural history wonders. This book is copiously illustrated mainly from photographs taken by the editor-author Janzen but unfortunately some of the printing is so dark that only those who already know what is depicted can recognize it. There are individually authored papers on early field biology explorations and museum startings, climate, geology, soils, agriculture past and present, plants, reptiles, amphibians, birds, mammals and insects. Several of these papers are particularly well done and helped me enjoy revisiting the area after three and a half decades. For advanced students and visitors studying at the Organization for Tropical Studies Research Station this new book will remind them of the "Book" put out by that institution and long unavailable. Could not Volume II of this new publication revise, modernize and amplify this "Book", omitting any duplications and adding some other pertinent material? I have been wondering ever since reading on p. 4 about the statement that the famous Henri Pittier was "determined, indefatigable, tyrannical". The first two of these qualities of character he had to have had along with

brilliant competency to accomplish all that he did. We only knew him personally in Venezuela and in New York in his later years. Tyrannical then? No! Just wonderful!

"McGRAW-HILL DICTIONARY OF EARTH SCIENCES" edited by Sybil P. Parker & Staff, vi & 837 pp. McGraw-Hill Book Company, New York, N. Y. 10020. 1984. $32.50.

"The terms selected for this Dictionary are, in the opinion of the editors, fundamental to understanding the earth sciences. Many definitions were drawn from the "McGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS" (3rd ed., 1984) [and appreciatively reviewed recently in PHYTOLOGIA] and others were written especially for this work. Synonyms, acronyms, and abbreviations are given along with the definitions; they are also listed in the alphabetical sequence as cross-references to the defining term". There are more than 15,000 terms defined in one or more ways as needed for each of the following earth-related sciences: geology, oceanography, crystallography, petroleum and mining engineering, geochemistry, hydrology, petrology, mineralogy, climatology, geodesy, geophysics, paleobotany, paleontology and geography. The book is carefully prepared in content and is printed in type that is readily readable by the many students, instructors and technicians in these fields who would need it.

"DR. JOSÉ DE JESUS JIMÉNEZ ALMONTE - Una Vida Dedicada a la Ciénsia" by José de Jesus Jimenez Olavarrieta, 368 pp. & 87 b/w photo. Taller Santo Domingo, Dominican Republic; available from the author at Máximo Gómez 34, Santiago, Dominican Republic. 1984. $15.00 plus $1 airmail.

This is an appreciative, loving and scientifically valuable account of the full lifetime accomplishments of this fine human being as a beloved family man, leading citizen, outstanding medical doctor and leader in hospital improvement, capable and gracious botanist known and admired by many others in this profession. In his lifetime he received many well earned certificates of merit as shown in the photographs reproduced in this book, which includes also some of him in the field with his ever-present vasculum. In the author's (himself a M.D.) accompanying letter he states "I summarize the history of Botany in the Dominican Republic, part of the history of Medicine in Santiago and, of course, my father's life", 1905--1983. Here is hoping that many more than family, friends, medicos and botanists will have the pleasure of reading this fine tribute by his son.

"A FIELD GUIDE TO BIRDS OF THE USSR - Including Eastern Europe and Central Asia" by V. E. Flint, R. L. Boehme, Y. V. Kostin & A. A. Kuznetsov, translated by Natalia Bourso-Leland, xxxi & 354 pp., 48 color pl. of 728 species, 71 b/w line-draw. & 303 maps.

Princeton University Press, Princeton, New Jersey 08540. 1984. $65.00.

The original, now out-of-print, Russian edition was published in 1968 and has been updated by the senior author in respect to all topics covered and has an added Latin-English cross-reference index. James Baird, of the Massachusetts Audubon Society, served as the English language ornithological advisor. The introduction explains the use of this field guide, advises about bird-watching in this part of the world and states "Since birds are the most wonderful of all the animals, one can only expect that becoming acquainted with them will be pleasant and will bring the reader much happiness". So much information in the descriptive text, which also includes distinguishing features of similar species, such clearly presented color plate paintings which often show both male and female and occasionally juveniles, such useful geographic distribution maps which cover about a sixth of the earth's land mass (i.e., arctic, tundra, taiga, broadleaf forest, steppe, semi-desert, desert and mountain zones) make this book indeed excellent!

"RANDOM WALKS IN BIOLOGY" by Howard C. Berg, ix & 142 pp., 57 b/w fig. & 1 tab. Princeton University Press, Princeton, N. J. 08540. 1984. $16.50.

The author's lectures in courses on biochemistry and biophysics at Harvard, the University of Colorado and Cal Tech and this book based on them present the author's "conviction that biologists and biochemists would enjoy their work more if they thought less in terms of thermodynamics and some of the rudiments of statistical physics... Biology is wet and dynamic. Molecules, subcellular organelles, and cells immersed in an aqueous environment, are in constant riotous motion". The chapters deal with microscopic and macroscopic theory, diffusion to capture with drift and at equilibrium, movements of self-propelled objects like *Escherichia coli*, other random walks, probability distributions and differential equations. This new orientation is that well thought of that the author has been named co-winner of the 1984 Biological Physics Prize of the American Physical Society.

"THE VITAMIN BOOK" by Rich Wentzler, iii & 224 pp., 52 b/w tab. & 3 diag. A Dolphin Book, Doubleday & Company Inc., Garden City, New York 11530. 1979. $5.95 paperback.

The introduction to this interesting and generally useful book stresses the role of foodstuffs on early atoms, molecules, simple life and human life; the chemical nature and functioning of all food nutrients and then, one by one, on the essential vitamins and minerals with their deficiency and excess effects and their graded specific food sources. All is explained very logically and scientifically in an easy, chatty reading style. Knowing some biochemis-

try gives confidence to the author's statements for these chemical processes as well as for the claims for the vitamin substances that vary so much among health faddists, etc., and for his sensible eating recommendations.

"COMMON MEDICINES - An Introduction for Consumers", Preliminary Edition, by David J. George, iii & 197 pp., 21 b/w diag., 23 tab. & 3 photo. W. H. Freeman & Company, San Francisco, California 94104. 1979. $7.00 paperbound.

"This book is a [well organized and well explained for intended readership level] rough draft of a text currently being expanded and rewritten to reflect the author's increasing experience in teaching consumers to better understand drug therapy ....The author apologizes for the spelling errors [oh, so many!], inconsistency of format", etc. The author gives a course under the title-topic for students in the University of Utah.

"AN INTRODUCTION TO THE HISTORY OF VIROLOGY" by A. P. Waterson & Lise Wilkinson, xiv & 237 pp., 21 b/w photo., 12 fig. & 1 frontispiece. Cambridge University Press, Cambridge & London, England, & New York, N. Y. 10022. 1978. $42.50.

This fine history is essentially conceptual with the "study of ideas and concepts, and the interactions between these, on the one hand, and experiment and technique, on the other". The text revolves around four well-studied during the last century viruses - fowl plague, tobacco mosaic, rabies and smallpox. A helpful personal element is added at the end of the text in the form of 138 brief and pertinent biographies of workers in the field. "Looking at virus diseases throughout the whole spectrum from the slow virus diseases to the violently acute ones", this book indicates much of what is known and also reminds readers that their history is far from complete.

"THE COMPUTER COOKBOOK 1984-1985 Edition" by William Bates, xiv & 396 pp., 163 b/w product photo., 68 fig. & diag., 4 maps & 57 charts. 1984. Quantum Press, Doubleday, New York, N. Y. 10167. $14.95 paperbound.

No, don't expect food recipes on punched-out cards, but rather an interesting encyclopedia or almanac and a consumer's guide to all kinds of hard and software for computers for household, research, writing and other individual uses. The author teaches computer science at the graduate level in the University of California at Berkeley. This, his new edition has 2-color text highlighting items of particular importance and effective marginal notes with helpful text amplifications. It is copiously and effectively illustrated. There are a couple of places where a "spelling corrector" could have been used. It truly is the best in its field and is now being translated into German, Japanese and French.

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NOTES ON IRIDACEAE. VI

Pierfelice Ravenna
INTA, Universidad de Chile, Santiago, Chile

New species and subspecies in the genera *Trimezia* and *Cipura*, are described; moreover, new combinations in *Nemastylis*, *Eleutherine*, *Trifurcia*, and *Sisyrinchium* are established.

TRIMEZIA SOBOLIFERA Ravenna, sp. nov.

Planta usque 80 cm alta. Rhizoma brevis verticalis. Folia 3-4 ensiformia flabellata viridia leviter glaucescentia flaccida nervio medio vel submedio crassiori ad 30-50 cm longa et 17-35 mm lata infra solum vaginis haud distincte incrassatis. Caulis teres saepe flexuosus post anthesin soboliferus inferne folio basalibus simile sed breviori ad 29-30 cm longo dein folio abbreviato circ. 11 cm et bracteis 1-3 ad 4-5 cm longis. Spatha circ. 4 cm longa valvis subaequalibus. Pedicelli spathis saepe leviter longiores. Perigonium lutcum 40-50 mm latum. Ovarium clavatum obtuse triquetrum pallide viride vel viridi-lutescente ad 9-9.2 mm longum et 2.3-2.4 mm latum. Tepala exteriora oblanceolato-pandurata ad 26-31 mm longa et 13 mm lata unguiculis concaviusculis pallidis striis castaneis notatis; lamina laete lutea ad basin castaneo-punctata apiculata; apiculus 0.8-1 mm longus inferne pilosus. Tepala interiora geniculato-recurvata ad 14 mm longa et 7-8 mm lata; unguiculus 9 mm longus et 2.8 mm latus pallidus striis castaneis notatus; lamina lutea obovato-quadrata recurvata in medio inferiori stria glandulis oleiferis oblongis densis maculisque pallide castaneis ad 7 mm longa et 7 mm lata. Filamenta praeter basin fusco-brunneam incrassatam leviter connatam tenuiter filiformia ad 3.7 mm longa. Antherae lineari-lanceolatae ad 4 mm longae; pollen loculique nigro-virides-centes. Stylus filiformis ad 4.4 mm longus. Styli rami lutei ad 4.3 mm concrescentes dein 2 mm liberi; cristae duae dorsales triangulari-cultriformes ad 2.9-2.3 mm longae: replicaturae stigmatosae 1.5 mm longae patentes. Capsula clavato-fusiformis ad 25.5 mm longa et 6 mm lata cicatricis perigonii parvis 1-1.5 mm latis. Semina angulata ochracea 1.5 mm lata.

COLLECTIONS. México, Veracruz, San Andrés de Tuxtla, Cerro El Vigía; Léia Scheinvar 674, 28-V-1967 (MEXU). Id. ibid., bosque caducifolio; M. Sousa 2264, 3-IV-1965 (MEXU). Oaxaca (?), La Coba, Chinantla; Liebman 43 (C 14591). Idem La Coba, Pocotepec; Liebman 44, VI-1842 (C 14590). Culta in Bonaria ex plantis in horto pr. Mazatlán civit. Sinaloa Mexici advectis; Ravenna 520, IV-1966 (Herb. Ravenna, type). United States, Florida, Dade

Co., Miami, Park site at SW 72 Ave. and Bird Rd.; G.N. Avery 562, 11-XII-1968 (NY). Venezuela, Caracas. originally obtained from garden of Dr. Lasser in 1960; Steyermark 112234, 25-VI-1976 (VEN).

Allied to *T. steyermarkii* Fost., and differing in the larger spathes, and by the fact of producing plantlets at every bract, including spathe-valves, of the past-flowered stem.

CIPURA INORNATA Ravenna, sp. nov.

Planta ad 20-30 cm alta. Bulbus subglobosus usque 18 mm latus. Folia basalia ad anthesin 2-3 plicato-taeniolata lineari-attenuata fusco-viridia ad 15-28 cm longa circ. 3-7 mm lata. Scapus 15-27 cm longus. Spathae 1-3 biflorae sessiles vel subsessiles valva inferiori 20-23 mm longa, superiori 35-40 mm longa acuta translucide marginata. Flos albus breviter pedicellatus 18.5-22 mm longus et 26-35 mm latus. Ovarium oblongo-pyriforme pallide viride ad 5-5.5 mm longum et 1.5 mm latum. Tepala exteriora late oblanceolato-spathulata ad 21-22 mm longa et 12 mm lata; interiora obovata erecto-patentia ad apicem paullo recurvata eglandulosa ad 15-17 mm longa et 8.5-9 mm lata. Filamenta libera filiformia alba ad 2-2.7 mm longa. Antherae oblongae luteae ad 3.2 mm longae. Stylus et pars concrescens styli ramorum albi 6.5 mm longi; area stigmatosa infundibulato-trilobata cristis nullis.

COLLECTIONS. Costa Rica, Guanacaste, 6 km SE de La Cruz ("Santa Cruz" sphalm.), 200-250 m; Ramón Ferreyra 15945, 24-VII-1964 (USM). Culta in Bonaria ex bulbis circ 5 km a La Cruz australi-orientem versus civit. Guanacaste Costa-Ricae collectis; Ravenna 319, XII-1964 (Herb. Ravenna). 8 Km a Palo Seco septentrionem versus civit. Guárico Venezuelae; Ravenna 2177, 25-VI-1976 (Herb. Ravenna holotype, VEN isotype).

Closely related to *C. campanulata* Rav.; it can be distinguished by the non flat, broadly teniolate leaves, and the inner tepals shorter than the outer ones.

CIPURA PALUDOSA Aubl. subsp. *mexicana* Ravenna, ssp. nov.

A subspecie typica habitu elatiori foliis angustioribus in vivo 4-9 mm latis floribus albis raro leviter coerulescentibus tepalis longioribus differt.

COLLECTIONS. Guatemala, dept. Izabal, on trail from Zapotillo to El Astor, lake Izabal S.C. Snedaker D-52, 22-V-1966 (IFAS). México, Oaxaca, along the Pan-American highway (route 190), 16 km NW of Zanatepec, 100 m; R. Merril King 504, 10-VI-1958 (ENCB). Idem, Guerrero, Rincón Viejo, 700-800 m; H. Kruse 536, 27-VIII-1960 (ENCB).

Jalisco, dry thin soil near Guadalajara; Pringle 4463, 27-VII/15-VIII-1893 (MEXU, ENCB). 5 Km ad septentrionem Esquinapae civit. Sinaloa Mexici; Ravenna 278, X-1963 (Herb. Ravenna, type).

It differs from subspecies *paludosa* in the narrower, broadly teniolate leaves, larger, white or only slightly bluish flowers, with comparatively slightly narrower tepals.

NEMASTYLIS TENUIS (Herb.) Bak. subsp. *COERULESCENS* (Greenm.) conb. nov.— *N. coerulescens* Greenman, Proc. Am. Acad. Sci. 32: 296, 1897.— *N. tenuis* var. *coerulescens* (Greenm.) R.C. Fost., Contr. Gray Herb. Harv. Univ. 155: 41, 1945.

COLLECTIONS. Mexico, Morelos, dry gravelly soil near Cuernavaca; Pringle 6324, VI-1896 (MEXU, NY, SI, isotypes).

It is distinguished from subspecies *tenuis*, on account of its larger bulb, well branched inflorescence (rhipidium), and larger flowers.

ELEUTHERINE LATIFOLIA (Standl. et Will.) Ravenna, comb. nov.— *Cipura latifolia* Standley & Williams, Ceiba 1: 75, 1950.

COLLECTIONS. Honduras, dep. Morazán, Zamorano, 800 m; A. Molina R. 498, VIII-1947 (US, phototype seen).

Rather frequent in Honduras and Guatemala.

ELEUTHERINE CITRIODORA (Rav.) Ravenna, comb. nov.— *E. bulbosa* (Mill.) Urb. subsp. *citriodora* Ravenna, Bol. Soc. Arg. Bot. 10: 314, 1965.

A species from the first Andean slopes of northern Argentina, and neighbouring areas of Bolivia. It is found growing also spontaneously in gardens and parks, as far as at Santa Cruz de la Sierra, Bolivia.

TRIFURCIA PULCHELLA (Sweet) Ravenna, comb. nov.— *Herbertia pulchella* Sweet, Brit. Fl. Gard. 3: tab. 222, 1829.

Though its distinctness, this species was not transferred so far to *Trifurcia*, its proper genus.

SISYRINCHIUM PALMIFOLIUM L. subsp. *FUSCOVIRIDE* (Rav.) Ravenna, comb. nov.— *S. macrocephalum* R. Grah. ssp. *fuscoviride* Ravenna, Wrightia 7 (1): 6, 1981.

After the Linnean herbarium became available in microfiches, it was possible to confirm that *S. macrocephalum* R. Grah. is a synonym of *S. palmifolium* L.: the transference is made accordingly.

NEW SPECIES IN PHAEDRANASSA AND EUCROSIA (AMARYLLIDACEAE)

Pierfelice Ravenna
INTA, Universidad de Chile, Santiago, Chile

New species of Amaryllidaceae, namely *Phaedranassa cinerea*, *Ph. viridilutea*, and *Eucrosia peruviana*, are described. The former two belong in the flora of Ecuador.

PHAEDRANASSA CINEREA Ravenna, sp. nov.

Bulbus late ovatus ad 9-11 cm longus et 7-8 cm latus inferne radicis crassis superne in pseudocollo 6-9 cm longo productus. Folia serotina post anthesin 2-3 cinereo-viridia utrinque pruinosa ad 45-51 cm longa et 7.5-10.5 mm lata; petioli erecto-patentes 15-16 cm longi inferne 9-11 mm lati in facie adaxiali subplani postice convexi, lamina oblanceolata patentia vel recurve patentia saepe undulata et plicatulo-nervosa acuta. Scapus teres glauco-viridis pruinosus ad 20-25 cm longus inferne leviter compressus circ. 9.7 mm latus ad apicem 5 mm latus. Spatha ad anthesin marcida valvis cartaceis lanceolatis ad basin liberis reflexis ad 33 mm longis. bracteae interiores 25-10 mm longae. Inflorescentia usque 11-flora. Pedicelli graciles glauco-virides teretifiliformes ad 27-30 mm longi. Flores declinati vel penduli. Ovarium ellipticum vel oblongo-ellipticum obtusotriquetrum cinereo-viride pruinosum ad 7.7-8 mm longum circ. 3.5-3.8 mm latum. Perigonium leviter ventricosum circ. 31-35 mm longum. Perigonii tubus campanulatus vel poculiformis duis tertiis inferioribus viridibus deinde carmineo-roseus. Tepala anguste oblanceolata usque 20 mm carmineo-rosea ad apicem oblique patentia cinereo-viridia albo-roseo-marginata; exteriora usque 29 mm longa in tertio inferiori 4 mm lata apicem versus 3.7-3.8 mm lata apiculo 1.8 mm longo intus ad basin tuberculo piloso notato; interiora usque 27 mm longa ad apicem 4.8-5 mm lata marginum albo-roseum 1.3 mm latum. Filamenta filiformi-subulata, sepalinum superiore 27.5 mm longum, sepalina lateralia 28.5 mm longa, petalinum inferiore 31 mm longum, petalina lateralia 32 mm longa. Antherae ellipticae versatiles sordidae 2.5-2.8 mm longae; pollen lutescens. Stylus filiformis ad initium anthesis 32 mm longus dein 38 mm longus. Stigma capitatus.

COLLECTIONS. Ecuador, prov. Chimborazo, road Gral. Elizalde (Bucay)—Pallatanga, 32 km from Pallatanga, 650 m; Øllgaard & Balslev 9006, 29-VIII-1976 (AAU, Herb. Rav.). Culta in Santiago Chiliae ex bulbis a Dre. Øllgaard in Aequatore collectis; Ravenna 3049, XI-1982 (Herb. Ravenna holotype, AAU isotype).

Distinguishable by its large, ash green leaves, which are markedly pruinose on both faces. The flowers are shorter than in *Ph. dulcis*.

PHAEDRANASSA VIRIDILUTEA Ravenna, sp. nov.

Planta usque 71 cm alta. Bulbus ovatus 40-45 mm longus et 35-40 mm latus in pseudocollo circ. 9 cm longo productus. Folia ad anthesin nulla. Scapus pariter cylindraceus usque 66 cm longus ad basin 7-8 mm latus et apicem 5 mm latus. Valvae lanceolatae marcescentes 40-42 mm longae; bracteae interiores anguste lineari-lanceolatae 30-20 mm longae. Pedicelli filiformes 11-30 mm longi. Flores patentes vel declinati. Ovarium 3.5-6.5 mm longum et 2.5-2.8 mm latum. Perigonii tubus viridis 9-10 mm longum et 2.5 mm latus. Perigonium anguste campanulatum vel subtubulare. Tepala oblanceolata circ. 11-12 mm lutea caeterum viride, exteriora 21-23 mm longa et 3.5-3.8 mm lata apiculo 0.6-0.7 mm longo, interiora 22-24 mm longa et 6.5-7 mm lata obtusa vel subacuta. Filamenta lineari attenuata, sepalina 15-16.5 mm longa, petalina 12-13 mm longae Antherae ellipticae versatiles 2.5-3 mm longae. Stylus filiformis 3.5-3.7 mm longus. Stigma minute capitatus.

COLLECTIONS. Ecuador, prov. Azuay, highway Cuenca-Cola de San Pablo, km 54, 2580 m; Jef D. Boeke 973, 14-II-1977 (Herb. Ravenna holotype, NY isotype).

A distinct species by virtue of its flower colour.

EUCROSIA PERUVIANA Ravenna, sp. nov.

Planta 15-26 cm alta. Bulbus ovatus circ 20 mm latus tunicis exterioribus fusco-ochraceis; pseudocollus brevis. Folia serotina oblanceolato-petiolata fusco-viridia 11-16 cm longa et 13-25 mm lata; petiolus 46 mm longus. Scapus teres gracilis 13-25 cm longus. Valvae lanceolatae 4-10 mm longae. Inflorescentia 3-8-flora. Pedicelli 5-20 mm longi. Ovarium late ellipticum vel ovatum obtuse triquetrum 3-4 mm longum et 2-2.5 mm latum. Perigonium bilabiate infundibulatum rubrum basin versus viride ad 16-22 mm longum et 12-17 mm in diametro horizontale et 16-24 mm in diametro verticali. Perigonii tubus viridis 3-4 mm longus. Tepala oblanceolata 14-17 mm longa extus ad apicem macula viridi; exteriora 4-5 mm lata apiculo 0.4-0.5 mm longo; interiora 5-7 mm lata obtusa vel subacuta. Filamenta fasciculato-declinata, sepalinum superius 50-60 mm longum, sepalina lateralia 54-65 mm longa, petalinum inferius 60-68 mm longum, petalina lateralia 65-70 mm longa. Antherae oblongo-reniformes luteae 2.5-3 mm longae. Stylus declinato-ascendens 65-80 mm longus. Stigma minute capitato-trilobatus.

COLLECTIONS. Peru, dept. Contumazá, prov. Guzmango, El Molino (Cascas—Contumazá; Sagástegui et al. 9338, 1-XI-1979 (TRP). Idem, Guzmango, 2500 m; López & Sagástegui, 5-X-1966 (TRP 6247). Idem, Cascas?, traido por un alumno; Sánchez-Vega 2790 (U. Tec. Cajamarca). Culta in Santiago ex bulbo in Cajamarca Peruviae collecto et a Dom. Sánchez-Vega donato; Ravenna 3070, XI-1983 (Herb. Ravenna, type).

Allied to *E. eucrosioides*, this species is separable by its more slender habit, narrower leaves, and a more regular perigone; the latter is green at the base, and uniformly red above.

ACKNOWLEDGEMENTS. The writer is indebted to Dr. B. Øllgaard, Botanical Institute, University of Aarhus, Denmark, and Prof. I. Sánchez Vega, Universidad Nacional Técnica de Cajamarca, Perú, for their consistent cooperation in sending dry and living material (bulbs) for study; Dr. A. López, and Prof. A. Sagástegui, Universidad de Trujillo, Perú, for facilities in the consultation of the Herbarium; and Dr. Patricia K. Holmgren, The New York Botanical Garden, for sending, among others, the specimen of *Phaedranassa viridilutea*.

THE ANTHEMIDEAE AND SENECIONEAE (ASTERACEAE) WARE OF LOUISIANA

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INTRODUCTION

The early botanical work on the vascular plants of Louisiana was carried on by several botanists including R. S. Cocks, S. L. P. De Cubieres, W. R. Dodson, C. Dorman, A. Featherman, and T. Vaughn (Brown 1945). Rafinesque's Florula Ludoviciana was published in 1817. His publication is significant not only as the first localized record of plants of southern Louisiana but also for including numerous new names, many of which have been accepted as valid names or have become the basionyms of new name combinations. The majority of the vascular flora of Louisiana is directly or indirectly covered by the floristic works of several botanists such as Chapman (1889), Mohr (1901), Small (1903, 1933), Fernald (1950), Gleason and Cronquist (1963), Radford et al. (1968), and Correll and Johnston (1970).

With reference to the recent botanical works in Louisiana, the following taxa have been assessed: ferns and fern allies (Brown and Correll 1942, Thieret 1980), Alismataceae (Curry and Allen 1973), Fabaceae (Lasseigne 1973), Rhyncosporeae and Sclerieae (Joyce 1974), Orchidaceae (Pridgeion and Urbatsch 1977), Onagraceae (Ellis and Urbatsch 1979), Droseraceae and Sarraceniaceae (Murray and Urbatsch 1979), Poaceae (Allen 1980), and Scrophulariaceae (Vincent 1982). Thomas and Allen (1982, 1984) published preliminary checklists on the vascular plants of Louisiana.

The family Asteraceae is one of the least studied families of the flowering plants for Louisiana. Several taxa of the Asteraceae of Louisiana, such as the genus Elephantopus (Curry 1976) and the tribe Veronieae, including the genera Elephantopus, Stokesia, and Veronia (Urbatsch 1977), have been reviewed. However, to date, a comprehensive floristic treatment has not been performed on the entire Asteraceae of Louisiana. As a part of the project on the flora of Louisiana, Gandhi and Thomas (1984a, 1984b, 1984c) studied the family Asteraceae as well as Convolvulaceae, Cuscutaceae, and Lamiaceae.

The family Asteraceae (also known as the Compositae) is cosmopolitan in distribution and is one of the most successful families of the flowering plants, consisting of as many as 13,000 species belonging to 900 genera (Willis 1973). In the United States, the family is represented by approximately 2,550 species belonging to 340 genera (Rice et al. 1982). The family is classified into 13 tribes belonging to two subfamilies (Cronquist 1981). The subfamily Asteroideae consists of the following 12 tribes: the Anthemideae, Arctotideae, Astereae, Calenduleae, Cynareae, Eupatorieae, Heliantheae, Inuleae, Liabeae, Mutisieae, Senecioneae, and Vernonieae. The subfamily Cichorioideae (= Lactucoideae) consists of only one tribe, the Cichorieae (= Lactuceae).

In Louisiana, the family Asteraceae is one of the dominant herbaceous families in the flora. It is also the largest family, represented by more than 360 species belonging to 90 genera. These taxa belong to 10 tribes, i.e., nine tribes in Asteroideae (excluding the Arctotideae, Calenduleae, and Liabeae) and the only tribe in the Cichorioideae. Some of these taxa are cultivated for ornamental or commercial purposes, e.g., Ageratum, Ambrosia, Anthemis, Aster, Bidens, Chrysanthemum, Cichorium, Coreopsis, Dahlia, Gerbera, Helianthus, Lactuca, Rudbeckia, Santolina, Senecio, Solidago, Tagetes, Tanacetum, Taraxacum, and many others.

For the purpose of a Master of Science thesis, the tribes Anthemideae and Senecioneae have been studied in detail by the senior author. The objective of this study was to produce a thesis that includes descriptions, keys, nomenclature, and data on the distribution, habitats, and phenology. The tribes Anthemideae and Senecioneae are represented in Louisiana by at least 27 species belonging to genera. The Botanical contributions made on the Asteraceae by Baillon (1888), Bailey (1949), Lawrence (1951), Cronquist (1952, 1955, 1980, 1981), and Rendle (1967) and on a few of its members by Cabrera (1949), Turner (1956), Kral and Godfrey (1958) and Barkley (1978) have been quite helpful in better understanding the family in general and the two tribes in particular.

MATERIALS AND METHODS

Sources of Specimens

The herbarium specimens on deposit in the Herbarium Northeast Louisiana University (NLU) provided the data for this study. The majority of the specimens were collected by Dr. R. Dale Thomas from Louisiana and other states during the past 17 years. Representative specimans of these tribes on deposit in the following Louisiana herbaria were also studied: Louisiana State University, Baton Rouge (LSU); Louisiana State University, Shreveport (LSUS); Northwestern State University (NATC); Tulane University (NO); and University of Southwestern Louisiana (LAF). (The acronyms of the herbaria are as given in Holmgren et al. 1981.)

For floristic study, either fresh or preserved (pickled) materials are preferred to dry ones. With the exception of a few species, this author did not have the access to fresh specimens. Dried flowering materials were removed from the herbarium specimens and soaked in 100° C water. The soft textured specimens were soaked for 2 to 5 minutes and hard textured specimens soaked for 5 to 15 minutes. This soaking causes the material to regain the original turgidity. Such a condition simulates that of the fresh specimen. At the conculsion of the study, the flowering material was re-dried, enclosed in a paper package, and was returned to the respective herbarium sheet.

Format

The sequence of the description of the taxa is as follows:

1. Family name, authority, common name and description
2. Key to the tribes Anthemideae and Senecioneae
3. Key to the genera
4. Generic number, name, authority, common name, description, total number of species and their distribution found in the world, and total number of species found in the Unites States
5. Key to the species
6. Species number, name, authority, publication details, common name, basionym, synonym, and description.
7. Infraspecific taxa number, name authority, publication details, common name, basionym, synonym, and description

The sequence of the arrangement of the tribes, genera, and species follows Cronquist (1980). The information on the names of taxa, authorities, and publication details is based on the data obtained from the Index Kewensis Plantarum Phanerogamarum (1893-), Index to American Botanical Literature (1886-), Gray Herbarium Card Index (1886-), and National List of Scientific Plant Names (Rice et al. 1982). In the event of discrepancies between the Index Kewensis Plantarum Phanerogamarum and other sources, the discrepancy was indicated in a note under the description of the respective species.

The common names used locally are mentioned. For all such names of taxa involving new combinations, basionyms are provided. The citation of synonyms is restricted to taxa, the correct names of which differ from those used in recent manuals of the eastern United States and Texas.

The descriptions of the taxa such as the family, genus, and species are based mostly on the specimens from Louisiana but also include selected information from specimens which are on deposit in Northeast Louisiana University Herbarium from other states. The descriptions include features on the nature of the habit, stem, leaves, inflorescence, flowers, and fruits; the measurements, numbers, shapes, colors, and any other special features of most of the above mentioned parts are provided. Each description begins with either a noun or an adjective and ends with a noun, adjective, or participle. If any part of the description is specific to Louisiana specimens, the same thing is denoted by the term "ours".

The characteristics of the habit (including the underground parts and aerial appendages), stem, leaves, inflorescence, peduncle, involucre, receptacle, paleae, ray and disk flowers, fruits, and pappus are separated from each other with a period (punctuation). The different features that are described in one sentence are separated either with a comma or semicolon. The measurements of the leaves include those of the petioles (unless otherwise noted); the corolla limbs or ligules, including those of the extended connectives; and the styles, including those of the stylar arms. The description of the family features is generally not repeated in the description of the genus and those of the genera are not repeated in the description of the species. In the description of each genus and species, the description of the sterile flowers and functionally staminate flowers precedes those of other flowers; similarly the description of the pistillate flowers precedes that of the bisexual flowers.

Keys to all the taxa listed are strictly dichotomous and bracketed. Each couplet is successively numbered. The heading of the second line of each couplet begins with a morphological feature contrasting to that of the heading of the first line. For contrasting, positive characters are generally used with an occasional negative character listed. These contrasting characters are easily recognized and/or persistent. The headings begin with a noun or an adjective.

The total number of species of each genus and their worldwide distribution (after Willis 1973) and also the total number of species of each genus found in the United Stated (Rice et al. 1982) are given at the end of the generic descriptions.

Abbreviations

In order to conserve space, the following abbreviations are used in the text.

Nomenclature and references

Authority abbreviations:	as given in the National List of Scientific Plant Names
Journal abbreviations:	as given in B-P-H (Botanico-Periodicum-Huntianum)
NLSPN:	National List of Scientific Plant Names
sp.:	species (singular)
spp.:	species (plural)
var.:	variety
vars.:	varieties

Description

cm:	centimeter(s)
m;	meter(s)
mm:	millimeter(s)
vmsl:	ventro-marginal stigmatic lines

Distribution

Compass directions:	n, ne, nw, s, se, sw, e, w
Fig.:	Figure
General distribution across the continents and the United States:	N, NE, NW, S, SE, SW, E, W
States:	Standard abbreviations

Geography

The distribution of a species within the United States is mentioned either by states or regions. This information was prepared by this senior author in a study of specimens deposited at the U. S. National Herbarium, Smithsonian Institute, Washington DC (US) and by referring to the distribution data provided in the National List of Scientific Plant Names (Rice et al. 1982)

Ecology and Phenology

According to Allen (1980), the state of Louisiana can be divided into five major vegetational regions: Coastal Marsh, Floodplain, Pine, Prairie, and Upland Hardwoods. The preference of the members of the Asteraceae for semiopen to open fields and disturbed areas is well known (Cronquist 1980). The nature of the soil or area if of a specific type such as blackish, clayey, granite, sandy, limestone, loamy, etc. is mentioned. The flowering period is given in months, eg., June to September.

TAXONOMY

Description of Asteraceae Dumort. The Aster Family

Annual, biennial, or perennial herbs or shrubs, occasionally vines (tree forms absent in ours); rhizome or stolon sometimes present; plant body less often laticiferous, occasionally aromatic. Leaves basal and/or cauline; basal leaves sometimes deciduous before anthesis; cauline leaves opposite or alternate, or opposite baseward and alternate upward, rarely whorled; blade entire to pinnatifid or pinnatisect, sometimes compound, less often resinous-glandular. Inflorescence a head (= capitulum), 1 to numerous, variously arranged, more commonly following centrifugal or basipetal pattern of arrangement. Receptacle (= rachis) short, surrounded by 1 to several series of partly or wholly green involucral bracts, flat, convex, or conical to columnar, rarely concave, occasionally bristly or pitted; each such pit if surrounded by a crown of scales, then the receptacle referred to as alveolate. Paleae (= receptacular bracts, chaffs) often present, uniform, or less occasionally dimorphic; each palea either flat and subtending a flower, or folded and clasping a flower on its dorsal side. Flowers (also known as florets in this

family) (1-) a few to numerous, protandrous, generally described as sessile (but often found to be attached to a filiform stalk), crowded on the receptacle, bisexual, pistillate (fertile or sterile), or functionally staminate; the sequence of flowering within the head centripetal; calyx (generally referred to as pappus in this family) reduced to awns, scales, bristles, or absent; corolla sympetalous; stamens (4-) 5, epipetelous, included or exserted; filaments generally free; anthers usually united (commonly referred to as syngenesious), introrse; connective extended; pollen grains spinulose or smooth-walled; ovary inferior, bicarpellary, unilocular, with a single basel ovule, style 2-branched and exserted in bisexual and pistillate flowers, often undivided and included or just exserted in functionally staminate flowers, the 2 stylar arms (= branches) variously shaped, bearing conspicuous or obscure ventro-marginal stigmatic lines (vmsl). Fruit a cypsela, smooth or various, flattened or angled, rarely subterete, often crowned with the pappus; the latter aiding the fruit in dispersal.

The success of this family is attributed to structural adaptations to the environment, efficient mechanism of pollination and dispersal of fruits, and the chemical nature of the plant body (probably preventing the grazing by cattle).

The majority of the authors regard the pappus to be a reduced and highly modified calyx, but Small (1917, 1918) and Koch (1930) were of the opinion that in Helianthus and its allied genera, the calyx and corolla have fused to form a single petaloid structure, and that the pappus (if present) represents trichome-like enations from the ovary.

There are four types of corolla: 1) tubular and cuneate, or funnel-shaped with a tube and a limb, (4- or) 5-toothed or -lobed (actinomorphic); 2) tubular, often filiform, without a limb, frequently minutely 2- to 5- toothed (tending to be actinomorphic); 3) bilabiate with 1- or 2-toothed inner lip and 3-toothed outer lip (zygomorphic); and 4) ligulate, with a tube toward base and a strap upward; the strap, also called ray or ligule, often 2- to 5-toothed or -lobed (zygomorphic).

All flowers with ligulate corollas are referred to as rays; the flowers with tubular or funnel-shaped corolla are referred to as disk flowers. The author include even the flowers with bilabiate corolla under the disk type. The flowers with filiform and/or tubular corolla that are without limb are not included under ray or disk types, and since such flowers are closely similar to the disk type, they are referred to

as disciforms. (The name "disciform" refers to the nature of the corolla or head.) Basing the classification on the nature of the corolla, the heads are classified into four categories:

1. Ligulate: all the flowers are of the ray type and are bisexual.
2. Discoid: all the flowers are of the disk type and are bisexual.
3. Radiate: the marginal flowers are of the ray type and are either pistillate or sterile, rarely bisexual (e.g., Stokesia); the other flowers are of the disk type and are either bisexual or functionally staminate.
4. Disciform: the peripheral flowers are pistillate, have filiform and/or tubular corolla (disciform type), and occasionally are without corolla; the central flowers are of the disk type and are either bisexual or functionally staminate.

Besides the above mentioned classification, the head inflorescence, in a broad sense, is classified into two categories: 1) Homogamous: heads with one kind of flowers such as the staminate, pistillate, or bisexual; 2) Heterogamous: heads with two kinds of flowers such as the sterile and bisexual, pistillate and bisexual, or pistillate and functionally staminate. This kind of classification may be useful to classify the heads that are devoid of corolla, e.g., in Xanthium, the pistillate heads consist of naked flowers.

The anther bases offer a few taxonomic variables; the bases may be truncate, rounded, auricled, sagittate, or caudate (= tailed). The filaments tend to be enlarged below the anthers. The connective extends beyond the anther cells; this extended condition is quite unusual for an evolutionarily advanced family. The description of the connective, provided in the genus description, refers to this extended part. The connective is usually folded slightly outward. In most of the insect-pollinated taxa the pollen grains are spinulose, whereas in wind-pollinated taxa the pollen grains are generally smooth-walled.

The stylar arms of bisexual flowers exhibit remarkable variations in different tribes. The arms may be flattened, terete, clavate, or filiform. The stigmatic regions of the arms are within, may be near to the bases of the arms, to the middle, or beyond. The stigmatic region more often is demarcated by the presence of ventro-marginal stigmatic lines (vmsl).

The stigmatic region bears stigmatic papillae which aid in the germination of the pollen grains. The non-stigmatic regions of the stylar arms (including the external surfaces) often bear hairy appendages or papillate outgrowths. The distribution of the hairs on the arms varies: 1) forming a ring immediately below the bases of the arms; 2) at the extreme tips of the arms; 3) as an external band at the bases of the deltoid tips of the arms of from the middle of the arms to their apices; and 5) on both the surfaces from almost middle of the arms to the apices. If the hairs are absent, the arms often bear non-stigmatic papillate outgrowths which are more conspicuous than those of the stigmatic papillae.

The style plays a significant role in carrying out the process of cross pollination. The style grows vertically and passes through the anther tube with its two arms held tightly against each other. In such a condition, the stigmatic regions are not in contact with the pollen. Further, the external appendages on the stylar arms not only brush the pollen out of the anther tube to the surface of the corolla mouth but also prevent any contact between the pollen and the stigmatic region. After surpassing the anther tube and the corolla, the stylar arms diverge. Thus, the style is essential for the removal of the pollen from the anther tube. For the same reason, even in functionally staminate flowers, the style is present. The stylar arms of pistillate flowers of different taxa vary in size and shape but not in the basic pattern. Further, since the pistillate styles are only the receptors of the pollen grains and are not involved in the dispersal of the pollen, generally they are without any appendages.

Figures 1-6 give some of the variations of heads, involucre, receptacles, flowers, anther bases, pollen grains, stylar arms, and fruits.

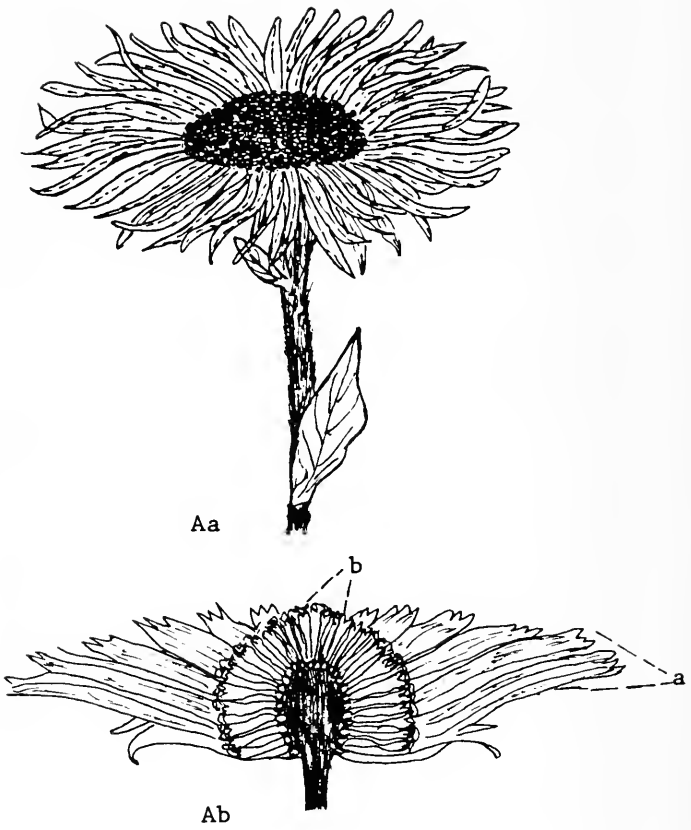


Fig. 1. Radiate Head Inflorescence in Asteraceae. (Aa) complete head; (Ab) vertical section. (a) rays; (b) disk flowers.

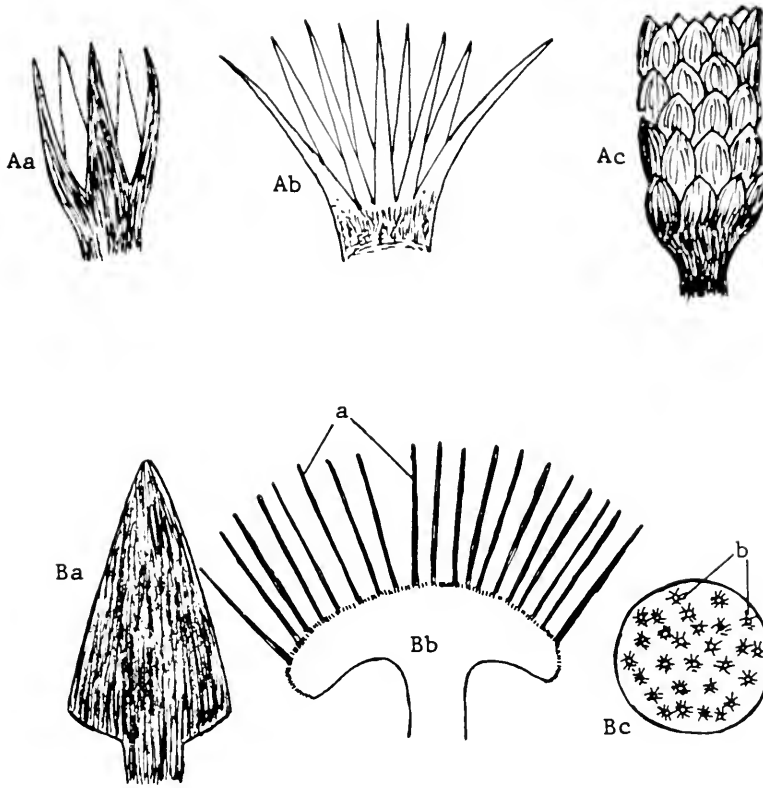


Fig. 2. Involucre and Receptacle Types in Asteraceae. (A) involucre types: (Aa) uniseriate and turbinate; (Ab) 2-seriate and campanulate (vertical section); (Ac) several-seriate and cylindrical. (B) receptacle types: (Ba) conical and naked; (Bb) convex and paleate; (Bc) circular and alveolate. (a) paleae; (b) scales.

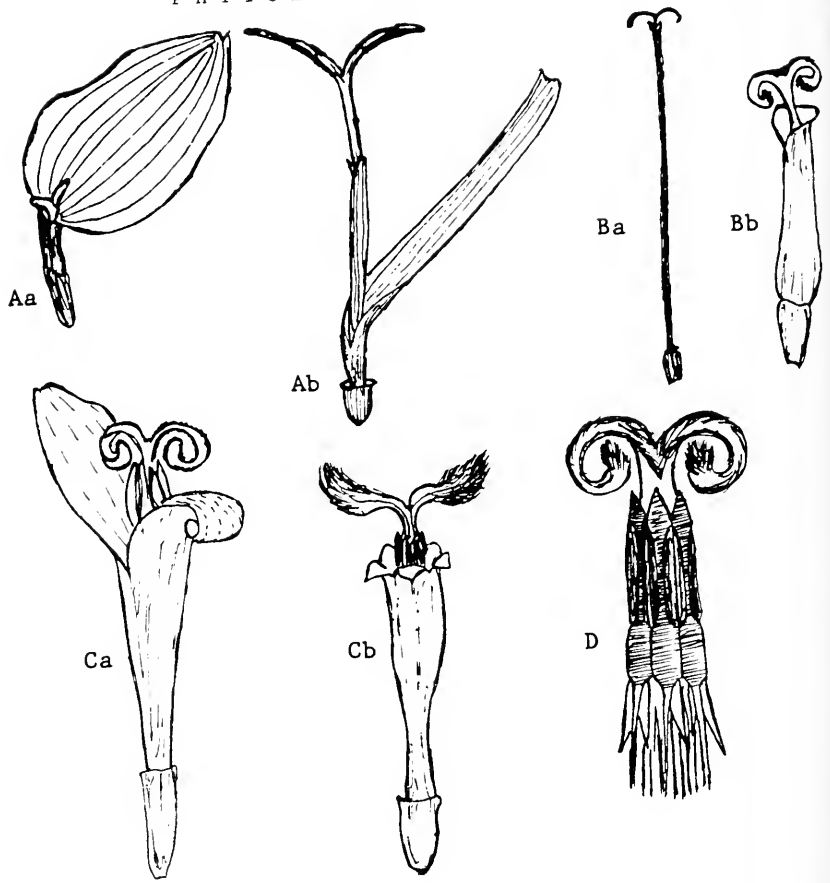


Fig. 3. Flower Types in Asteraceae and Structural Details (A) ray-flower types with ligulate corolla: (Aa) pistillate; (Ab) bisexual. (B) disciform flower types: (Ba) with filiform corolla; (Bb) with tubular corolla. (C) Disk flower types: (Ca) bisexual, with bilipped corolla; (Cb) bisexual with funnel-shaped corolla. (D) style passing through syngenesious anthers in a bisexual flower.

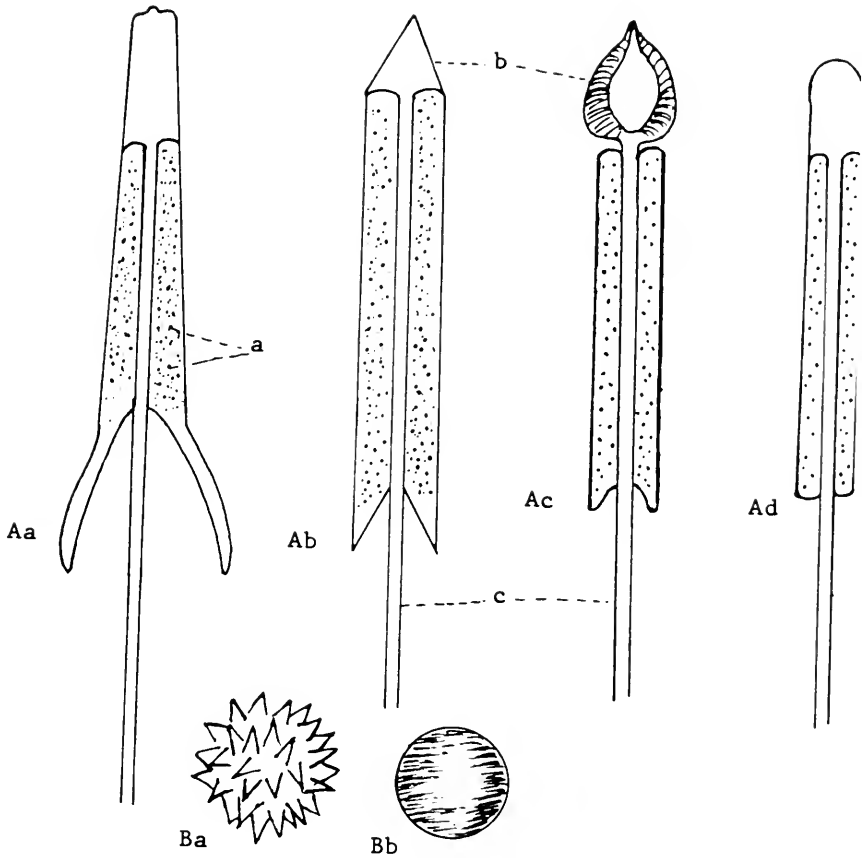


Fig. 4. Anther Base and Pollen Grain Types in Asteraceae. (A) anther base types: (Aa) tailed; (Ab) sagittate; (Ac) auricled; (Ad) rounded. (B) pollen grain types: (Ba) spinulose; (Bb) smooth-surfaced. (a) pollen grains. (b) connective; (c) filament.

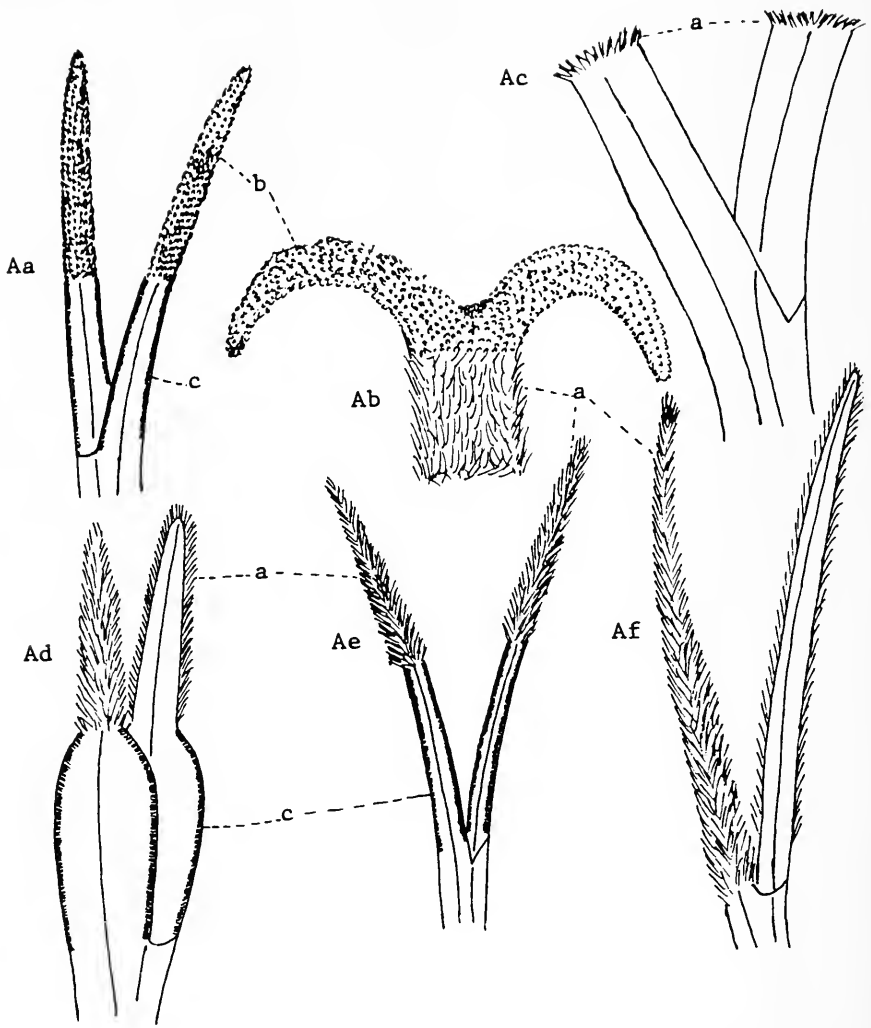


Fig. 5. Stylar Arm Types. (Aa) papillate upward; (Ab) papillate for the most part and hairy at the bases; (ac) hairy at the summit; (Ad) esternally hairy from the middle; (Ae) hairy on both sides from the middle; (Af) externally hairy from the bases to the tips. (a) hairs; (b) papillae; (c) vmsl.

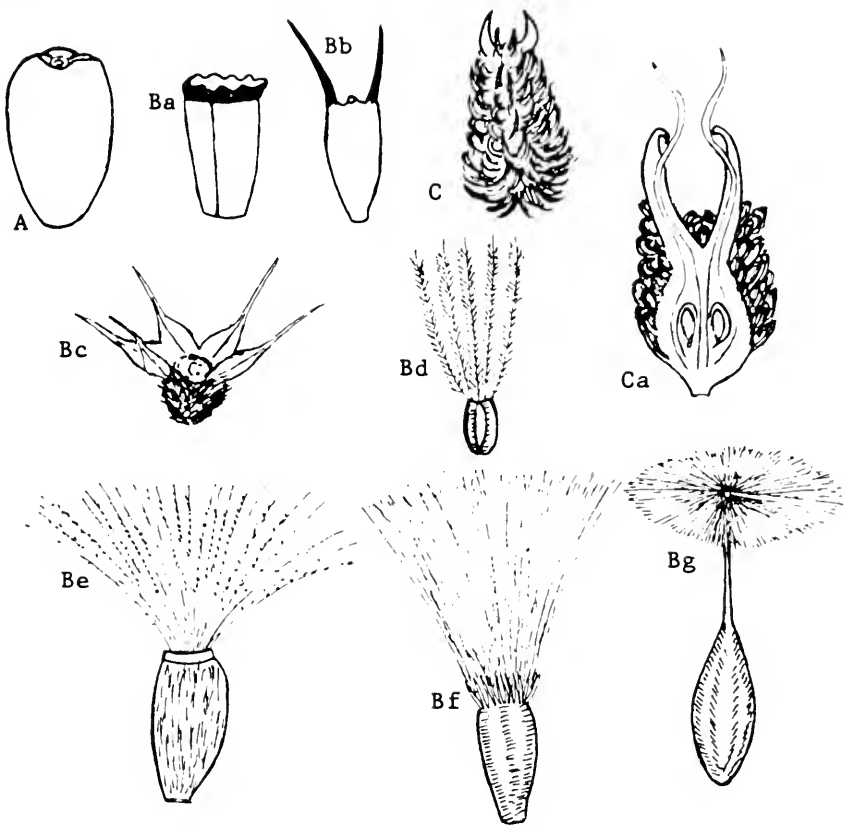


Fig. 6. Fruit (Cypsela) Types in Asteraceae. (A) without pappus. (B) crowned with various forms of pappus: (Ba) scaly crown; (Bb) awns; (Bc) awned scales; (Bd) plumose bristles; (Be) obscurely dentate bristles; (Bf) double pappus, with outer short scales, and inner longer bristles; (Bg) pappus bristles attached to the pappiferous disk at the summit of the cypsela beak. (C) cypsela completely covered with bur-like fructiferous involucre; (Ca) vertical section of the fructiferous involucre at anthesis.

Key to the Tribes Anthemideae and Senecioneae

1. Involucre 2- to 6-seriate; bracts imbricate, hyaline-scarious along the margins, occasionally petaloid; pappus absent or scaly and small; paleae present or absent ..... Anthemideae
1. Involucre generally 1-seriate; bracts subequal, herbaceous-chartaceous along the margins, not petaloid; pappus hairy; paleae absent . ..... Senecioneae

Artificial Key to the Genera of Anthemideae and Senecioneae

Anthemideae

1. Involucral bracts, all or a few white, yellow, or pinkish above the middle and appearing petaloid ... . 1. Hymenopappus
1. Involucral bracts not as above 2
2. Heads radiate; rays conspicuous or not 3
2. Heads discoid or disciform 5
3. Paleae absent..... 5. Chrysanthemum
3. Paleae present, uniformly distributed on the receptacle or restricted to the center 4
4. Rays 5 or few ..... 3. Achillea
4. Rays 10(+) ..... 2. Anthemis
5. Herbs under 25 cm high, often stoloniferous; head solitary, apparently basal or axillary; paleae and pistillate corolla absent ..... 9. Soliva
5. Herbs or subshrubs, usually reaching 0.5 to 2 m high; heads several to numerous, corymbiform, racemiform, or paniculiform, rarely solitary on long peduncles; paleae rarely present; pistillate corolla present, or flowers bisexual 6
6. Heads solitary on long peduncles; paleae present ..... 4. Santolina
6. Heads otherwise; paleae absent 7
7. Heads discoid; plant body to 0.5 m high ... . 7. Matricaria
7. Heads disciform; plant body to 2 m high 8
8. Involucre under 4 mm wide; central flowers as many as 25 ..... 8. Artemisia
8. Involucre to 1 cm wide; central flowers 100(+) ..... 6. Tanacetum

Senecioneae

1. Heads disciform ..... 12. Erechtites
1. Heads radiate or discoid 2
   2. Heads discoid; corolla white to dull pink ... . 11. Cacalia
   2. Heads radiate, if discoid, then the corolla yellow ..... 10. Senecio

Descriptions of the Genera and Species and Key to the Species of Tribe Anthemideae

1. Hymenoppappus L'Her. Woolly White

Taprooted biennials (ours). Stem branched in the inflorescence. Leaves basal and alternate; basal leaves forming a rosette, entire to pinnatified, often revolute along the margins, minutely punctate (usually visible on the upper surface), sheathing at bases; cauline leaves more or less distantly placed, smaller. Heads discoid (ours), medium-sized, terminating the branches and/or branchlets, forming a corymbiform or paniculiform inflorescence; central heads often become over-topped; terminal heads frequently grow congested. Involucre campanulate, 2- or 3-seriate; bracts petaloid, partly or wholly white, or yellow- or pink-tinged. Receptacle convex. Palaea absent. Flowers bisexual; corolla white or anthocyanic, funnel-shaped, with five reflexed lobes; anthers nearly equalling the filaments; filaments not enlarged below the anthers; connective subacute; pollen grains spinulose; stylar arms flat, deltoid at the apices, externally hairy upward or only at the apices, bearing themselves. Cypsela dark or brown obovate or obconical, 3- to 5-sided, many-nerved, bearing dense ascending hairs. Pappus of 12 to 25 small hyaline scales, crowning the fruit.

A genus consisting of 10 spp. distributed over USA and Mexico; nine spp. reported from USA; Turner (1956) performed cytotaxonomic study on this taxon.

1. Corolla white; basal leaves once or twice pinnatified; stylar arms 2 to 2.7 mm long; pappus scales under 1 mm high ..... 1. H. scabiosaeus
1. Corolla anthocyanic or white; basal leaves subentire to once pinnatified; stylar arms usually under 1.5 mm long; pappus scales 0.8 to 1.5 mm high ... . 2. H. artemisiaefolius

1. Hymenopappus scabiosaeus L'Her., Hymenopappus s. l. n. d. (1788)

Taproot as long as 20 cm. Stem floccose, becoming glabrate with age, to 1 m high; branches sparsely resinous-glandular, floccose for the most part, bearing jointed trichomes upward. Leaves glabrate above, densely white-tomentose beneath; basal leaves once or twice pinnatified, to 15 cm long (including 1 to 5 cm long petioles), primary segments often divided, to 5 x 3 cm; cauline leaves entire to pinnatifid, becoming sessile upward. Heads many to numerous. Peduncle slender, 0.5 to 4 cm high. Involucral bracts as many as 8, subequal or unequal, elliptic, ovoid, or oblong, obtuse, to 13 x 7 mm. Disk: 1 cm wide; flowers 15 to 20; corolla white, to 7 mm long, limb 4.2 x 2.2 mm, lobes 2.2 x 1 mm; style to 8 mm long, arms externally hairy upward, about 2.4 mm long, vms1 0.9 mm long. Cypsela thickened upward, cuneate below the middle, densely pilose, scarcely glandular, to 4 mm high, about 1.4 mm wide on each face. Pappus scales obovate, obtuse, slightly concave inward, to 0.9 x 0.3 mm.

E USA, MO, KS, AR, OK, TX, and AZ; scattered in dry pine woods in w LA; May to July.

2. Hymenopappus artemisiaefolius DC., Prodr. 5.658 (1836).

Similar to H. scabiosaeus in many aspects. Basal leaves subentire to once pinnatifid; undivided leaves elliptic, to 11 x 5 cm; pinnatified leaves with blade as large as 22 x 9 cm, terminal segments sometimes the largest (to 6 x 4 cm), petiole to 10 cm long. Involucral bracts to 10 x 5 mm; corolla anthocyanic, occasionally white, to 6 mm long, limb 3.5 x 1.4 mm, lobes 1.5 x 0.8 mm; style 7 mm long, arms hairy at the bases of the deltoid apices, to 1.4 mm long. Cypsela pilose on the angles and sometimes also on the surfaces, to 3.5 mm high. Pappus scales to 1.5 x 3 mm.

LA to TX; locally abundant in dry pine woods in w LA; April to June (-October).

Note: Some specimens intergrade between H. artemisiaefolius and H. scabiosaeus. They bear mixed characters such as twice pinnatifid basal leaves associated with anthocyanic corolla. In several specimens, the color of the corollas intergrades between creamy-white and pink. One specimen (R. D. Thomas 71507 and N. Carroll 1515) bears both white-flowered heads and pink-flowered heads. Cronquist (1980) also has reported about such an intergradation; he also has recommended reducing H. artemisiaefolius to a variety under H. scabiosaeus.

2. Anthemis L.

Annual, aromatic, taprooted herbs (ours). Plant body flocculent, becoming glabrate with age, branched; resinous glands scarcely present on the leaves and fruits. Primary axis sometimes short, Leaves alternate, once or twice pinnatisect, bearing lateral appendages at the bases, Heads radiate (ours), terminating the branches. Pedunculiform branches naked below the heads. involucre campanulate or hemispherical, usually 2- 3-seriate; bracts scarious-margined, subequal. Receptacle shortly conical. Paleae present, found all over the receptacle or restricted to the center, hyaline. Rays: pistillate or sterile; corolla usually white, sometimes yellow; stylar arms (if present) smooth. Disk: flowers numerous, bisexual; corolla yellow, funnel-shaped or cylindrical and constricted below the middle, bulbous at the base, 5-toothed; anthers longer than the filaments, auricled; connective subacute; pollen grains spinulose; stylar arms truncate, penicillate, bearing vmsl from the bases to the apices. Cypsela glabrous, several-ribbed, smooth or muricate, often 4- or 5-angled. Pappus of a short scaly crown, absent.

A genus consisting of about 200 spp. distributed over Europe, Mediterranean to Persia; four spp. reported from USA.

1. Rays fertile; paleae distributed all over the receptacle ..... 1. A. arvensis
1. Rays sterile; paleae absent in the margin of the receptacle ..... 2. A. cotula

1. Anthemis arvensis L., So. Pl. 894 (1753). field chamomile

Plant body to 70 cm high. Leaves 2(-5) x 2(-3) cm; ultimate leaf segments filiform or linear. Heads many, medium-sized. Peduncle 2 to 10 cm high. Involucre to 7 x 10(-16) mm; bracts oblong, abruptly acuminate to caudate, ciliated, 1.8 mm wide. Receptacle 8 mm high (at fruiting). Paleae distributed all over the receptacle, slightly folded, acuminate, 3.5 mm high, 0.5 mm wide on each face. Rays: about 16, pistillate; corolla 14(-20) mm long, ligule 12(-18) x 4 mm; style 2.7 mm long, arms 0.4 mm long. Disk flowers; corolla 3.3 mm long, limb 1.8 x 1 mm, teeth 0.6 x 0.5 mm; style 2.7 mm long, arms 0.5 mm long. Cypsela brown, smooth, 1.3 x 0.7 mm. Pappus usually absent.

In most parts of USA (excluding TX to AR, NV to CO); one specimen is at US, collected by L. A. B. Langlois (no. 87) from w LA (without the name of the location) in 1885; April to July.

Note: According to Willis (1973) the fruit has papillae on its upper surface which become sticky when wet.

2. Anthemis cotula L., Sp. Pl. 894 (1753)
may weed, dog fennel

Similar to A. arvensis in many aspects; plant body to 60 cm high. Leaves to 6 x 2.5 cm. Heads many, medium-sized. Peduncle 5 to 8 cm high. Involucre to 0.5 x 1.5 cm; bracts oblong to lanceolate, acute, tending to be glabrate. Receptacle to 1 cm high (at fruiting). Paleae restricted to the center of the receptacle and peripherally absent, linear, 2.3 mm high. Rays: 10 to 14, sterile; corolla 12 to 15 mm long, ligule to 12 x 3 mm. Disk flowers: corolla 2.8 mm long, limb 1.5 x 1.2 mm, teeth 0.6 x 0.4 mm; style 3 mm long, arms 0.6 mm long. Cypsela brown, often slightly curved, generally tubercled along the ribs, to 1.3 x 0.7 mm. Pappus absent.

Found all over USA; locally abundant in low fields throughout the state; April to June.

3. Achillea L. Yarrow

Perennial herbs. Stem 1 to a few-clustered, branched in the inflorescence. Leaves basal and alternate; basal and lower cauline leaves petiolate, sheathing; median and upper cauline leaves almost sessile; blade twice or thrice pinnatisect. Heads radiate, small-sized, peduncled, arranged in flat- or convex-topped paniculate corymbiform cymes. Involucre turbinate, a few-seriate; bracts 1-ribbed or not, scarious- margined. Receptacle conical in fruit. Paleae present, outer ones similar to the involucral bracts, inner paleae concave to keeled, sheathing the disk flowers on their dorsal sides. Rays: 3 to 5, pistillate; corolla white, pink, or purple, ligule 3-toothed. Disk flowers: many, bisexual; corolla funnel-shaped, teeth 5, subacute, ascending or spreading; anthers slightly longer than the filaments, tailed; connective obtuse; pollen grains spinulose; stylar arms truncate, penicillate (the pistillate stylar arms lacking these appendages), bearing the vmsl for almost their entire lengths. Cypsela compressed, cuneate, callous-margined, glabrous. Pappus absent.

A genus consisting of about 200 spp. distributed in N Temperate regions; five spp. reported from USA.

1. Achillea millefolium L., So. Pl. 899 (1753). millefoil yarrow

Rhizomatous, fibrous-rooted, aromatic herbs. Plant body thinly floccose to woolly; resinous glands often present on the leaves and inflorescence. Stem to 1.2 m high. Basal and lower leaves often deciduous; median leaves to 15 x 1.5(-4) cm, ultimate segments 0.2 mm wide. Heads numerous. Involucre about 4 mm high; outermost involucral bracts elliptic to ovate, obtuse, to 2 x 1.2 mm; inner bracts and outer paleae elliptic, concave, to 3 x 1.2 mm; inner paleae 3.5 x 1.5 mm. Rays: corolla tube 1.7 mm long, ligule 2 x 2.2 mm. Disk: 4 mm wide; flowers 20 to 40(+); corolla 2.8 mm long, limb 1.2 x 1 mm, teeth 0.3 x 0.3 mm; style 2.1 mm long, arms 0.6 mm long. Cypsela about 1.4 x 0.5 mm.

Occuring throughout USA; scattered and locally abundant along roadsides in the state; May to July.

Note: In the vegetative state, this species resembles ferns. This taxon may be polymorphic: the number of disk flowers varies from 10 to 20 (as per Correll and Johnston 1970, and Cronquist 1980).

4. Santolina L.

Aromatic subshrubs (ours). Leaves alternate, pinnatifid, pectinate, or finely dissected, absent on the pedunculiform branches. Heads discoid, medium-sized, terminating the branches. Involucre campanulate, about 5-seriate; bracts scarious or scaly, yellowish. Receptacle convex, alveolate, (appearing as rudimentary honeycomb). Paleae present, slightly folded, each one sheathing an ovary or a fruit. Flowers as many as 100 (ours); corolla yellow, somewhat angled baseward, 5-toothed; anthers nearly equal to the filaments, sagittate; connective obtuse; pollen grains spinulose; stylar arms flat, truncate, penicillate, bearing the vmsl for the entire lengths. Cypsela angled, glabrous. Pappus absent.

A genus of 10 spp. distributed over W Mediterranean; one sp. reported from USA.

1. Santolina chamaecyparissus L., Sp. Pl. 842 (1753). lavender-cotton

Plant body profusely branched, gray- to silvery-tomentose on the branches and leaves, to 60 cm high; resinous glands concealed by the tomentum. Leaves numerous, oblong in outline, petioled, 2(-2.5) x 0.3 cm; leaf segments many, congested, about 1.5 x 0.5 mm. Heads

about 12. Peduncle 4 to 5 cm high. Involucre thinly flocculent, 5 x 10 mm; bracts 1-ribbed, concave inward; outermost bracts lanceolate, subacute, 3.2 x 1 mm; inner bracts elliptic, about 3.7 x 1.7 mm. Paleae stalked, obtuse, pubescent at the apices, often with a pink median rib, 4.2 mm high, 0.8 mm wide on each face. Corolla 5.4 mm long, teeth reflexed, 0.8 x 0.7 mm; style 5.6 mm long, arms 1.4 mm long. Cypsela 3- to 5-angled, cuneate, brown on the faces, scarious along the angles, 2.5 mm high.

Often cultivate; escaped, and naturalized in some parts of USA; long-persisting in cemeteries and around old buildings; March to June.

5. Chrysanthemum L.

Annual or perennial herbs. Leaves alternate, often basally disposed, simple toothed to shallowly pinnatifid. Heads usually radiate, medium- to fairly large-sized, solitary to several, terminating the stem and branches. Involucre about 5-seriate (ours), imbricate; bracts progressively larger inward. Receptacle almost flat and circular (ours). Paleae absent. Rays: as many as 30 (ours), pistillate; corolla white (ours), ligule minutely 2- or 3-toothed; stylar arms bearing the vms1 for their entire lengths, papillate at apices. Disk flowers: numerous, bisexual; corolla yellow, funnel-shaped, 5-toothed; anthers minutely auricled or rounded at the bases, slightly longer than the filaments; connective obtuse to subacute; pollen grains spinulose; stylar arms truncate, penicillate. Cypsela glabrous, a few- to several-ribbed, cylindrical or angled, pistillate ones sometimes scarcely 2- or 3-winged or -angled. Pappus of an inconspicuous scaly crown, or absent.

A genus consisting of nearly 200 spp. (in a broad sense) and distributed over Europe, Asia, Africa, and America, or consisting of five spp. (in a strict sense) and distributed over Eurasia and Mediterranean; three spp. found in USA (in a strict sense).

1. Chrysanthemum leucanthemum L., Sp. Pl. 888 (1753).

ox-eye daisy, white weed

Leucanthemum vulgare Lam., Fl. Fr. 2:137 (1778).

Perennial, rhizomatous, fibrous-rooted, glabrous herbs. Stem 1 to a few together, rooting at the bases and forming clumps, branched or not, to 70 cm high. Leaves tending to be basal or absent at least below the

heads; basal leaves spathulate, elliptic, or suborbicular and narrowed into winged petioles, obtuse to subacute, crenate, bluntly toothed or shortly lobed, 3(-10) x 1(-2.5) cm including 1 to 7 cm long petioles); lower cauline leaves spathulate or oblanceolate; other cauline leaves becoming oblong and sessile upward. Head solitary or a few. Peduncle often naked, to 20 cm high. Involucre hemispherical, 6 x 10(-15) mm; bracts scarious and purple-tinged along the margins; outermost bracts ovate, obtuse to acute, 3.7 x 2.2 mm; innermost bracts lanceolate, obtuse, 6.5 x 2.3 mm. Rays: corolla tube flattened and appearing winged, 2 mm long, ligule 10(-20) x 4 mm; style 2.8 mm long, arms 0.7 mm long. Disk flowers: corolla somewhat constricted in the middle, 3.6 mm long, limb 2.8 x 0.9 mm, teeth 0.7 x 0.5 mm; style 4 mm long, arms 0.7 mm long. Cypsela dark brown, about 10-ribbed, disk ones somewhat obovoid, to 2 x 0.7 mm.

Introduced, and established as a weed in temperate parts of USA; uncommon along roads on sandy soils in the n and se parts of the state; April to June.

6. Tanacetum L. Tansy

Perennial, often stoloniferous herbs (ours). Stem solitary, or a few separately arising from the creeping rhizome, branched at apex. Leaves alternate, once to thrice pinnatifid, punctate, sheathing at the bases; rachis narrowly winged; lower leaves deciduous. Heads disciform (ours), but generally appearing discoid, racemiform or arranged in flat- or convex-topped corymbiform cymes, peduncled. Involucre saucer-shaped, 4- or 5-seriate; bracts obtuse or irregular at apices, scarious-margined upward, 1-nerved, becoming narrower inward. Receptacle hemispherical (ours). Paleae absent. Marginal flowers: 5(+), pistillate; corolla simulating that of the disk, somewhat compressed, usually 3-toothed, teeth flat or hooded; stylar arms just exserted, bearing the vmsl from the bases to the apices, inconspicuously papillate at the summit. Central flowers: about 200, bisexual; corolla yellow, cylindrical, scarcely differentiated into limb and tube, teeth usually 5, subacute; anthers shorter than the filaments, minutely auricled at bases; filaments slightly enlarged below the anthers; connective obtuse; pollen grains spinulose; stylar arms simulating those of the pistillate ones, truncate, penicillate. Cypsela glabrous, 3-angled (in pistillate flowers) or 5-angled (in bisexual flowers), crowned with minutely dentate inconspicuous cupular scaly pappus.

A genus consisting of 50 to 60 spp. found in N. Temperate regions; six spp. reported from USA.

1. Tanacetum vulgare L., Sp. Pl. 844 (1753)

Aromatic, coarse, glabrate herbs. Stem to 2 m high. Leaves commonly twice or thrice pinnatifid, sessile or petioled, about 15 x 8 cm; pinnae to 4 x 1.8 cm; ultimate segments serrate. Heads many to numerous. Peduncle 1 to 3 cm high. Involucre to 1 cm wide; outer bracts narrowly elliptic to oblong, 3.4 x 1.4 mm; inner bracts spathulate, to 2.7 x 0.6 mm. Corolla 2.2 x 0.7 mm, teeth erect or reflexed, 0.3 x 0.3 mm; style to 2.2 mm long, arms 0.5 mm long. Cypsela dull brown, about 1 mm long. Pappus 0.2 mm long.

Scattered in most parts of USA; escaped from cultivation and becoming naturalized; (July-) August to September (-October).

7. Matricaria L.

Herbs. Leaves alternate, pinnatifid or dissected. Heads discoid (ours), small- to medium-sized, terminating branches, sometimes appearing corymbiform. Involucre 2- or 3- seriate; bracts lanceolate, obtuse, 1-nerved, green, scarious- or hyaline-margined. Receptacle conical in fruit. Paleae absent. Flowers numerous, small-sized; corolla yellow, funnel-shaped, 4- or 5-toothed; anthers shorter than the filaments, auricled; connectice conical, acute; pollen grains spinulose; style branches short, flat, scarcely penicillate at the apices. Cypsela slightly curved, cuneate, a few-nerved on the ventral side. Pappus none (ours),

A genus consisting of 40 spp. from Europe, Mediterranean, and W Asia, 10 spp. from S Africa, and six spp. chiefly from NW America.

1. Matricaria matricarioides (Less.) T. Porter, Mem. Torrey Bot. Club 5:341 (1894). pineapple weed

Artemisia matricariodes Less., Linnaea 6:210 (1831).

Matricaria discoidea DC., Prodr. 6:50 (1837).

Annual herbs, freely branched from the bases, taprooted, pineapple-scented, to 40 cm high. Stems and branches glabrescent. Leaves pinnatifid, often sheathing at the bases; lobes entire and linear, or repeatedly pinnatified, glabrous, 5 x 1.5 cm; ultimate segments 0.5 mm wide. Heads many. Peduncles to 12 mm high.

Involucre broadly campanulate, to 0.4 x 1 cm; outer bracts 1 mm wide. Receptacle about 4 x 1.7 mm. Corolla 1.8(-2.1) mm long, limb 0.6 mm long, teeth 4(-5), 0.2 mm long; style to 1.5 mm long, arms 0.2 mm long. Cypsela often bearing 1 or 2 reddish brown lines, about 1.2 x 0.5 mm.

Common in W USA, less common in E USA; rare along roadsides in East Carroll, Franklin, and Morehouse parishes; March to June.

Note: Gandhi and Thomas (1984d) published a note on the nature of the disk-corolla of this taxon.

8. Artemisia L. Worm Wort, Worm Wood, Sage Brush

Annual or perennial, generally aromatic herbs or subshrubs. Stem striated, usually branched in the inflorescence. Leaves alternate, frequently pinnatifid, more often gray- or white-tomentose beneath; stipule-like foliar appendages often present at the leaf bases. Heads disciform (ours), small- or medium-sized, subsessile to peduncled, numerous, generally arranged in paniculiform inflorescence. Involucre 3- or 4-seriate; median and inner bracts scarious-margined or scarious for the most part. Receptacle convex or hemispherical, occasionally bearing glandular hairs (otherwise paleae absent). Central flowers: yellow, funnel-shaped, bearing short glandular hairs, 5-toothed; anthers longer than the filaments, shortly tailed or auricled; connective flat, acute; pollen smooth-walled; stylar arms truncate, penicillate, vmsl as long as the arms. Marginal flowers: pistillate; corolla tubular, 2-toothed; style exserted, arms not penicillate, otherwise similar to those of the central flowers. Cypsela glabrous, faintly ribbed. Pappus absent.

A taxon consisting of 400 spp. distributed in N Temperates, S Africa, S America, and introduced elsewhere; over 60 spp. reported from USA; this taxon is wind-pollinated.

1. Leaves twice or thrice pinnatifid, pubescent only on the nerves beneath; annuals ..... 3. A. annua
1. Leaves entire to pinnatifid, densely gray- or white-tomemtose on one or both the surfaces; perennials 2
   2. Leaves entire, if lobed, then the segments not secondarily divided; stipule-like appendages usually absent ..... 2. A. ludoviciana
   2. Leaves often once or twice pinnatifid, occasionally palmatifid; stipule-like appendages usually present ... 1. A. vulgaris

1. Artemisia vulgaris L., Sp. Pl. 848 (1753)
mugwort

Fibrous-rooted, often stoloniferous, perennial herbs, with short, thickened rizome, to 1.5 m high. Stem branched upward, puberulent below the inflorescence, glabrate baseward. Stipule-like appendages usually present at the bases of the leaves; lower leaves deciduous; median leaves ovate or elliptic in outline, more often pinnatifid, less often palmately pinnatified below the inflorescence, abruptly narrowed into petioles or subsessile, generally glabrescent above, punctate-glandular and densely white-tomentose beneath, to 6(-10) x 4(-6) cm, lower primary segments often entire, other segments secondarily divided; upper leaves sessile, entire. Heads small-sized, numerous, arranged in terminal and subterminal paniculiform inflorescence; each head subtended by a short foliar bract. Peduncle 0.5 to 2 mm high. Involucre almost cylindrical, 2.7 x 1.8 mm; bracts scarious-margined, often ciliolate; outermost bracts ovate, 1.7 x 1 mm; innermost bracts oblanceolate, 3 x 1.3 mm. Central flowers: commonly three of them reaching maturity; corolla white, 2.2 mm long, limb 1.2 x 0.8 mm, teeth 0.4 x 0.4 mm, with reflexed apices; style 2 mm long, arms 0.6 mm long. Pistillate flowers: about 6; corolla 1.2 mm long; style 2.3 mm long, arms 1.2 mm long.

Occurring in E and W USA; widely scattered in LA; September to October.

2. Artemisia ludoviciana Nutt., Gen. Am. 2:143 (1818).

dusty miller

Fibrous-rooted, stoloniferous perennials, with creeping rhizomes, to 1.5 m high; resinous glands present on the leaves beneath and also on the stem apices, concealed. Stem 1 to a few together, densely arachnoid-villous or persistently white-woolly. Leaves elliptic, oblong, or oblanceolate, entire to lobed, densely gray- or white-tomentose on both the sides or just beneath, 5(-7) x 2(-3) cm. Heads small-sized, numerous, arranged in a few-headed short glomerules or monochasiums, these together forming a narrow paniculiform inflorescence (to 32 x 2.5 cm).

Involucre loosely wooly, campanulate or turbinate, about 4 x 3.5 mm; outermost bracts ovate, abruptly acuminate, 2.3 x 1.8 mm. Receptacle convex. Central flowers: as many as 20; corolla white, 2(-2.5) mm long, limb 1.6 x 0.6 mm, teeth 0.5 x 0.35 mm; style 2.3 mm

long, arms 0.7 mm long. Pistillate flowers; 8 or more; corolla 1.4 mm long; style 2.5(-3.4) mm long, arms 1.2 (-1.6) mm long.

Occuring all over USA; widely scattered and escaped from cultivation; August to October.

3. Artemisia annua L., Sp. Pl. 847 (1753). sweet worm wood

Annuals, taprooted, sweet-scented, 0.5 to 2.5 m high. Stem glabrescent, profusely branched, occasionally bushlike; branchlets slender, often 4-angled. Stipule-like appendages present; leaves twice or thrice pinnatifid, punctate-glandular, often pubescent beneath, 5(-10) x 2(-5) cm; ultimate segments dissected or lobed, 5(-7) x 2.5 mm. Inflorescence paniculiform, about 35 x 10 cm; branches racemiform, to 10 x 2(-3) cm. Heads in hundreds, small-sized, subtended by foliar bracts. Peduncle 0.5 to 1.2 mm long. Involucre hemispherical, 1.5(-2.3) x 1.8(-3.5) mm; outermost bracts about 2 or 3, herbaceous, 1(-1.5) x 0.25(-0.5) mm; median ones the largest, 4 to 6, elliptic or suborbicular, with a median green stripe, hyaline elsewhere, 1.2(-2) x 1(-1.5) mm innermost ones almost similar to the median ones but smaller or subequal. Receptacle convex, bearing short glandular hairs. Central flowers: as many as 20; corolla white, funnel-shaped, 1 mm long, limb 0.7 x 0.5 mm, teeth 0.3 x 0.3 mm; style 1.2 mm long, arms 0.3 mm long. Pistillate flowers: 6 to 10; corolla to 0.8 mm long; style 0.6 mm long, arms 0.3 mm long.

E USA, MO to UT, AZ and AR: uncommon in LA; May to November.

9. Soliva Ruiz & Pavon Stickers

Annual, often stoloniferous or closely growing and mat forming, sometimes decumbent, taprooted or fibrous-rooted, small herbs. Stem, if present, 1 to several, slender frequently appearing dichotomously branched. Leaves alternate or basal, with sheathing petioles, pinnately dissected; ultimate segments small, narrowly elliptic, acute, 2(-4) x 0.7 mm. Heads disciform, small-sized, subtended by a few leaves, solitary, basal in acaulescent species, and axillary in caulescent species. Involucre hemispherical; bracts 2- to 4-seriate, subacute, usually scarious, 1-nerved; outer bracts ovate to lanceolate; inner bracts oblong, narrower. Receptacle almost flat slightly convex, or shortly conical. Paleae absent. Central flowers: a few, functionally staminate;

corolla cylindrical and cuneate, or somewhat funnel-shaped, yellowish-green, 4-toothed; anthers truncate or shortly sagittate at the bases; connective obtuse; pollen grains spinulose; style just exserted, appearing capitate; rudimentary ovary present. Marginal flowers: numerous, pistillate; corolla absent; stylar arms smooth. Cypsela turgid, slightly flattened parallel to the involucre, bearing the persistent spinescent style, winged, often hairy at the summit; wings flat and smooth, if turgid and cross-ridge then not appearing as wings, often extending into two awns or spines at the apices, occasionally indentated at the bases. Pappus absent.

A genus consisting of eight spp. native to S America, and becoming naturalized elsewhere; six spp. (including those of Gymnostyles Juss.) reported from USA; Cabrera (1949) reviewed this genus.

1. Plants caulescent; wings of cypsela thin, extended into a pair of lateral short spines at the apices, indentated at the bases ..... 1. S. pterosperma
1. Plants essentially acaulescent; wings of cypsela turgid and cross-ridge, not extending into a pair of lateral spines, truncate at the bases 2
   2. Wings of cypsela cross-ridged from the bases to the apices or at least to 9/10 of their length, extended into a pair of lateral short awns at the apices; leaves usually once pinnatisect ... . 2. S. stolonifera
   2. Wings of cypsela cross-ridged only for 2/3 of their length, distally smooth, truncate at the apices and bases; leaves usually twice or thrice pinnatisect ..... 3. S. mutisii

1. Soliva pterosperma (Juss.) Less., Syn. Gen. Comp. 268 (1832).
   Gymnostyles pterosperma Juss., Ann. Mus. Natl. Hist. Nat. 4:262, t. 16 f. 3 (1804)

Decumbent or erect herbs, forming mats, often rooted at the lower nodes; plant body sordid-villous, to 15 cm high. Stem profusely and (apparently) dichotomously branched. Leaves once pinnatisect, to 4.5 x 2 cm; pinnae palmately cleft. Head solitary in the forks of branches and appearing axillary. Involucre to 6 mm wide; bracts 3-nerved, villous along the margins; outer bracts ovate, 4.5 to 2.2 mm; inner bracts oblanceolate or spathulate, 4.5 x 1.3 mm. Receptacle shortly conical. Central flowers: corolla 1.6 mm long, limb 1.1 x 0.5 mm, teeth 0.2 x 0.2 mm; anthers truncate at the bases; style 1.7 mm long. Marginal flowers: style stiff in fruit, 1.7 mm high. Cypsela hispidulous,

to 3.2 x 3 mm (including the wings); wings thin, ellipsoid, narrowing both upward and baseward, constricted and indentated at the bases, extended into two lateral spines upward (1.1 mm high).

NC to FL westward to TX, also in CA; abundant pest in lawns throughout the state; April to May.

Note: According to Cabrera (1949), the table(t.) number of Jussieu's publication is 61 and not 16. Cronquist (1980) described the growth of this taxon as sympodial.

2. Soliva stolonifera (Brot.) Loudon, Hort. Brit. 364 (1830).
   Hippia stolonifera Brot., Phytog. Lusit. 72 (1800-1801); Fl. Lusit. 1:373 (1804).
   Gymnostyles nasturtiifolia Juss., Ann. Mus. Natl. Hist. Nat. 4:262, t. 16, F. 2 (1804)

Similar to S. mutisii in several aspects; plants essentially acaulescent, stoloniferous. Leaves a few-clustered at the nodes, usually once pinnatisect, sparsely villous, to 3 x 1 cm. Head solitary at each node, found above the leaves. Invloucre 6 mm wide; bracts obtuse; outer bracts ovate to lanceolate, 3.5 x 1.2 mm; inner bracts oblong, 3.2 x 0.4 mm. Receptacle almost flat. Central flowers: corolla 1.8 mm long, limb 0.8 x 0.4 mm; anthers shortly sagittate; style 2 mm high. Marginal flowers; style semiflexuous, 2 mm high. Cypsela oblong to cuneate hairy at the summit, to 2 x 1.7 mm (including the wings); wings thick, cross-ridged from the bases almost to the apices on the ventral surfaces, slightly so or almost smooth on the dorsal surfaces, truncate at the bases, extended into a pair of lateral awns at the apices (0.7 mm high).

SC to FL, and westward to TX; scattered throughout the state; March to April.

Note: as per De Candolle (1836-38), Brotero described Hippia stolonifera in Fl. Lusit. (1:453), and also in Phytog. (p. 72); according to Index Kewensis, the description of this taxon was published in Fl. Lusit. (1:373); Cabrera (1949) mentioned that the publication was in Fl. Lusit. (1:72. 1801). According to Stafleu (1967), Broter's Phytographia Lusitaniae Selectior and Flora Lusitanica were published in 1800 (often cited as 1801) and 1804, respectively. (Also refer to the note under the description of S. pterosperma.)

3. Soliva mutisii H. B. K., Nov. Gen. et Sp. Pl. 4:302 (1820).

Plants essentially acaulescent, stoloniferous, sparsely to densely tawny or canescent villous; stolons 1 to 3 cm long. Leaves a few-clustered at the nodes, twice or thrice pinnatisect, to 12 x 2.2 cm (including 4 cm long petiole). Heads subtended by leaves, appearing in basal rosettes or clusters, but in reality solitary at each node. Involucre to 1 cm wide; outer bracts ovate to lanceolate, 5 x 1.5 mm; inner bracts oblong, 4.3 x 0.6 mm. Receptacle almost flat. Central flowers: corolla 2.7 mm long, limb 1.6 x 0.5 mm, teeth 0.2 x 0.3 mm; anthers shortly sagittate; styles 2.8 mm high. Marginal flowers: style flexuous, 2.2 mm high. Cysela oblong or slightly cuneate, hairy at the summit, about 2 x 1.2 mm (including the wings); wings thick, cross-ridged for 2/3 of thier lengths, distally smooth, the smooth region 0.7 mm high.

FL to TX; scattered and locally abundant; April to May, occasionally also flowering in winter.

Note: Correll and Johnston (1970) remarked that this taxon is closely related and perhaps conspecific with S. anthemifolia (Juss) R. Br. ex Less.; the described S. anthemifolia but did not include S. mutisii as a synonym or as a separate taxon. Since our specimens are villous, they are included under S. mutisii.

Descriptions of the Genera and Species and Key to the Species of Tribe Senecioneae

10. Senecio L. Groundsel, Ragwort

Annual, biennial, or perennial (short- or long-lived) herbs (ours); rhizomes and/or stolons often present. Stems frequently branched upward. Leaves alternate and basal, or mostly basal (then the inflorescence appearing subscapose), various in shape; reniform, suborbicular, elliptic, oblong, or ovate, crenate, toothed, lobed, or pinnatisect; basal leaves generally petiolate; cauline leaves usually sessile, auricled. Heads usually radiate, rarely discoid, medium-sized, arranged in umbelliform, corymbiform, or paniculiform cymes. Involucre campanulate, 1-seriate, often subtended by a few small greenish or purple-tinged bractlets; principal bracts generally 13, 21, or 34, lanceolate, or some of them slightly keeled, for the most part herbaceous, subequal, 0.7 to 1.7 mm wide. Receptacle flat or slightly concave. Paleae absent. Rays: as many as or fewer than the involucral bracts,

pistillate; corolla yellow or ochroleucous, ligule 2- or 3-toothed; stylar arms similar to those of the disk, but without any appendages at the summit. Disk flowers: 25(+), bisexual; corolla yellow, funnel-shaped, or cylindrical and cuneate, 5-toothed; anthers nearly equalling or slightly longer than the filaments. connective obtuse; pollen grains spinulose; stylar arms truncate or obtuse, penicillate, bearing the vmsl from the bases to the apices. Cypsela often a few-ribbed, glabrate or sericeous. Pappus of 40(+) white or sordid obscurely dentate capillary bristles.

A cosmopolitan genus consisting of as many as 3,000 spp.; about 110 spp. reported from USA.

Note: Senecio was reviewed by Barkley (1978) for the North American Flora. In his description on Senecio, Barkley (l.c.) pointed out that the number of involucral bracts and also the number of rays approximately fit intc the fibonacci series (5-8-13-21-34).

1. Rays absent ..... 7. S. vulgaris
1. Rays present 2
   2. Ligule under 2 mm long ..... 8. S. sylvaticus
   2. Ligule 4 to 10 mm long 3
3. Basal leaves truncate to deeply cordate; cypsela usually glabrous; stolons usually present ... . 3. S. obovatus
3. Plants not with the above combined features 4
   4. Plants annual; leaves cauline 5
   4. Plants perennial; leaves mostly basal 6
5. Plants taprooted; terminal lobes of the leaves tending to be subreniform ... 6. S. imparipinnatus
5. Plants fibrous-rooted; terminal lobes of the leaves irregular, not subreniform ..... 5. S. glabellus
   6. Stolons present; cypsela usually glabrous ... . 3. S. obovatus
   6. Stolon usually absent; cypsela usually sericeous 7
7. Stem floccose-woolly toward the base.... ..... 4. S. anonymus
7. Stem floccose-woolly for the most part 8
   8. Basal leaves 1 to 2.5 cm wide; lower and median cauline leaves pinnatifid; biennials or short-lived perennials ..... 2. S. plattensis
   8. Basal leaves 1 to 4 cm wide; lower and median cauline leaves not or scarcely pinnatifid; perennials ..... 1. S. tomentosus

1. Senecio tomentosus Mischx., Fl. Bor. Am. 2:119 (1803).

Perennial, fibrous-rooted herbs, forming colonies; rhizome vertical. Stem usually solitary, densely arachnoid at base, sparsely so upward, becoming glabrescent with age, to 80 cm high. Leaves mostly basal, and a few cauline; basal leaves ovoid, oblong, elliptic, or ovate, obtuse, crenate, sometimes purplish beneath, to 18 x 4 cm (including the 10 cm long petiole); lower cauline leaves tending to be pinnatified with large terminal lobes (about 14 x 6 cm) and 2 or 3 pairs of small lateral lobes, petiole to 12 cm long, median and upper cauline leaves becoming small-sized and sessile, merely toothed or pinnatifid. Heads many, arranged in terminal and subterminal umbelliform or corymbiform cymes. Peduncle 1 to 6 cm high. Involucre 5(-7) x 10 mm; bracts usually 21. Rays: about 13; corolla 13 mm long, ligule 9 x 3 mm. Disk flowers: corolla 6 mm long, limb 3.2 x 1.5 mm, teeth 0.8 x 0.6 mm; style 5.2 mm long, arms 1.2 mm long. Cypsela sericeous, 2 x 0.5 mm. Pappus bristles 5.5 mm high.

E USA and TX; common along sandy roadsides in upland areas; February to May.

2. Senecio plattensis Nutt., Trans. Amer. Philos. Soc. n. s. 7:413 (1841).

Biennial or perennial, fibrous-rooted herbs; rhizome short. Stem solitary or a few together, usually arachnoid, 30 to 50 cm high. Leaves mostly basal, and a few cauline; basal leaves ovoid, oblong, or lanceolate, serrulate to serrate, occasionally tending to be lyrate, sometimes purplish-tinged, often arachnoid and becoming glabrous with age, to 7 x 1.5(-3) cm, petiole 4 to 8 cm long; cauline leaves distantly placed, pinnatifid, sessile, clasping. Heads many, arranged in corymbiform cymes. Peduncle 2 to 5 cm high. Involucre to 6 x 10(-15) mm; bracts usually 13. Rays: about 13; corolla 5 to 6 mm long, limb 3.5 x 1.5 mm, teeth 0.6 x 0.5(-0.7) mm; style to 6.7 mm long, arms 0.7 mm long. Cypsela sericeous, 2.5 x 0.6 mm. Pappus bristles white, 4.5 mm high.

Common in Midwestern USA, and spreading to E USA and TX; scattered along roadsides in upland areas; February to April.

3. Senecio obovatus Muhl. ex Willd., Sp. Pl. 3:1999 (1804). ovate-leaf ragwort

Perennial, fibrous-rooted, stoloniferous herbs; rhizome slender, oblique or horizontal; plant body glabrescent, or arachnoid for the most part or only in the leaf axils and in inflorescence. Stem usually solitary, to 60 cm high. Leaves mostly basal, and a few cauline; basal leaves ovate, ovoid, or oblong, obtuse, crenate, truncate or subcordate, sometimes lyrate and crenate, often purplish beneath, to 6 x 4 cm, petioles narrowly winged, to 8 cm long; cauline leaves distantly placed, tending to be confined to below the middle, usually lyrate or pinnatisect, with large terminal segments, sessile, clasping, to 12 x 3.5 cm. Heads several to many, arranged in umbelliform cymes. Peduncle bearing a few bractlets, 3 to 5 cm high. Involucre to 6 x 10 mm; bracts 13 or 21. Rays: about 13; corolla 8 to 10 mm long, ligule 6(-10) x 2(-3.5) mm. Disk flowers: corolla to 7.5 mm long, limb 2(-3) x 1.5 mm, teeth 1.2 x 0.6 mm; style to 7.8 mm long, arms 1 mm long. Cypsela usually glabrous, 2.3 x 0.4 mm. Pappus bristles to 6 mm high.

Common in Midwestern USA, and spreading to E USA and TX; scattered along stream banks in upland areas; March to May.

4. Senecio anonymus Wood, Class-book (ed. 1861) 464 (1861). golden ragwort
S. smallii Britt., Bull. Torrey Bot. Club 4:132 (1894).

Perennial, fibrous-rooted herbs; rhizome short, oblique. Stem densely arachnoid toward base, remaining so until fruiting or at least until anthesis, becoming glabrate with age, to 1 m high. Leaves basal and cauline; basal leaves oblong, oblanceolate, or narrowly elliptic, obtuse, crenulate, serrate, or toothed, sometimes tending to be pinnate with large terminal lobes and a few small lateral lobes, occasionally purple, to 14 x 2(-3) cm, petiole 4 to 18 cm long; cauline leaves slightly or not reduced, lower cauline leaves similar to basal leaves, pinnatifid or bipinnatifid, long-petioled, upper cauline leaves sessile. Heads numerous, arranged in corymbiform, umbelliform, to dichasial cymes. Peduncle 1 to 6 cm high. Involucre to 6 x 8 mm; bracts usually 21. Rays: generally 13; corolla to 6.5 mm long, ligule 3.5 x 1.5 mm. Disk flowers: corolla to 4.7 mm long, limb to 2.5 x 0.8 mm, teeth 0.5 x 0.5 mm; style to 5 mm long, arms 0.5 mm long. Cypsela sericeous, 1.5 x 0.5 mm. Pappus bristles 4 mm high.

E USA; rare along roadsides in Webster, Tangipahoa, and Washington parishes; (April-) May (-June).

5. Senecio glabellus Poir. in Lam. & Poir., Encyc. 7:102 (1806). yellow top, butterweed

Annual, fibrous-rooted herbs; plant body glabrous or arachnoid near the leaf axils and in the inflorescence, to 1 m high. Leaves basal and cauline; lower leaves deeply pinnatifid, to 20 x 7 cm (including the lacerate-based sheathing petioles), segments suborbicular, ovate, or obovate, toothed or irregularly lobed, sessile and broadly attached, or abruptly constricted and appearing petiolulate, sometimes purplish beneath; terminal segments to 3 x 3.5 cm (excluding the stalks, if present). Heads generally numerous, arranged in corymbiform or umbelliform cymes; older heads usually become over-topped. Peduncles 1 to 4 cm high. Involucre to 5 x 8 mm; bracts usually 13 or 21. Rays: usually 13; corolla to 8 mm long, ligule 4.5 x 1.7 mm. Disk flowers; corolla 6.5 mm long, limb 2.5 x 1 mm, teeth 0.8 x 0.4 mm; style to 5 mm long, arms 0.7 mm long. Cypsela sericeous along the ribs, rarely glabrous, yellow- or white-tinged, 1.7 x 0.5 mm. Pappus bristles to 5 mm high.

E USA, westward to WY and TX; abundant, especially on wet clay soil through out the state; February to May.

6. Senecio imparipinnatus Klatt, Abh. Naturf. Ges. Halle 15:333 (1882).

Plants essentially with slender taproots, usually below 0.5 high. Terminal segments of leaves tending to be subreniform.

OK, TX, eastward to MS; sporadic and uncommon throughout the state; March to May.

Note: The above characteristic features differentiate this taxon from S. glabellus. However, the taproots and/or the subreniform leaf segments are not always strongly developed. Some poorly developed taproots are masked by the lateral roots and appear as fibrous roots. The terminal segments of leaves are often irregularly shaped. In such a situation, it is difficult to assign the specimens to either S. glabellus or S. imparipinnatus. On the taxonomy of this complex (including S. greggii Rydb.), Correll and Johnston (1970) remarked that S. imparipinnatus intergrades with S. glabellus and S. greggii, and these three spp. are poorly defined from each other. According to these authors, S. glabellus grows in sandy soil and S. imparipinnatus is common in the eastern half of TX.

Barkley (1978) attributed wet open wooded areas or swampy grass lands to S. glabellus and low sandy damp or drying sites to S. imparipinnatus. Cronquist (1980) remarked that both the taxa grow in moist places. In LA, S. glabellus usually occurs on wet clay soils.

7. Senecio sylvaticus L., Sp. Pl. 868 (1753).

Annual herbs: taproots slender, masked with lateral fibrous roots. Stem arachnoid, becoming glabrescent with age, usually unbranched, to 60 cm high. Leaves cauline, pinnatifid or lyrate, covered with loose hairs beneath, gradually becoming smaller upward, sometimes scarcely clasping, lower leaves 3(-10) x 2(-4) cm. Heads many, arranged in corymbiform cymes. Peduncle bearing a few small bractlets, 2 to 5 cm high. Involucre 5 x 8 mm; bracts often 13. Rays: 5 to 8; corolla 4 mm long, ligule 1.5 x 0.5 mm. Disk flowers: corolla cuneate, 4.2 x 0.5 mm, limb scarcely differentiated, teeth minute; style 4.3 mm long, arms 0.5 mm long. Cypsela sericeous, 2 x 0.5 mm. Pappus bristles to 4.5 mm high.

Occasional in E USA, and more or less common from WA to CA; known only from railroad tracks in Monroe (Ouachita Parish); June to September.

8. Senecio vulgaris L., Sp. Pl. 867 (1753). groundsel

Annual herbs; taproots slender, often masked with lateral fibrous roots; plant body glabrate, scarcely pubescent or woolly, 10 to 30 cm high. Stem often branched. Leaves cauline, lyrate, pinnatifid, oblong, oblanceolate, or narrowly elliptic, sessile usually clasping, to 6 x 2 cm. Heads discoid, a few to many, arranged in corymbiform, or umbelliform cymes. Peduncle bearing a few inconspicuous bractlets, 1 to 4 cm high. Involucre 6 x 10 mm; bracts 13 or 21. Disk flowers; corolla 4.1 mm long, limb 1.5 x 0.5 mm, teeth 0.5 x 0.2 mm; style 4 mm long, arms 0.4 mm long. Cypsela 2.3 x 0.4 mm, appearing glabrous but bearing capillary hairs (1 mm long). Pappus bristles 5.5 mm high.

Nearly common all across USA; along railroad tracks in Ouachita Parish, also a weed near Jackson Square in New Orleans (Orleans Parish); March to September.

11. Cacalia L. Indian Plantain

Perennial herbs, with fleshy roots. Stem solitary or a few together, branched upward. Leaves basal and alternate, entire, remotely toothed, or undulate, coriaceous, palmately 3- to 9-nerved, these nerves diverging or converging at apex; basal leaves and lower

cauline ones petiolate; median and upper cauline leaves often becoming short-petioled. Heads discoid, medium-sized, arranged in panicled corymbiform cymes. Peduncle bearing minute bractlets. Involucre cylindrical, 1-seriate; bracts about 5 (ours), subequal, imbricate, often scarious-margined and/or keeled; keels winged or not. Receptacle flat, often centrally cusped (ours). Paleae absent. Flowers bisexual, about 5 (ours); corolla white or dull pink, funnel-shaped, 5-lobed; anthers longer than the fillaments, usually auricled; connective obtuse; pollen grains spinulose; stylar arms penicillate, vmsl from the bases almost to the apices. Cypsela glabrous, a few- to several-nerved, -ribbed, or -grooved, glutinous, transversely rugulose. Pappus of 200(+) white capillary bistles.

A genus consisting of 50 spp. mostly found in E Asia; about seven spp. (including those of Arnoglossum Raf.) reported from USA. Kral and Godfrey (1958) reviewed the Florida Cacalia.

1. Leaves toothed to lobed, with diverging nerves .... 1. C. atriplicifolia
1. Leaves entire to remotely toothed, with converging nerves 2
   2. All or some of the involucral bracts with median scarious wings along the keels (conspicuous at fruiting); stem angled or grooved ... . 2. C. plantaginea
   2. Involucral bracts without median wings; stem terete or striate ..... 3. C. ovata

1. Cacalia atriplicifolia L., Sp. Pl. 835 (1753). pale Indian plantain
   Mesadenia atriplicifolia (L.) Raf., New Fl. 4:79 (1836)
   Arnoglossum atriplicifolium (L.) H. Rob., Phytologia 28:294 (1974)

Similar to C. ovata in several aspects. Stem often glaucous, terete or grooved, to 2 m high. Median leaf blades ovate, elliptic, or reniform, toothed or lobed along the margins, granular-punctate above, glaucous or pale green beneath, with diverging palmate nerves, about 12 x 12 cm, petiole to 20 cm long; upper leaves becoming reduced and short-petioled. Main peduncle to 10 cm high. Involucre to 9 x 3 mm; bracts obtuse, to 7 x 2.3 mm. Corolla 7.5 mm long, limb 3.2 x 0.8 mm, lobes 2.2 x 0.4 mm; style 8 mm long, arms 1 mm long. Cypsela dark-brown, bluntly angled, ribbed, to 4 mm high. Pappus 6 mm high.

NJ westward to MN, south to FL, LA, and OK; in LA, one specimen is at NO collected by Josiah Hale with no ticket or location, probably from Rapides Parish area during the 1830's; another specimen is at US collected by Mohr, probably collected from se LA in 1884; July to October.

2. Cacalia plantaginea (Raf.) Shinners, Field & Lab. 18:81 (1950).
tuberous-rooted Indian plantain
Arnoglossum plantagineum Raf., Fl. Lud. 65 (1817).
Cacalia tuberosa Nutt., Gen. Am. 2:138 (1818).

Similar to C. ovata in many aspects; plant body often glaucous on the stem and leaves beneath, to 1.5 m high. Stem dark purple, tending to be angled and/or grooved. Basal leaves elliptic, ovate, obovate, or rhomboid, obtuse to subacute, truncate or subacute at base, with converging nerves, blade to 22 x 8 cm, petiole to 30 cm long. Involucre to 12 x 5 mm; bracts, all or fewer with strong median wings along the keels, 1 mm wide on each face; wings conspicuous at fruiting, about 1 mm wide. Corolla 10.5 mm long, limb 5 x 1.5 mm, lobes 4 x 0.7 mm; style 10.6 mm long, arms 2.4 mm long. Cypsela elliptic or ovoid, greenish-yellow, several-ribbed or appearing grooved, to 3 x 1.5 mm. Pappus bristles 7 mm high.

E and Midwestern USA and TX; common in w LA and in pinelands of the Florida parishes; April to July.

3. Cacalia ovata Walter, Fl. Carol. 196 (1788).
ovate-leaf or lance-leaf Indian plantain
Cacalia lanceolata Nutt., Gen. Amer. 2:138 (1818)
Arnoglossum ovatum (Walter) H. Rob., Phytologia 28:294 (1974).

Plant body often glaucous on the stem and leaves beneath, to 1.5 m high. Stem terete baseward, striate upward. Basal leaves elliptic to ovate, with converging nerves, blade 14 x 10 cm, petiole to 18 cm long; lower cauline leaves elliptic to ovate, obtuse, narrowed into winged petioles, about 22 x 12 cm (including 6 cm long petiole), becoming deciduous along with the basal leaves. Main peduncle to 15 cm high. Involucre to 10.5 x 5 mm; bracts lanceolate, obtuse often scarious-margined, somewhat keeled but without median wings, to 10 x 2.3 mm. Corolla 10.7 mm long, limb 5 x 2 mm, lobes 3.2 x 0.3 mm, becoming reflexed; style 10.8 mm long, arms 1.8 mm long. Cypsela cuneate, dark, weakly

to strongly nerved, about 5 x 1.1 mm. Pappus bristles 6 mm high.

SC to Fl, westward to TX; ovate-leafed forms most common in bay-galls of se LA; lance-leafed forms most common in sw prairies; June to September.

12. Erechtites Raf.

Annual, fibrous-rooted, tall herbs. Stem branched in the inflorescence and often below it. Leaves alternate, simple, subentire to lobed, reduced to bracts in the inflorescence. Heads disciform, medium-sized, peduncled, arranged in monchasiums or corymbiform cymes. Involucre 1-seriate, usually cubtended by a few loosely arranged linear short herbaceous bractlets, these passing downward on the peduncle; bracts herbaceous. Receptacle flat, inconspicuously alveolate. Paleae absent. Marginal flowers: pistillate, numberous; corolla whitish, tubular, slender, 5-toothed; stylar arms exserted, with short apparently pappillate deltoid apices; vmsl as long as the arms. Central flowers; numerous, bisexual; corolla somewhate dilated just below the mouth, otherwise tubular and slender; anthers shorter than the filaments, slightly auricled; connective obutse; pollen grains spinulose; stylar arms almost similar to those of the pistillate ones except for the presence of a tuft of hairs at the bases of the deltoid apices. Cypsela several-nerved, scarcely sericeous. Pappus of numerous capillary deciduous inconspicuously and distantly dentate bristles.

A genus consisting of 15 spp. distributed over America, Australia, and New Zealand; three spp. reported from USA.

1. Erechtites hieracifolia (L.) Raf. ex DC., Prodr. 6:294 (1838).
Senecio hieracifolia L., Sp. Pl. 866 (1753).

Plant body glabrescent or thinly covered with jointed trichomes, to 2 m high. Leaves narrowly elliptic, ovate, lanceolate, or oblanceolate, acute, serrate or toothed, gradually becoming smaller upward; lower leaves narrowed into petioles; median and upper leaves attenuate baseward, petioled, or with broad sessile and somewhat clasping bases. Heads several to many. Peduncles 2 to 5 cm high. Involucre to 14 x 9 mm (at anthesis); bracts as many as 12, linear to oblong, acute, scarious-margined, subequal or unequal, to 1.5 mm wide. Pistillate flowers: 100(+); corolla 12 to 15 mm long, teeth 0.3 x 0.2 mm; style 13 to 16

mm long, arms 0.5 mm long. Central flowers; 50(+); corolla 13 to 15 mm long, teeth 0.6 x 0.5 mm; style to 16 mm long, arms 0.5 mm long. Cypsela pale brown, 2.2 mm high. Pappus bristles white, slightly shorter than the corolla.

1. Upper leaves with broad, sessile or subsessile, and somewhat clasping bases ..... 2. var. praealta
1. Upper leaves attenuate baseward ... . 1. var. intermedia

1. var. intermedia Fernald, Rhodora 19:27 (1917).

Features as given in the key.

E USA and TX; common in cut-over woods throughout the state; (June-) August to October.

2. var. praealta (Raf.) Fernald, Rhodora 19:27 (1917).
E. praealta Raf., Fl. Lud. 65 (1817).

Features as given in the key.

E USA; common throughout the state; (June-) August to September.

Note: the vars. intermedia and praealta are not mentioned by Cronquist (1980). In NLSPN (Rice et al. 1982) these vars. are treated as synonyms under E. hieracifolia.

SPECIES DISTRIBUTION MAPS

The location of the Louisiana parishes is illustrated in figure 7. Figures 8 to 10 give the Louisiana distribution of the 25 species covered in this state. No definite locations for Anthemis arvenis and Tanacetum vulgare are known from Louisiana.

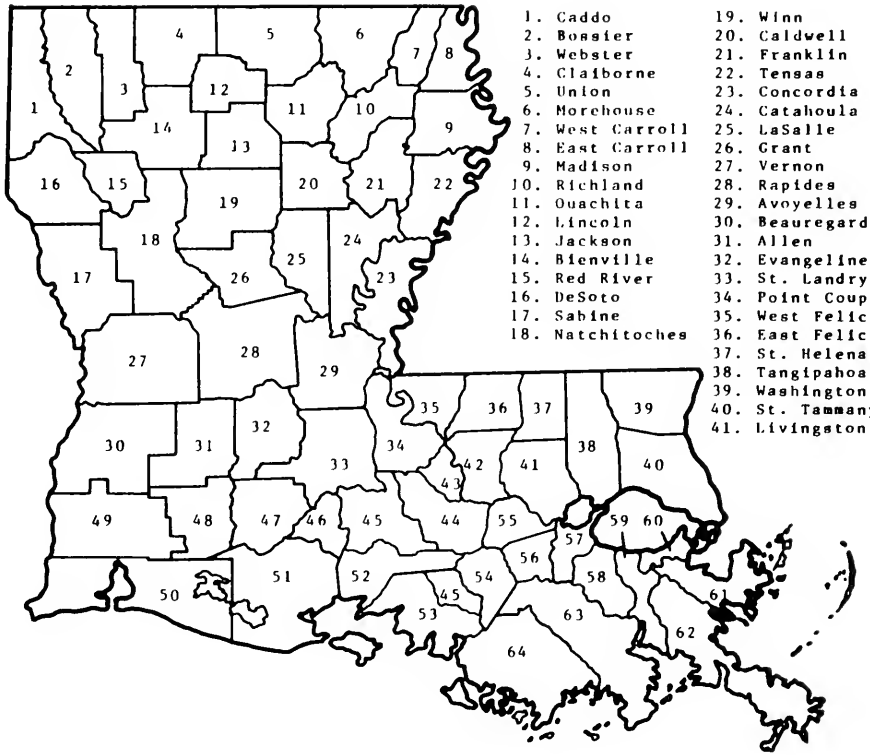
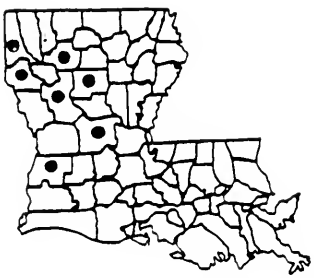
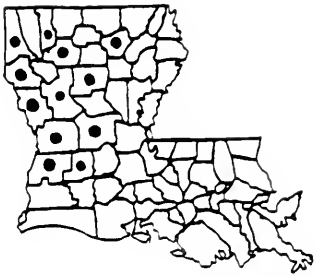


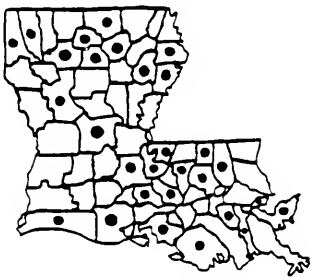
Fig. 7. Parishes in Louisiana.



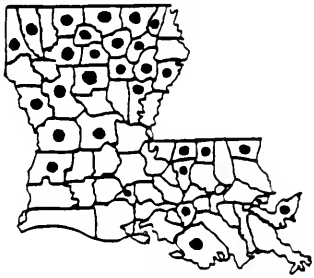
Hymenopappus scabiosaeus



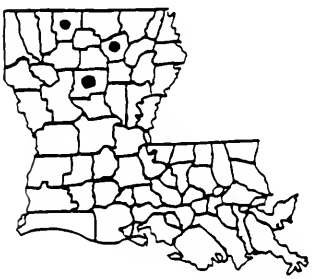
Hymenopappus artemisaefolius



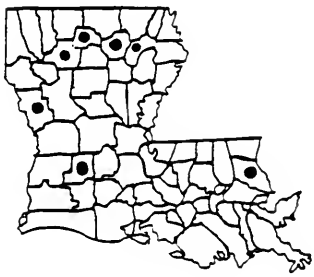
Anthemis cotula



Achillea millefolium

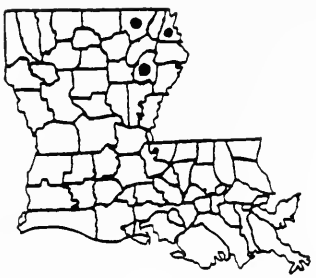


Santolina chamaecyparissus



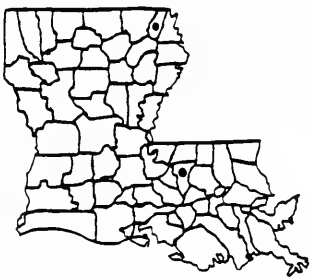
Chrysanthemum leucanthemum

Fig. 8. Distribution of Asteraceae in Louisiana, I.



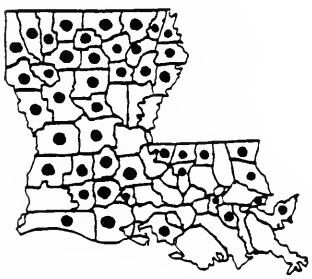
Matricaria matricarioides

Artemisia vulgaris

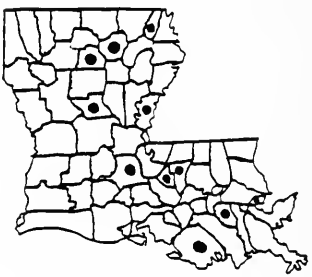


Artemisia ludoviciana

Artemisia annua

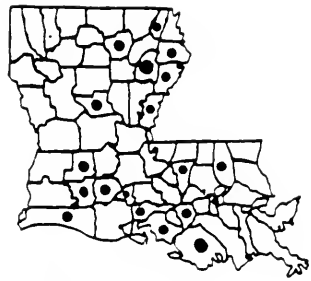


Soliva pterosperma

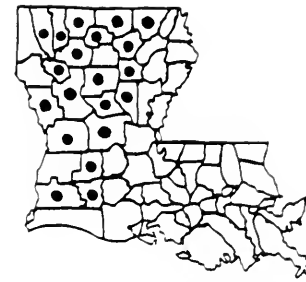


Soliva stolonifera

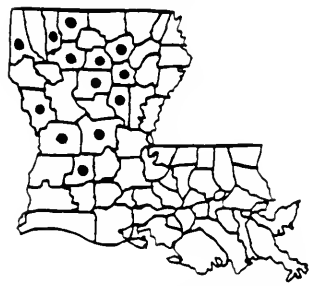
Fig. 9. Distribution of Asteraceae in Louisiana, II.



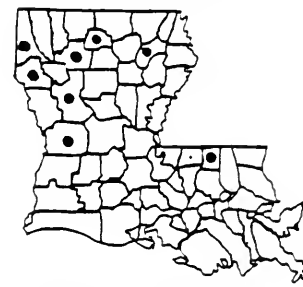
Soliva mutisii



Senecio tomentosus

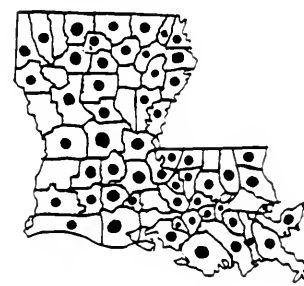


Senecio plattensis



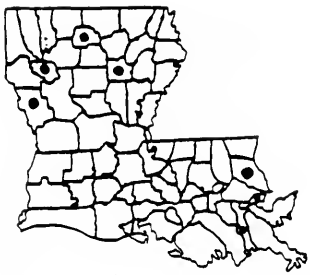
Senecio obovatus

Senecio anonymus



Senecio glabellus

Fig. 10. Distribution of Asteraceae in Louisiana, III.

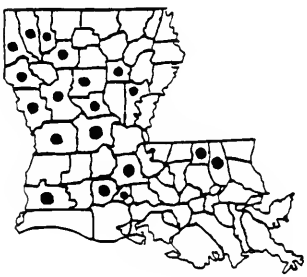


Senecio imparipinnatus

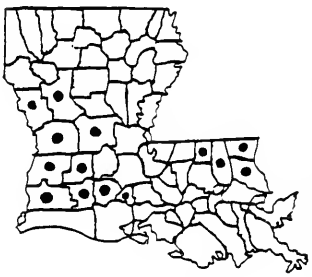
Senecio sylvaticus

Senecio vulgaris

Cacalia atriplicfolia



Cacalia plantaginea



Cacalia ovata

Fig. 11. Distribution of Asteraceae in Louisiana, IV.

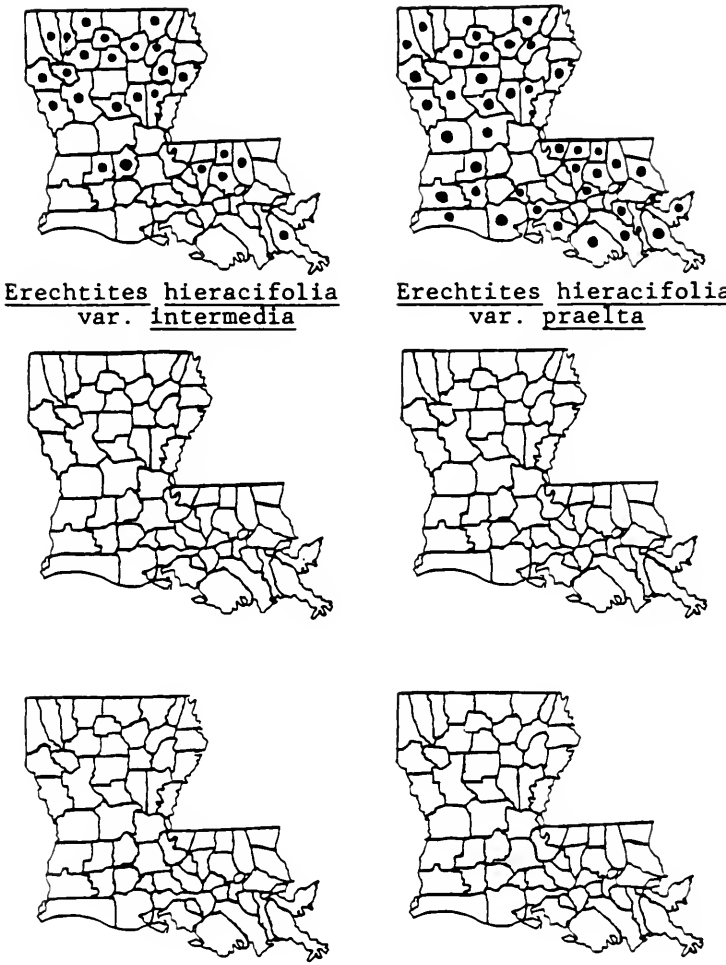


Fig. 12. Distribution of Asteraceae in Louisiana, V.

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The authors wish to thank the curators of the Louisiana herbaria for making their specimens available to them for study. This paper is based on a thesis by Gandhi and supervised by Thomas.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CCXVIII.

A SECOND SPECIES OF *ILTISIA*.

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The genus *Iltisia* was originally described by S. F. Blake in 1957 from the Cerro de la Muerte area of the Talamanca range in Costa Rica, and for many years continued to be known from only that limited area. Recently, collections made by A. S. Weston in 1964, 1969, and 1976 have been determined by Jose Cuatrecasas that extend the range of the previously known species southeastward along the Talamancas to Cerro Sakira (*Weston 5820*), Cerro Las Vueltas (*Weston 5952*), Cerro Chirriposillo (Cuerici)(*Weston 1565*), and Cerros Aka and Durika (*Weston 10224*). Now, collections made in 1983 have been seen that extend the range of the genus southeastward to Cerro Echandi on the border of Costa Rica and Panama. The latter collections prove to represent a second species of the genus.

ILTISIA ECHANDIENSIS R. M. King and H. Robinson, sp. nov.

Plantae herbaceae perennes decumbentes sensim erectae apice ad 16 cm altae in partibus vegetativis non ramosae. Caules fulvi teretes vix striati sparsi pilosuli et sessiliter glandulo-punctati, internodis inferioribus ca. 7 mm longis superioribus ad 30 mm longis. Folia plerumque opposita, petiolis 1-2 mm longis; laminae subcarnosae late ovatae plerumque 6-7 mm longae et 5-6 mm latae base late obtusae vel subtruncatae margine pauce crenatae vel sublobatae apice rotundatae vel breviter obtusae supra et subtus glandulo-punctatae base trinervatae. Inflorescentiae ascendentiter cymosae alterne ramosae 4-6-capitatae, pedicellis 3-13 mm longis dense minute fulvo-puberulis. Capitula ca. 4 mm longa et 5 mm lata; squamae involucri in parte purpureae ca. 10 subaequilongae ca. 2-seriatae ellipticae ca. 3 mm longae et 1.3-1.5 mm latae apice breviter acutae margine pauce puberulo-fimbriatae extus glandulo-punctatae. Flores ca. 30 in capitulo; corollae albae 4-lobatae exteriores asymmetricae in lobis binis exterioribus majores, tubis angustis ca. 0.7 mm longis pauce glandulo-punctatis, faucibus abrupte late campanulatis ca. 0.8 mm longis, lobis minoribus et lobis in floribus disciformibus 0.6-0.8 mm longis et 0.5-0.6 mm latis, lobis majoribus ad 2 mm longis et 1 mm latis apice breviter acutis extus pauce glandulo-punctatis intus omnino dense breviter papillosis; filamenta in parte superiore ca. 0.2 mm longa; thecae ca. 0.45 mm longae; appendices antherarum ca. 0.08 mm longae et 0.1 mm latae; appendices stylorum erecte appresse angusto-papillosi. Achaenia ca. 1.5 mm

longa 4-angulata in costis superne perminute breviter setulifera, pappis nullis. Grana pollinis in diametro ca. 22 µm.

TYPE: COSTA RICA/PANAMA: Puntarenas/Bocas del Toro: Cordillera de Talamanca, Cerro Echandi, on the international border; ca. 9°02'N, 82°49'W. Páramo with *Chusquea-Hypericum*-grasses-sedges dominant. Elev. 3050-3160 m. Creeping stems; florets white to purple when young. 22 August 1983. *G. Davidse, L. D. Gómez, A. Grijalva, I. Chacón, R. Chacón & G. Herrera 23854* (Holotype, US; isotype, MO). PARATYPE: COSTA RICA, PANAMÁ: Prov. Puntarenas, Bocas: Cerro Echandi, 3200 m. Flws. purplish to white. August 1983. *L. D. Gómez, R. Chacón, I. Chacón & G. Herrera 21866* (MO).

Iltisia echandiensis is generally a larger plant than the closely related *Iltisia repens* Blake and it differs markedly in the asymmetry of the peripheral flowers which have expanded outer lobes similar to those of the related genus *Microspermum* of Mexico. It is notable that in the new species of *Iltisia* the characteristic four-lobed condition of the corolla prevails and the enlarged lobes are a pair divided to the base rather than a a group of three fused for half their length as in *Microspermum*. The new species is further distinct within the genus *Iltisia* by the more acute tips of the involucral bracts, the corolla lobes all being slightly longer than wide and slightly acute rather than obtuse, and by the achenes bearing minute setulae.

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Iltisia echandiensis R. M. King & H. Robinson, Holotype, United States National Herbarium. Photos by Victor E Krantz, Staff Photographer, National Museum of Natural History.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CCXIX.

A NEW SPECIES OF *CRONQUISTIANTHUS*.

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The genus *Cronquistianthus* was described by R. M. King and H. Robinson in 1972 to include 13 Andean species concentrated in Ecuador and Peru. The genus has proven to contain a number of additional species as indicated especially in three papers by King and Robinson in 1981, 1982, and 1983. An additional new species is recognized in the present paper bringing the present total of species in the genus to 25. The new species is apparently the northernmost member of the genus and is the element previously referred to as having some hairs inside the corolla erroneously under the name *C. origanoides* (H.B.K.) K.& R.

The undescribed nature of the present species was discovered while examining a series of species recently described from Ecuador by Alexander Gilli (1983) the types of which were kindly loaned by Dr. Harald Riedl of the Naturhistorisches Museum in Vienna, Austria. The Gilli species of Asteraceae that have been seen all prove identifiable with previous concepts as follows: *Baccharis lepidota* Gilli = a slightly odd form of *B. nitida* (R.& P.) Pers.; *Eupatorium melanhabdotrichum* Gilli = *Polyanthina nemorosa* (Klatt) K.& R.; *Eupatorium niveum* H.B.K. var. *setosocarpum* Gilli = *Cronquistianthus origanoides* (H.B.K.) K.& R.; *Monactis calycifera* Gilli = *M. pallatangensis* (Hieron.) H.Robins.; *Steleocodon gracilis* gen. & sp. nov. Gilli = *Phalacraea longipetiolata* (B.L.Robins.) K.& R.; *Trichapium strigosum* gen. & sp. nov. Gilli = *Clibadium manabiense* H.Robins.; *Vernonia otavalensis* Gilli = *Baccharis latifolia* (R.& P.) Pers. It was during the resolution of the *Eupatorium niveum* var. *setosocarpum* that the need to restrict the concept of *Cronquistianthus origanoides* was recognized and the following new species was discovered.

CRONQUISTIANTHUS TRIANAE R. M. King & H. Robinson, sp. nov.

Plantae fruticosae vel subvolubiles ad 2.5 m altae mediocriter ramosae. Caules atro-rubescentes subhexagonales vix striati evanescentiter albo-tomentosi. Folia opposita, petiolis 3-12 mm longis; laminae anguste ovatae 2.5-4.5 cm longae et 1.0-1.8 cm latae base truncatae vel obtusae margine crenatae base excepta apice acutae supra in nervis et nervulis insculptae inter nervulis subplanae glabrae subtus dense appresse albo-tomentosae base vel fere ad basem trinervatae, nervis secundariis basilaribus ad mediam foliorum ascendentibus. Inflorescentiae in ramis

terminales dense corymbosae, pedicellis 0-2 mm longis appresse albo-tomentosae. Capitula anguste campanulata ca. 6 mm alta et 3 mm lata; squamae involucri flavO-virides ca. 20 subimbricatae ca. 4-seriatae graduatae oblongae 1-4 mm longae et 0.5-1.0 mm latae apice rotundatae et minute apiculatae margine late scariosae extus sparse albo-tomentosae. Flores ca. 9 in capitulo; corollae pallide albo-virides 3.3-3.5 mm longae, tubis 1.0-1.2 mm longae late cylindraceis, faucibus 1.8-2.0 mm longis leniter infundibularibus extus base et apice minute glanduliferis intus inferne plerumque sparse piliferis, lobis triangularibus ca. 0.45 mm longis et latis extus dense minute glanduliferis; filamenta in partibus superioribus 0.30-0.35 mm longa, cellulis in parietibus valde annulatis; thecae ca. 0.7 mm longae; appendices antherarum oblongo-ovatae ad 0.13 mm longae et 0.17 mm latae; appendices stylorum base extus pauce glanduliferae apice late spathulatae. Achaenia prismatica ca. 5-angulata ca. 2 mm longa apice multisetulifera aliter glabra vel subglabra; setae pappi ca. 35 scabridae 2.5-3.0 mm longae in cellulis apicalibus anguste obtusae. Grana pollinis in diametro 18-20 um.

TYPE: COLOMBIA: Narino: Tuquerres, 3200 m. *Triana 1210* (Holotype, US). PARATYPES: COLOMBIA: Narino: near Pun, high bank above Rio Pun, 3000 m alt. Bush 1 m high, flowers white. Aug. 15, 1935. *Y. Mexia 7623* (US); Pasto, near base of Volcán El Galeras, above town of Ibonuca. Alt. about 2700-2950 m. June 4, 1946. *R. E. Schultes & M. Villarreal 8008* (US); Tangua, vereda de Cubiján, cerca a Pasto. Alt. 3100 m. Arbusto de 1-2,5 metros, vistoso por sus hojas bicolores. Inflorescencias blancas. July 1965. *L. Uribe Uribe 5315* (US); ECUADOR: in andibus Quitensibus: A shrub from the bank of the river Machangara. 1859. *W. Jameson* (US): Carchi: Wooded hills about 5 miles south of Tulcán. Alt. 2500 m. Shrub. Aug. 10, 1923. *A. S. Hitchcock 21002* (US); Las Penas between La Rinconada and San Gabriel, alt. 3150 m. Thicket. 22 VI 1939. *E. Asplund 7201* (US); Road Tulcán - San Gabriel, ca. km 20, south of Tulcán. Alt. 3000-3100 m.s.m. Ca. ½ m high. Capitula light grey. 22 II 1974. *G. Harling & L. Andersson 12042* (US); El Angel and vicinity. Elev. 3340 m. Vine in trees, flowers pale whitidh-green. August 10, 1978. *J. L. Zarucchi 2322* (US).

The new species is the larger part of what has been considered to be *Cronquistianthus origanoides* (H.B.K.) K.& R. in previous treatments of the genus, and the present material is that described as having hairs inside the corolla. Material of the present species also seems to be what B. L. Robinson (1918) regarded as *Eupatorium (Cronquistianthus) niveum* H.B.K. from Colombia. Both of the related species, *C. origanoides* and *C. nivea*, were described by Humboldt, Bonpland and Kunth at the same time (1818) and both were reported from Colombia. However, neither of the previous species actually seems to occur in Colombia. The first, *C. origanoides*, is clearly the entity originally noted for its rugose and pubescent upper leaf surfaces

that occurs in northern Ecuador in the provinces of northern Pichincha and Imbabura. It has broader, partly reddish, more tomentose involucral bracts. The second species, *C. nivea*, was well illustrated in Humboldt, Bonpland and Kunth (1818) and is clearly the more broadly and cordately leaved plant now known to occur on Mt. Pichincha near Quito, Ecuador. The new species is the only member of the genus that truly seems to occur in Colombia with a southward extension of its range into the adjacent Prov. of Carchi in Ecuador.

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Cronquistianthus trianae R. M. King & H. Robinson, Holotype, United States National Herbarium. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CCXX.

A NEW SPECIES OF *ALOMIELLA* FROM BRAZIL.

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Collections made in Mato Grosso, Brazil in 1975 include material of a second species of the previously monotypic genus *Alomiella*. The species is named for the collector, Gert Hatschbach of the Museo Botanico Municipal, Curitiba, Brazil.

ALOMIELLA HATSCHBACHII R. M. King & H. Robinson, sp. nov.

Plantae herbaceae perennes erectae ad 18-30 cm altae e basis interdum profuse ramosae superne mediocriter ramosae. Caules fulvescentes tenues in nodis interdum subtiliter deflexi teretes substriati minute subsessiliter stipitate glanduliferi. Folia plerumque alterna basilaria interdum opposita, petiolis tenuibus 2-12 mm longis; laminae rhomboideae 3-9 mm longae et 2-7 mm latae base cuneatae margine supra basem pauce grosse serratae apice acutae supra sparse minute puberulae subglabrae subtus minute subsessiliter stipitate glanduliferae distincte supra basem leniter trinervatae. Inflorescentiae in ramulis minute foliiferis diffuse cymosae, pedicellis primariis ad 23 mm longis omnino sparse minute subsessiliter glanduliferis. Capitula ca. 5 mm alta et lata; squamae involucri ca. 30 inaequales ca. 3-seriatae anguste oblongae vel ellipticae 1.5-4.0 mm longae et 0.3-0.9 mm latae apice breviter acutae interdum vix acuminatae extus et margine minute puberulae et minute subsessiliter glanduliferae inferne bicostatae. Flores ca. 35-40 in capitulo; corollae albae ca. 3 mm longae in nervis incrassatis inferne valdiores, tubis ca. 0.7 mm longis glabris, faucibus ca. 1.7 mm longis longe infundibularibus base e tubis indistinctis extus glabris, lobis anguste triangularibus ca. 0.7 mm longis et base 0.35 mm latis extus et intus in cellulis laxe oblongis laevibus extus pauce pilosulis, pilis non glanduliferis et biseriatis ca. 0.1 mm longis; filamenta in partibus superioribus ca. 0.15-0.20 mm longa, parietibus cellularum tenuiter ornatis; thecae antherarum ca. 1.1 mm longae; appendices antherarum oblongo-ovatae ca. 0.23 mm longae et 0.15 mm latae; appendices stylorum dense ascendentiter papillosae, cellulis apicalibus scleroideis. Achaenia fusiformia ca. 1.8 mm longa plerumque in costis dense setulifera; carpopodia ca. 0.2 mm lata et 0.1-0.2 mm alta, cellulis basilaribus majoribus, parietibus valde incrassatis; setae pappi ca. 9 facile deciduae 0.7-0.9 mm longae margine inferne longius barbellatae. Grana pollinis in diametro ca. 20 µm.

TYPE: BRAZIL: Mato Grosso: Chapada dos Guimarães. Flor alva, paredões rochosos na borda da chapada. 13/2/1975. *G.Hatschbach, W.Anderson, R.Barneby & B.Gates 36137* (Holotype, MBM; isotype, US).

The new species occurs in the same general area as the type species of the genus, *Alomiella regnellii* Malme.

The discovery of the second species of *Alomiella* necessitates an emendation of the generic description to include material with a short pappus of deciduous capillary bristles and with setulae on the achene. In lacking the two features, the type species can be seen as having calvous achenes of the type widely and erratically distributed in the Asteraceae. A greater phyletic reliability is demonstrated for the strongly thickened veins of the corolla and the sclerified apical cells of the style branches. The latter two characters are particularly useful as indicators of the unquestionably very close relationship between two species, one of which was placed in the genus *Alomia* in the traditional classification, and one which would key to *Trichocoronis* in the key by Robinson (1913). The latter genera have proven to be basically North American.

In addition to having achenes with a pappus and setulae, the new species differs from *A. regnellii* by being smaller in all its parts, having only small rhomboidal leaf blades, having only small subsessile stipitate glands on its stems and leaves, and having only short biseriate hairs on the lobes of the corollas. In *A. regnellii* the corolla lobes have longer hairs including some that are uniseriate.

The new species raises interesting questions regarding what other variations of *Alomiella* may occur in Mato Grosso.

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Alomiella hatschbachii R. M. King & H. Robinson, Isotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XXXX.

A NEW SPECIES OF *WULFFIA* FROM ECUADOR.

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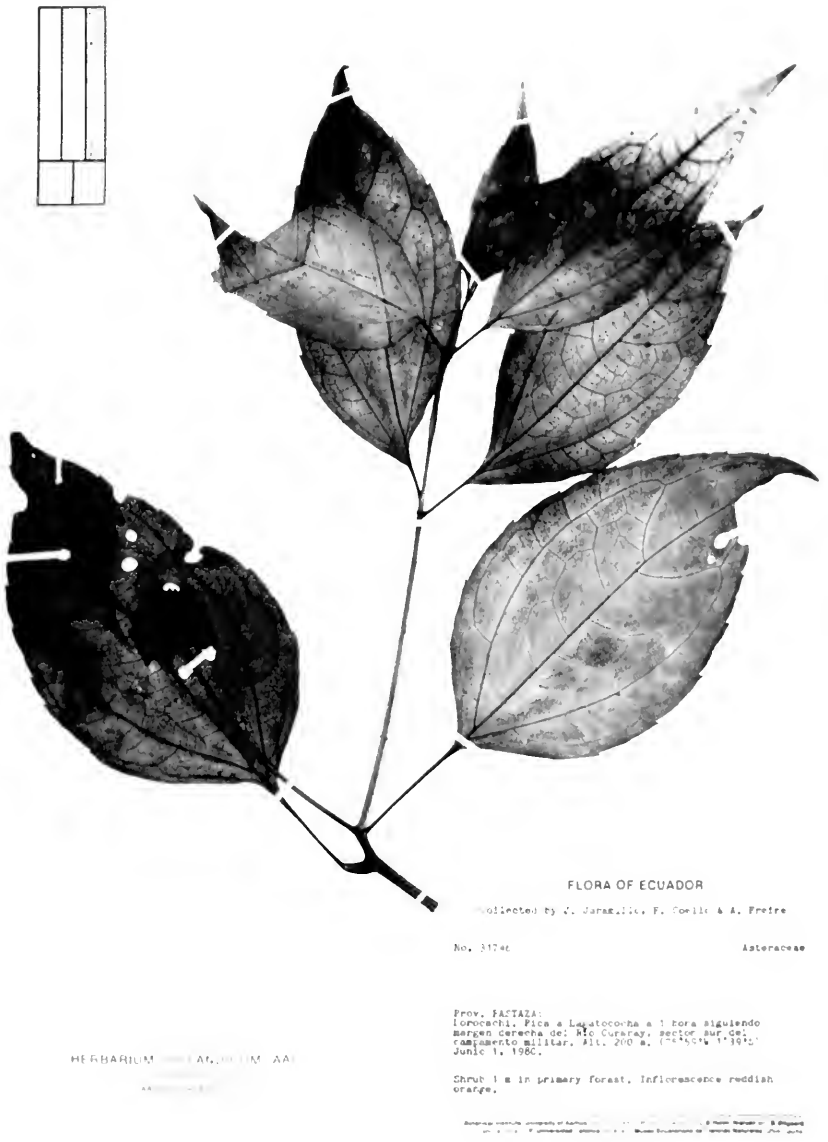
A series of collections of the family Asteraceae obtained from the Botanical Institute, University of Aarhus contains material of a remarkably distinct species of the genus *Wulffia*.

WULFFIA MACROCEPHALA H. Robinson, sp. nov.

Plantae fruticosae ad 1.2 m altae laxe mediocriter ramosae. Caules fulvo-virides subhexagonales leniter striati breviter appresse strigosi et strigulosi propre nodis densius strigosi. Folia opposita, petiolis 1.5-4.0 cm longis; laminae ovatae plerumque 10-16 cm longae et 4.0-8.5 cm latae base obtusae vel breviter acutae et breviter acuminatae margine remote distincte serratae apice anguste leniter acuminatae supra perparce appresse strigosae subglabrae subtus appresse breviter strigosae fere ad sed distincte supra basem ascendentiter trinervatae. Inflorescentiae plerumque unicapitatae, pedicellis 3-9 cm longis appresse strigosis superne densius strigosis. Capitula late campanulata ca. 1.2 mm alta vetusta ad 18 mm alta; squamae involucri ca. 20 herbaceae ultimate patentes subaequales oblongae vel breviter acutae 3-4 mm latae plerumque 11-12 mm longae vetustae ad 18 mm longae apice obtusae utrinque breviter strigosae; paleae oblongae ca. 10 mm longae ad 3 mm latae apice acutae et minute apiculatae extus striato-venulosae dense breviter strigosae. Flores radii ca. 11 in capitulo steriles; corolla rubro-aurantiaceae, tubis ca. 1.5 mm longis in partibus majoribus glabris apice minute hispidulo-spiculiferis, limbis ca. 15 mm longis et 4.5-5.0 mm latis apice minute trilobatis subtus margine dense minute hispidulo-spiculiferis et in medio minute puberulis. Flores disci ca. 60 in capitulo; corolla aurantiaceae ca. 8 mm longae, tubis 0.8-1.0 mm longis glabris, faucibus longe cylindrico-campanulatis 5.5-6.0 mm longis extus ubique minute hispidulo-spiculiferis, lobis ovato-triangularibus ca. 1 mm longis et 0.7 mm latis extus dense minute hispidulo-spiculiferis intus margine dense longe papillate fimbriatis in medio saepe perparce minute hispidulo-spiculiferis; filamenta in parte superiore ca. 0.8 mm longa; thecae 2.0-2.5 mm longae; appendices antherarum flavae ovatae ca. 0.5 mm longae et 0.45 mm latae extus in medio glanduliferae. Achaenia obpyramidata superne truncata 5-6 mm longa et 3 mm lata plerumque glabra in superficiis apicalibus sparse minute spiculifera, cicatricibus apicalibus centralibus ca. 0.4 mm latis vix prominulis; pappus nullus. Grana pollinis in diametro 30-32 μm.

TYPE: ECUADOR: Pastaza: Lorocachi. Pica a Lagatococha a 1 hora siguiendo margen derecha del Río Curaray, sector sur del campamento militar. Alt. 200 m. (75°59'W 1°39'S). Junio 1, 1980. Shrub 1 m in primary forest. Inflorescence reddish orange. *J. Jaramillo, F. Coello & A. Freire 31746* (Holotype, AAU; isotype, US). PARATYPES: ECUADOR: Pastaza: Lorocachi. A 3 km, margen izquierda del Río Curaray, aguas abajo, al sur este del campamento militar. Bosque primario y secundario. Alt. 200 m. (75° 58'W 1°38'S) Mayo 27, 1980. Vine in primary forest. Calyx green. Corolla pinkish red. Fruits green. *J. Jaramillo, F. Coello & A. Freire 31334* (AAU); Napo: Between Proyecto Buffalo and Proyecto INCRAE, about 12-13 km from Lago Agrio on via San Miguel. Cultivated disturbed area with some remnants of primary forest. Alt. 300. (77°53'W 0°10'N). April 4, 1980. Shrub 1.2 m. Flowers orange red. Stem and lower surface of leaves subscabrous. *J. Brandbyge, E. Asanza C. & L. Reib 30444* (AAU, US).

A number of different species names have been used in the genus *Wulffia*, but previously known material all falls close to or into the concept of *Wulffia baccata* (L.f.) O.Kuntze which is often considered to be the only species in the genus. None of the previous material gives a hint of the degree of distinction seen in the present species from amazonian Ecuador. Actually, the large usually solitary heads and the elongate involucral bracts caused some concern regarding the generic relationship. Nevertheless, the habit and leaf form, the striated apiculate paleae, and the form of the disk corollas with their often retrorse minute spicules closely match the condition in *Wulffia baccata*. The achenes with the broad truncate apices are clearly the type seen in the *Wulffia-Melanthera* relationship, and the pappus is lacking as in *Wulffia*. The dried achene surfaces in the new species show no evidence of the fleshiness that is characteristic of *W. baccata*, but collection data indicates the achenes are green and some softeness may be discovered in living material. The reddish flowers of the new species are distinct from the yellowish form usually seen in *W. baccata*, but orange to reddish flowers have been noted in other material of the genus.



Wulffia macrocephala H. Robinson, Holotype, Herbarium Jutlandicum, Aarhus. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XXXIX.

NEW SPECIES OF *ASPILIA* FROM BRAZIL.

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The present paper continues the process of describing new species of *Aspilia* from South America, a process begun in a previous paper in a series on the *Wedelia-Aspilia* complex in Brazil (Robinson, 1984b). The species descriptions and notes provided here hopefully bring the coverage of the genus in the area to the level attained for *Wedelia* in Brazil in another of the recent studies (Robinson, 1984a). The generic limits of *Wedelia* and *Aspilia*, however, remain less adequately defined than those of two other related brasilian genera that have been studied recently, *Dimerostemma* Cassini (Robinson, 1984c) and *Angelphytum* Barroso (Robinson, 1984d).

In the present treatment, *Aspilia* is defined in the traditional way as those Ecliptine Heliantheae having a constricted apical crown bearing all the pappus elements, having little or no wing on the achene, and having sterile rays. As such, the genus shows many parallels in detailed characters with the related genus *Wedelia* which differs by having fertile rays. While some readjustment of generic lines seems inevitable, essential aspects of such a revision are still impossible to predict. Fortunately, obvious related groups of species do not seem to vary in the sterility or fertility of their rays.

In spite of the indications of its artificial limits, *Aspilia* shows a remarkable tendency to contain all the species in the *Wedelia-Aspilia* complex that have distinct fiber sheaths on the veins of the disk corollas and have black anther appendages (exception *W. brachycarpa* Baker). In addition, as seen in the present series, the basal tube of the ray corolla is glabrous or scarcely pubescent in species of *Aspilia* in Brazil but is often pubescent in brasilian *Wedelia*. The brasilian species of *Aspilia* also more often have subsessile leaves, and the few seen with petioles seem generally anomalous, *A. latissima* Malme (*de Paula & Conceição 1664*; US; IBGE) in the broad leaf blades and the narrow wings on the petioles, and *A. pseudoyedaea* in the *Oyedaea*-like habit and the *Dimerostemma*-like shape of the disk corollas.

In the present effort a few older concepts of *Aspilia* species have been examined. Two species from Goias, *A. asperrima* (Gardn.) Baker (specimens seen *Heringer 15568, Macedo 4418*) and *A. attenuata* (Gardn.) Baker (specimen seen *Heringer 15305*) are notable for the stout form of the aristae on the achenes and the lack of a well-developed constriction under the pappus, for

which reason both species were originally described in the genus *Viguiera*.

Aspilia linearifolia Baker (*A. linearis* Blake, non *A. linearifolia* Oliver & Hiern) is evidently *Viguiera aspilioides* Baker.

Material under the name *Aspilia setosa* Griseb. has been reexamined and proves to include a variety of species. The typical element based on Argentinian material is close to *A. montevidensis* (Spreng.) O.Kuntze and has been reduced to a variety of the latter by Cabrera (1970). Other elements include the following.

A few specimens that have been identified as *Aspilia setosa* prove to be *A. reflexa* Baker which is usually readily recognized by its distally broader and coarsely serrate upper leaves and its more rounded basal leaves. Three specimens reported and distributed under the name *A. setosa, King 8185, 8214,* and *8229* prove to be *Wedelia bishopii* H.Robinson.

A large series of specimens under the name *Aspilia setosa* have proven to be *A. hirsuta* (Gardn.) Benth.& Hook.f. ex Jackson & Hook.f. Examples of the species seen include *King 8258, 8744, 8937; Davidse & Ramamoorthy 10728; Mori & Funch 13385; Hoehn & Gehrt 17460; Irwin et al. 9837, 10525, 25044, 28261; and Anderson et al. 35310.* The name *A. hirsuta* has most often been placed in the synonymy of *A. foliacea* (Spreng.) Baker, but the former is distinct in its longer foliose stems with more consistently elliptical leaves, by its longer straighter hairs on the stems leaves and involucral bracts, and by the distinctly shorter more rounded tips of the paleae in the heads.

A recent collection of *Aspilia warmingii* Baker (*King & Bishop 8565*) comparing closely with the type photograph, shows a similarity to *A. hirsuta*, but it has more sharply serrate leaves, shorter asperulous to hirtellous pubescence, and more prominent lower secondary veins in the leaves that often produce a distinct trinervation. The tips of the paleae are very broad and rounded.

A considerable amount of material from Minas Gerais and Bahia has been redetermined as *Aspilia fruticosa* (Gardn.) Baker including those determined as *A. parvifolia* Mattfeld which seems to be a synonym. Also included are *Irwin et al. 20717* and *23119* that were identified as *A. clausseniana* Baker, a less shrubby species from farther south in Brazil. A somewhat similar plant under the latter name seems to be the variously ternately or alternately leaved *Aspilia anomala* Baker. Other shrubby plants with linear leaves and narrower involucral bracts, including some from Bahia that have been called *A. parvifolia* Mattf., *Carvalho et al. 969, King & Bishop 8747,* and *8776* appear to be *A. foliosa* (Gardn.) Baker.

A number of plants from Minas Gerais and Goias with usually erect stems from a xylopodium,with ascending branches above, with rather smooth elliptical leaves, and with terminal heads having large herbaceous involucral bracts seem to all represent *Aspilia laevissima* Baker. These include three specimens from

Goias, *Maguire, Maguire & Pires 44802; Irwin et al. 10397;* and *King & Bishop 8974*, and one from western Minas Gerais, *Pereira 142*, having black anther appendages, and four from the Cerro Cipó area of Minas Gerais, *Maguire, Maguire & Pires 44636*; and *King & Bishop 8442, 8451,* and *8460*, having pale anther appendages.

In addition, the following nine species are described as new, one from Bolivia and eight from Brazil.

ASPILIA BISHOPLECTA H. Robinson, sp. nov.

Plantae suffruticosae e xylopodiis erectae ad 0.7 m altae mediocriter ramosae. Caules brunnescentes superne pallidiores teretes dense hispidi et hispiduli. Folia opposita, petiolis nullis vel subnullis; laminae oblongo-ovatae vel ellipticae 2.0-4.5 cm longae et 0.7-1.7 cm latae base rotundatae margine integrae vel pauce serrulatae leniter vel distincte anguste reflexae apice acutae vel subobtusae supra dense scabridae subtus hispidulae vel leniter velutinae in nervis secundariis pinnatae. Inflorescentiae terminales plerumque pluri-capitatae, pedunculis 1-7 mm longis dense canescentiter hispidulis. Capitula late campanulata 14-15 mm alta; squamae involucri ca. 30 oblongae imbricatae graduatae 1.5-10.0 mm longae et 1-4 mm latae plerumque pallidae et extus glabrae apice virides erectae obtusae vel breviter acutae vel vix apiculatae scabridulae; paleae flavae oblongae ad 10 mm longae et 1.5 mm latae glabrae apice ovatae et denticulatae acutae. Flores radii ca. 14 in capitulo; corollae flavae, tubis ca. 4 mm longis angustis glabris, limbis ca. 10 mm longis et 5 mm latis apice bilobatis. Flores disci 30-35 in capitulo; corollae flavae 8-9 mm longae, tubis ca. 3 mm longis glabris, faucibus longe campanulatis ca. 4 mm longis extus glabris in nervis fibrillosis, lobis triangularibus ca. 1 mm longis et 0.8 mm latis extus dense minute scabridulis intus margine dense longe papillosis; filamenta in partibus superioribus ca. 0.5 mm longa vix incrassata; thecae antherarum ca. 3 mm longae; appendices antherarum nigrescentes ca. 0.45 mm longae et 0.37 mm latae extus glanduliferae. Achaenia submatura ca. 6 mm longa hispidosetulifera, setulis tenuibus profunde bifurcatis, coronis apicalibus valde constricta ad 0.3 mm latis minute squamelliferis non aristiferis. Grana pollinis in diametro ca. 32 µm.

TYPE: BRAZIL: Minas Gerais: 28 km along road, NE of Barrocao, towards Salinas. Elev. 2600 ft. Subshrub with woody xylopodium, 3 dm tall, flowers yellow. Jan. 21, 1981. *R.M.King & L.E.Bishop 8584* (Holotype, UB; isotype, US). PARATYPE: BRAZIL: Minas Gerais: Estrada Três Marias a Corinto, km 36. Subarbusto 70 cm, capitulos amarelos. 30.11.1976. *G.L.Shepherd, J.B.de Andrade, L.S. Kinoshita & J.Y.Tamashiro 3820* (US).

The species bears showy clusters of large heads notable for their many graduated pale involucral bracts with green apical margins. The erect and sometimes slightly apiculate tips of the bracts are reminiscent of *Aspilia ramosissima* (Gardn) H.Robinson, comb. nov. (*Viguiera ramosissima* Gardn., London J. Bot. 7: 402.

1848) and *A. floribunda* (Gardn.) Baker, but the heads of the latter are much smaller and their anther appendages are distinctly yellow. The involucral bracts in *A. ramosissima* are much more strongly apiculate to long-mucronate and the bracts in *A. floribunda* are more acute. The actual relationship of the new species is probably closer to shrubby species such as *A. fruticosa* (Gardn.) Baker and *A. andersonii* H.Robins., but the heads of the latter are smaller with less series of involucral bracts, and the tips of the bracts are longer and strongly reflexed.

The name of the species honors the collector, Dr. L. E. Bishop.

ASPILIA CARDENASII H. Robinson, sp. nov.

Plantae suffruticosae ad 30-60 cm altae mediocriter ramosae. Caules fulvo-virides in partibus rufescentes teretes leniter striati breviter appresse strigosi. Folia opposita, petiolis indistinctis 1-2 mm longis; laminae lanceolatae vel lineari-lanceolatae 4.5-8.0 cm longae et 0.4-1.2 cm latae base subobtusae vel anguste rotundatae margine integrae vel subintegrae anguste leniter reflexae apice anguste acutae supra breviter strigosae subtus pallidiores in nervis breviter strigosae et aliter sparse strigulosae fere ad basem distincte sublongitudinaliter trinervatae. Inflorescentiae in ramis terminales pauci-capitatae, pedicellis plerumque 1-2 cm longis dense breviter albo-strigosis. Capitula late campanulata 9-11 mm alta; squamae involucri ca. 12 imbricatae leniter graduatae ca. 3-seriatae oblongae plerumque 5-6 mm longae et 1.5-2.0 mm latae base pallidae supra mediam plerumque herbaceae erectae vel interdum superne patentes apice obtusae et in marginem anguste recurvatae, squamae interiores apice solum subherbaceae; paleae 7-9 mm longae in partibus majoribus inferioribus oblongis plerumque 2 mm latis superne in lobis truncatis demarcatae extus superne rubro-maculatae, paleae in partibus apicalibus valde angustiores triangulares ca. 1.5 mm longae et 1 mm latae apice acutae extus minute scrabidulae. Flores radii ca. 10 in capitulo; corollae albae, tubis angustis ca. 2.5 mm longis plerumque glabris, limbis oblongis ad 8 mm longis et 2 mm latis apice profunde ad 4 mm bilobatis extus sparse puberulis. Flores disci ca. 20 in capitulo; corollae albae 7-8 mm longae, tubis 3.0-3.5 mm longis glabris, faucibus leniter campanulatis (1-) 2.0-2.5 mm longis extus sparse puberulis base sensim densioribus et pauce scrabidulis in nervis fibrillosis, lobis anguste oblongis vel linearibus ca. 2 mm longis et 0.7 mm latis extus plerumque laevibus superne minute scabridulis margine persparse minute puberulis intus inferne laevibus superne leniter mamillosis; filamenta in partibus superioribus ca. 0.4 mm longa vix incrassata; thecae ca. 3 mm longae; appendices antherarum nigrescentes ca. 0.5 mm longae et 0.4 mm latae extus glanduliferae. Achaenia oblonga ca. 5 mm longa et 2.5 mm lata hispido-setulifera, setulis tenuibus longe bifurcatis, lineis callosis inferioribus 4 distinctis, coronis

apicalibus valde constricta ad 1 mm latis margine minute squamelliferis perbreviter biaristatis, aristis solum ad 0.3 mm longis. Grana pollinis in diametro 30-33 µm.

TYPE: BOLIVIA: Santa Cruz: San Micerato-Santiago de Chiquitos. 970 m. Among grasses in sandstone hills. 30-60 cm high, flowers white. II-50. *Cárdenas 4563* (Holotype, US).

The species superficially resembles *Aspilia floribunda* (Gardn.) Baker, but the tips of the involucral bracts are less differentiated, the anther appendages are black, and the ray and disk corollas are white and deeply lobed.

ASPILIA CYLINDROCEPHALA H. Robinson, sp. nov.

Plantae suffruticosae ad 1 m altae pauce ramosae. Caules rubescentes teretes vix striati strigosi et minute hispiduli. Folia opposita, petiolis subnullis ca. 1 mm longis; laminae anguste oblongae vel lineares 1.5-4.5 cm longae et 0.2-0.6 cm latae base acutae margine integrae anguste revolutae scabridae apice obtusae supra dense pilosulae et sparse scabridae subtus pallidiores velutinae in nervis primariis scabridae, nervis pinnatis. Inflorescentiae in ramis terminales subglomeratae pauci-capitatae, pedicellis 1-5 mm longis dense albo-hispidulis. Capitula cylindrica ca. 9 mm alta et 4 mm lata; squamae involucri ca. 35 imbricatae graduatae ca. 5-seriatae 1-6 mm longae extus in partibus majoribus pallidae et glabrae superne herbaceo-appendiculatae virides et lateraliter rubescentes hispidulae apice subtruncatae vel obtusae et submucronatae erectae vel saepe reflexae; paleae 7-8 mm longae et ca. 1.5 mm latae apice rubescentes obtusae vel breviter acutae plerumque in marginem pilosulae. Flores radii 6-7 in capitulo; corollae flavae, tubis ca. 3.7 mm longis glabris, limbis ovalis ca. 5 mm longis et 2.5 mm latis apice ad 1 mm bilobatis. Flores disci 5 in capitulo; corollae flavae ca. 6 mm longae, tubis ca. 1.5 mm longis glabris, faucibus ca. 3.5 mm longis extus glabris in nervis leniter fibrillosis, lobis triangularibus ca. 0.6 mm longis et latis extus dense minute scabridulis intus margine dense longe papillosis; filamenta in parte superiore ca. 0.4 mm longa vix incrassata; thecae 2.5-2.8 mm longae; appendices antherarum nigrescentes ca. 0.4 mm longae et 0.35 mm latae extus glanduliferae. Achaenia oblonga ca. 6.5 mm longa et ca. 2.2 mm lata hispidulo-setulifera, setulis tenuibus profunde bifurcatis, coronis apicalibus valde angustiores ca. 0.7 mm latis margine perminute setulo-squamelliferis non aristatis. Grana pollinis in diametro 25-27 µm.

TYPE: BRAZIL: Minas Gerais: Serra do Cabral, immediately E of Joaquim Felicio, campo and sparse cerrado on upper slopes. Elev. ca. 1000 m. Subshrub to ca. 1 m tall; rays yellow, disc yellow-brown. 6 March 1970. *H.S.Irwin, S.F.da Fonsêca, R.Souza, R.Reis dos Santos, J.Ramos 27007* (Holotype, UB; isotype, US).

The material of the new species was originally determined and distributed as *Aspilia floribunda* (Gardn.) Baker which it resembles in the narrow leaves, the multiseriate graduated

involucral bracts, and the slight tendency for mucronate tips on the bracts. The new species differs, however, in the more abruptly differentiated often reflexed tips of the bracts and by the black anther appendages. In the latter characters and the somewhat woodier appearance the species seems closer in relationship to *A. fruticosa* (Gardn.) Baker and its allies, but the involucral bracts are in more series with shorter reflexed tips. The species is distinct from all relatives by the narrowness of the heads and the presence of only five flowers in the disk. The habit of the plant is very similar to species of the Eupatorine genus *Chromolaena*, especially *C. ivaefolia* (L.) K.& R.

ASPILIA HERINGERIANA H. Robinson, sp. nov.

Plantae suffruticosae 1 m altae? mediocriter ramosae. Caules brunnescentes teretes vix striati dense strigosi. Folia opposita, petiolis indistincte demarcatis 1-2 mm longis; laminae lanceolatae 4-13 cm longae et 0.9-1.8 cm latae base acutae attenuatae margine remote subserrulatae planae vel interdum anguste reflexae apice anguste acuminatae supra strigosae et strigulosae subtus velutinae et in nervis primariis dense strigosae, nervis secundariis ascendentiter pinnatis. Inflorescentiae in ramis terminales subaggregatae pauci-capitatae, pedicellis 5-15 mm longis dense albo-strigosis vel subhispidulis. Capitula late campanulata ca. 10 mm alta; squamae involucri purpureae exteriores ca. 14 lanceolatae 5-10 mm longae base ad 1.5 mm latae superne sensim herbaceae et laxe reflexae apice anguste acutae in partibus reflexis supra virides et scabrido-pilosulae subtus violaceae albo-velutinae, squamae interiores ca. 6 ad 10 mm longae et 3.5 mm latae apice rotundatae vel obtusae et irregulariter denticulatae extus inferiore glabrae superne subglabrae vel minute puberulae; paleae in partibus basilaribus oblongae ca. 7 mm longae pallidae ad 1.5-2.0 mm latae in partibus apicalibus ovato-appendiculatae ca. 1.5 mm longae et 0.7 mm latae rubescentes apice breviter acutae glabrae vel subglabrae. Flores radii ca. 6 in capitulo; corollae flavae, tubis angustis ca. 4 mm longis glabris, limbis oblongo-ellipticis ca. 9 mm longis et 4.5 mm latis apice breviter bilobatis base in marginem pauce puberulis. Flores disci ca. 20 in capitulo; corollae flavae 7.0-7.5 mm longae, tubis ca. 1.7 mm longis glabris, faucibus leniter campanulatis ca. 4.5 mm longis extus glabris in nervis distincte fibrillosis, lobis triangularibus ca. 0.9 mm longis et 0.7 mm latis extus minute puberulis perpauce breviter spiculiferis intus praeter basem dense breviter papillosis; filamenta in partibus superioribus ca. 0.3 mm longa vix incrassata; thecae ca. 3 mm longae; appendices antherarum nigrescentes ca. 0.5 mm longae et 0.4 mm latae extus glanduliferae et minute setuliferae. Achaenia oblonga ca. 5.5 mm longa superne ad 1.8 mm lata sericeo-setulifera, setulis leniter flexuosis longe bifurcatis, coronis apicalibus leniter sed distincte angustioribus ad 1.2 mm latis margine squamelliferis et minute biaristatis, aristis ad 0.3 mm longis.

Grana pollinis in diametro ca. 30 μm.

TYPE: BRAZIL: Goias: Município de Formosa, Rio Tiquiri. Cerrado, flores amarelas. 25 Maio 1967. *E.P.Heringer 11466* (Holotype, IBGE; isotype, US).

Aspilia heringeriana shows some similarity to the *A. fruticosa* group of the genus by its graduated involucral bracts, but it is thoroughly distinct in the purplish color of the bracts, the lanceolate shape of the outer bracts, and the strongly differentiated round-tipped inner bracts. The corolla lobes of the disk flowers also seem unusual in the genus by their near lack of spicules on the outer surface and the more uniform papillosity on the inner surface.

ASPILIA HISPIDANTHA H. Robinson, sp. nov.

Plantae herbaceae perennes e xylopodiis erectae ca. 0.5 m altae non vel solum superne pauce ramosae. Caules brunnescentes teretes dense scabri vel scabriduli. Folia opposita, petiolis subnullis 1-2 mm longis; laminae oblongo-ellipticae 2.5-4.5 cm longae et 0.3-1.2 cm latae base obtusae vel acutae margine plerumque integrae interdum pauce subserrulatae anguste reflexae apice obtusae vel breviter acutae supra in nervis primariis prominentes aliter sublaeves antrorse appresse scabridulae subtus leniter ascendentiter pinnato-nervatae irregulariter scabridae in nervis longius. Inflorescentiae terminales in ramis uni-capitatae, pedunculis plerumque 3-7 cm longis superne sensim dense canescentiter scabridulis. Capitula late campanulata ca. 12 mm alta; squamae involucri exteriores herbaceae 5-10 integrae late oblongae vel late ovatae 10-14 mm longae et 4-8 mm latae apice obtusae extus puberulae et scabridulae vel pilosulae, squamae interiores 6-7 late oblongae ca. 8 mm longae et ca. 5 mm latae margine late scariosae et pilosulo-fimbriatae apice rotundatae; paleae oblongae ca. 8 mm longae et ca, 3 mm latae extus glabrae superne angustiores et denticulatae apice ovato-appendiculatae, appendicibus ca. 2 mm longis et 1.5 mm latis leniter rufescentibus margine minute denticulatis apice rotundatis vel vix obtusis extus in medio minute appresse puberulis. Flores radii 7-10 in capitulo; corollae flavae, tubis ca. 1.5-3.0 mm longis angustis glabris, limbis 15-17 mm longis et 6-8 mm latis apice bi- vel tri-lobatis. Flores disci 35-50 in capitulo; corollae flavae 5.5-7.0 mm longae, tubis 1.5-2.5 mm longis glabris, faucibus longe campanulatis 3.0-3.5 mm longis extus glabris in nervis non vel vix fibrillosis, lobis triangularibus 0.8-1.0 mm longis et latis extus inferne pauce minute puberulis superne sensim dense scabridulis intus margine dense longe papillosis; filamenta in partibus superioribus ca. 0.3 mm longa aliquantum incrassata; thecae ca. 2.5 mm longis in lineis interioribus et in connectivis minute hispidulae; appendices antherarum flavae ovatae ca. 0.5 mm longae et 0.4 mm latae extus glanduliferae. Achaenia obpyramidata ca. 6 mm longa et ca. 3.5 mm lata hispidosetulifera, setulis tenuibus profunde bifurcatis, coronis

apicalibus valde constrictis ad 1.5 mm latis vix biaristatis et margine breviter squamelliferis, aristis 0.3-1.5 mm longis. Grana pollinis in diametro ca. 30 μm.

TYPE: BRAZIL: Bahia: 8 km along road S of Mucuge, 2-5 km E along base of mountain. Elev. 2800-3000 ft. Stiff herb from xylopodium, flowers yellow. Feb. 1, 1981. *R.M.King & L.E.Bishop 8761* (Holotype, UB; isotype, US). PARATYPES: BRAZIL: Bahia: Vicinity of Pico das Almas, ca. 20 km NW of the town of Rio das Contas. Elev. 3500-4600 ft. Stems decumbent from woody xylopodium, flowers yellow. Jan. 25, 1981. *R.M.King & L.E.Bishop 8653* (US); 37 km E of Seabra along road towards Itaberaba. Elev. 2200 ft. Stiff herb from xylopodium, flowers yellow. Feb. 2, 1981. *R.M.King & L.E.Bishop 8778* (US).

The new species is notable for the breadth of the herbaceous involucral bracts and for the minute hairs on and beside the connectives of the anthers. Two of the specimens, *8653* and *8761*, have ca. 8-10 involucral bracts while *8778* has only about five. The closest relative may be *Aspilia cupulata* Blake (*Oyedaea angustifolia* Gardn., not *Aspilia angustifolia* Oliver & Hiern) of eastern Brazil in Piauhy and Bahia (recent collections *King & Bishop 8594, 8677*). The latter has narrower involucral bracts, longer and narrowly oblong disk corolla lobes with red-tinged margins, and has no minute hairs on the anther connectives. It is the minute hairs abaxially on the anthers after which the new species is named.

ASPILIA PSEUDOVIGUIERA H. Robinson, sp. nov.

Plantae herbaceae perennes erectae ad 1.2 m altae non vel pauce ramosae. Caules cinereo-brunnescentes teretes leniter striati dense strigulosi, internodis primariis elongatis ad 14 cm longis. Folia opposita, petiolis nullis; laminae lineares 4-13 cm longae et ad 0.6 cm latae base ca. 2 mm latae margine remote serrulatae apice anguste acutae supra strigulosae subtus in nervis majoribus strigulosae aliter asperulaceae fere ad basem longitudinaliter trinervatae. Inflorescentiae terminales laxe cymosae alternate ramosae plerumque 9-capitatae, pedicellis 15-30 mm longis dense albo-strigosis. Capitula late campanulata 10-13 mm alta; squamae involucri ca. 14 valde imbricatae ca. 3-seriatae leniter graduatae late ovatae vel late oblongae 4-7 mm longae et 3-5 mm latae, squamae exteriores apice sensim viridiores obtusae sparse pilosulae vel strigulosae, squamae interiores apice late rotundatae scariosae glabrae; paleae ca. 9 mm longae in partibus basilaribus oblongae ad 1.5 mm latae in partibus appendiculatis flavescentes ovato-oblongae 1.5 mm longae et

ca. 0.8 mm latae apice anguste acutae. Flores radii 12-14 in capitulo; corollae flavae, tubis angustis 2.5-3.0 mm longis glabris, limbis ellipticis 16-17 mm longis et 5.0-5.5 mm latis apice breviter inciso-bilobatis base in marginem hirtellis subtus in nervis majoribus minute puberulis. Flores disci ca. 60 in capitulo; corollae flavae 6-7 mm longae, tubis 1.8-3.0 mm longis glabris, faucibus leniter campanulatis 2.7-3.3 mm longis extus plerumque glabris base pauce minute puberulis et perpauce minute strigulosis in nervis non fibrillosis, lobis triangularibus ca. 0.6 mm longis et 0.6-0.7 mm latis extus dense breviter spiculiferis inferne pauce minute puberulis intus praeter basem papillosis margine longius; filamenta in partibus superioribus ca. 0.3 mm longa leniter incrassata; thecae 2.0-2.5 mm longae; appendices antherarum flavae late ovatae ca. 0.4 mm longae et latae extus glanduliferae. Achaenia anguste oblonga ca. 4.8 mm longae et 1 mm lata sericeo-setulifera, setulis non flexuosis apice breviter bifurcatis, coronis apicalibus subtiliter constrictis in sinis breviter alatis, aristis 2 ad 1.0-1.5 mm longis, squamellis distinctis ad 0.5-0.7 mm longis. Grana pollinis in diametro 25-27 µm.

TYPE: BRAZIL: Mato Grosso do Sul: Mun. Mundo Novo. Porto Frangeli. Ereta, 1 m 20, capitulos amarelos, Vargedos inundaveis. 10/12/1982. *G.Hatschbach 45839* (Holotype, MBM; iostype, US).

The new species has an apical crown with broad aristae and slight wings resulting in a nearly unconstricted appearance more like a *Viguiera*. Such achenes are also seen in *A. asperrima* (Gardn.) Baker and *A. attenuata* (Gardn.) Baker of Goias, but the latter two differ by having among other things, broader leaves more coarsely pubescent outer involucral bracts, less strongly differentiated inner involucral bracts, more abruptly constricted and more medially costate appendages on the paleae, and longer lobes on the disk corollas with a highly differentiated fringe of marginal papillae. The latter two species and the petiolate *A. latissima* Malme are all like the present species in the less flexuose shallowly bifid setulae on their achenes. In spite of the great difference in leaf shape, *A. latissima*, having the same type of elongate achenes and occurring in similar pantanal habitats in the same geographical area, might be the closest relative.

ASPILIA PSEUDOYEDAEA H. Robinson, sp. nov.

Plantae suffruticosae ad 1.5 m altae mediocriter ramosae. Caules brunnescentes rubrotincti teretes striati dense breviter hirsuti et hirtelli. Folia opposita, petiolis 5-12 mm longis distaliter subabrupte delimitatis; laminae ovales plerumque 5-12 cm longae et 2-5 cm latae base rotundatae et sensim breviter acuminatae margine irregulariter subserrulatae et minime anguste reflexae apice acutae supra scabridae in nervis majoribus anguste distincte prominulae subtus leniter pallidiores dense

pilosae in nervis distincte prominentes, nervis secundariis pinnatis leniter ascendentiter arcuatis in sextis inferioribus valdioribus. Inflorescentiae in ramis terminales subaggregatae multicapitatae, pedicellis 5-10 mm longis dense pallide hispidulis. Capitula late cylindrica 10-12 mm alta; squamae involucri ca. 16 imbricatae inaequales ca. 3-seriatae late oblongae 3-7 mm longae et 2-4 mm latae apice rotundatae margine ciliato-fimbriatae exteriores extus in medio pilosulae; paleae fulvescentes ca. 7 mm longae inferne ad 2 mm latae superne sensim angustiores et in appendicibus rotundatis ca. 1 mm longis et latis terminatae. Flores radii ca. 8; corollae flavae, tubis ca. 2.5 mm longis glabris, limbis ovalibus ca. 5 mm longis et 2.5 mm latis glabris minute trilobatis. Flores disci 10-12 in capitulo; corollae flavae ca. 5 mm longae, tubis ca. 1 mm longis glabris, faucibus cylindrico-campanulatis ca. 3 mm longis extus glabris in nervis non fibrillosis, lobis triangularibus ca. 1.3 mm longis et ca. 0.9 mm latis extus dense minute obtuse spiculiferis intus superne plerumque in marginem dense longe papillosis, ductis resiniferis distinctis; filamenta in partibus superioribus ca. 0.4 mm longa distincte incrassata; thecae ca. 2.2 mm longae; appendices antherarum flavae ca. 0.5 mm longae et 0.4 mm latae extus glanduliferae. Achaenia leniter obpyramidata ca. 6 mm longa et 2 mm lata minute pilosulo-setulifera, setulis tenuibus flexuosis profunde bifurcatis, coronis apicalibus distincte leniter constrictis ca. 1.3 mm latis margine non aristatis dense squamelliferis, squamellis ca. 0.2 mm longis. Grana pollinis in diametro ca. 25-27 μm.

TYPE: BRAZIL: Distrito Federal: ca. 25 km NW of Brasília. Wet campo and adjacent gallery margin. Elev. 900 m. Subshrub ca. 1.5 m tall. Rays yellow; disk yellow-brown. 12 May 1966. *H.S.Irwin, J.W.Grear,Jr., R.Souza, R.Reis dos Santos 15792* (Holotype, UB; isotype, US).

The name of the new species is intended to reflect the strictly habital resemblance to some members of the Andean genus *Oyedaea* which differs by having winged, prominently aristate achenes without constricted apical crowns, but which usually has distinct petioles and clustered broadly cylindrical heads. The *Oyedaea* type habit seems unique among the brasilian species of *Aspilia*. The short basal tubes and cylindrical throats on the disk corollas, the lack of fiber sheaths on the corolla veins, and the thickened anther collar are characters that might indicate relationship to the genus *Dimerostemma*, but the new species does not have the narrow contorted glanduliferous style branches, winged achenes, thinner leaves, or differentiated outer involucral bracts that are characteristic of the latter.

ASPILIA SIMPSONAE H. Robinson, sp. nov.

Plantae suffruticosae ad 0.5 m altae mediocriter ramosae. Caules fulvo-virides teretes striati hirsuti et hispiduli in nodis densius. Folia opposita, petiolis ca. 1 mm longis; laminae

coriaceae ovatae 2.5-7.0 cm longae et 0.9-3.8 cm latae base late rotundatae margine serrulatae apice acutae supra virides subvenulosae aspero-pilosulae subtus subnitido-virides reticulo-exsculptae in nervis majoribus hirsutae aliter hispidae fere ad basem valde trinervatae. Inflorescentiae terminales corymbosae, pedicellis 0.5-4.0 cm longis dense hirsutis. Capitula late campanulata 12-16 mm alta; squamae involucri 15-20 subaequales oblongae 12-15 mm longae et 3-5 mm latae in partibus basilaribus pallides breves in partibus majoribus appendiculatis longae herbaceae apice breviter acutae extus pilosulae; paleae ca. 10 mm longae inferne pallidae ad 3 mm latae glabrae supra median sensim lineares ca. 0.8 mm latae rubrae extus minute puberulae. Flores radii ca. 14 in capitulo; corollae albae, tubis ca. 4 mm longis angustis glabris, limbis ca. 17 mm longis et 5 mm latis apice bilobatis. Flores disci 25-55 in capitulo; corollae albae 7-8 mm longae, tubis ca. 2 mm longis glabris, faucibus longe campanulatis 4.5-5.0 mm longis extus plerumque glabris in nervis distincte fibrillosis, lobis triangularibus vel ovato-triangularibus ca. 1 mm longis et 0.8-0.9 mm latis extus inferne pauce pilosulis margine et superne dense minute scabridulis intus margine et superne papillosis; filamenta in partibus superioribus ca. 0.4 mm longa leniter incrassata; thecae antherarum 3.0-3.5 mm longae; appendices antherarum nigrescentes ovatae ca. 0.5 mm longae et 0.4 mm latae extus glanduliferae. Achaenia ca. 8 mm longa et 2.5 mm lata hispidulo-setulifera, setulis tenuibus profunde bifurcatis, coronis apicalibus valde constricta ad 1.5 mm latis margine breviter squamelliferis et biaristatis, aristis ad 1 mm longis sparse pilosulis. Grana pollinis in diametro 30-35 μm.

TYPE: BRAZIL: Mato Grosso: 30 km West of Alto do Araguaia on route 364. Herbs to 1 m tall along the road. Ligules white. Chaff in buds deep red. Feb. 10, 1977. *B.B.Simpson 8594* (Holotype, US). PARATYPE: BRAZIL: Mato Grosso: Mun. Alto Garças. Rod. BR 364. Erva 50 cm, capitulos e ligulas alvas. Do cerrado. 14/2/1974. *G.Hatschbach 34165* (US).

The paratype specimen was distributed originally as *Aspilia leucoglossa* Malme which is a mostly unbranched, unicapitate, xylopodial species related to the common *A. foliacea* (Spreng.) Baker. It has leaves of similar shape to those of the present species but with a much thinner texture. The new species actually seems closest to *A. ovalifolia* (DC.) Baker of Goias, but that is a much less coarsely pubescent species with more broadly ovate, duller textured, mostly alternate leaves with yellow flowers and broader topped pale paleae.

ASPILIA VIEIRAE H. Robinson, sp. nov.

Plantae herbaceae perennes e xylopodiis erectae ad 0.4 m altae non vel pauce ramosae. Caules fulvi teretes pauce striati strigosi. Folia opposita sessilia inferiores minores base bracteiformes; laminae leniter coriaceae lineari-lanceolatae ad 6-12 cm longae et 0.7-1.4 cm latae base attenuatae margine remote

mucronato-serrulatae apice anguste acutae supra et subtus virides sparse breviter strigosae et exsculpto-venosae fere ad basem sublongitudinaliter tri- vel quinque-nervatae. Inflorescentiae terminales et solitariae vel diffusae in ramis terminales unicapitatae, pedicellis plerumque 3-6 cm longis superne latioribus dense breviter strigosis et strigulosis. Capitula late campanulata 12-14 mm alta; squamae involucri 6-8 lanceolatae 15-23 mm longae et 4-5 mm latae herbaceae patentes vel leniter reflexae apice anguste acutae extus dense strigosae; paleae ca. 9 mm longae in partibus basilaribus oblongae ad 1.5 mm latae extus glabrae superne in denticulis terminatae in partibus apicalibus angustiores lanceolatae ca. 2.5 mm longae argute acutae extus minute puberulae. Flores radii 8-10 in capitulo; corollae albae, tubis angustis ca. 4.5 mm longis glabris, limbis oblongis ca. 15 mm longis et ca. 5 mm latis base abrupte rotundatis et in marginem minute puberulis apice distincte bilobatis extus in nervis minute puberulis. Flores disci ca. 25-30 in capitulo; corollae albae ca. 7 mm longis, tubis ca. 2.5 mm longis glabris, faucibus leniter campanulatis ca. 4 mm longis extus glabris in nervis distincte fibrillosis, lobis triangularibus ca. 0.8 mm longis et 0.7 mm latis extus minute puberulis et dense scabridulis intus margine et superne breviter papillosis; filamenta in partibus superioribus 0.30-0.35 mm longa aliquantum incrassata; thecae ca. 3 mm longae; appendices antherarum nigrescentes ca. 0.4 mm longae et 0.35 mm latae extus glanduliferae. Achaenia obpyramidata ca. 6 mm longa et 3 mm lata sericeo-setulifera, setulis vix flexuosis apice plerumque breviter bifurcatis, coronis apicalibus valde constrictis ad 1.5 mm latis margine distincte squamelliferis et breviter biaristatis, aristis 1.0-1.5 mm longis dense scabridulis. Grana pollinis in diametro ca. 37 µm.

TYPE: BRAZIL: Rondônia: A 4 km proximo de Vilhena, 12°45'S-60°10'W. Campo. Erva de 40 cm de altura; flores brancas; cálice verde. Solo argiloso. 25/10/1979. *M.G.Vieira, J.L.Zarucchi, R.H.Peterson, J.F.Ramos & C.D.A.Mota 614* (Holotype, INPA; isotype, US). PARATYPE: BRAZIL: Rondonia: Vilhena, arredores do aeroporto. Arbusto de 40 cm, flor branca, campo cerrado. 2/1/79. *M.G.Silva & A.Pinheiro 4096* (US).

The new species has the erect mostly unbranched stems from a xylopodium of the type seen in *Aspilia foliacea*, *A. hirsuta*, and *A. leucoglossa*, but the leaves are of a totally different texture, venulation, shape, and pubescence. The flowers also seem to differ in being white.

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55: 389-414.

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_____. 1984c. Studies in the Heliantheae (Asteraceae). XXXI. Additions to the genus *Dimerostemma*. Proc. Biol. Soc. Wash. 97: 618-626.

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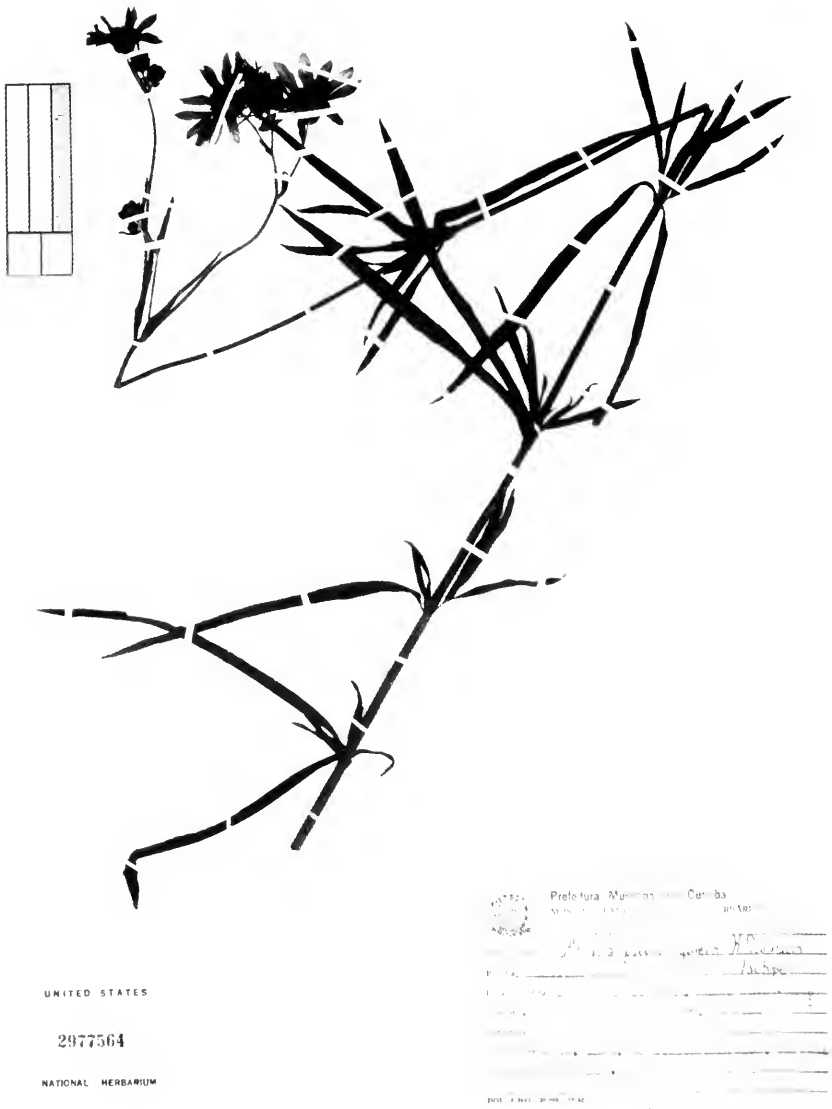
Aspilia bishoplecta H. Robinson, Isotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Aspilia cardenasii H. Robinson, Holotype, United States National Herbarium.

Aspilia cylindrocephala H. Robinson, Holotype, United States National Herbarium.

Aspilia heringeriana H. Robinson, Isotype, United States National Herbarium.

Aspilia hispidantha H. Robinson, Isotype, United States National Herbarium.

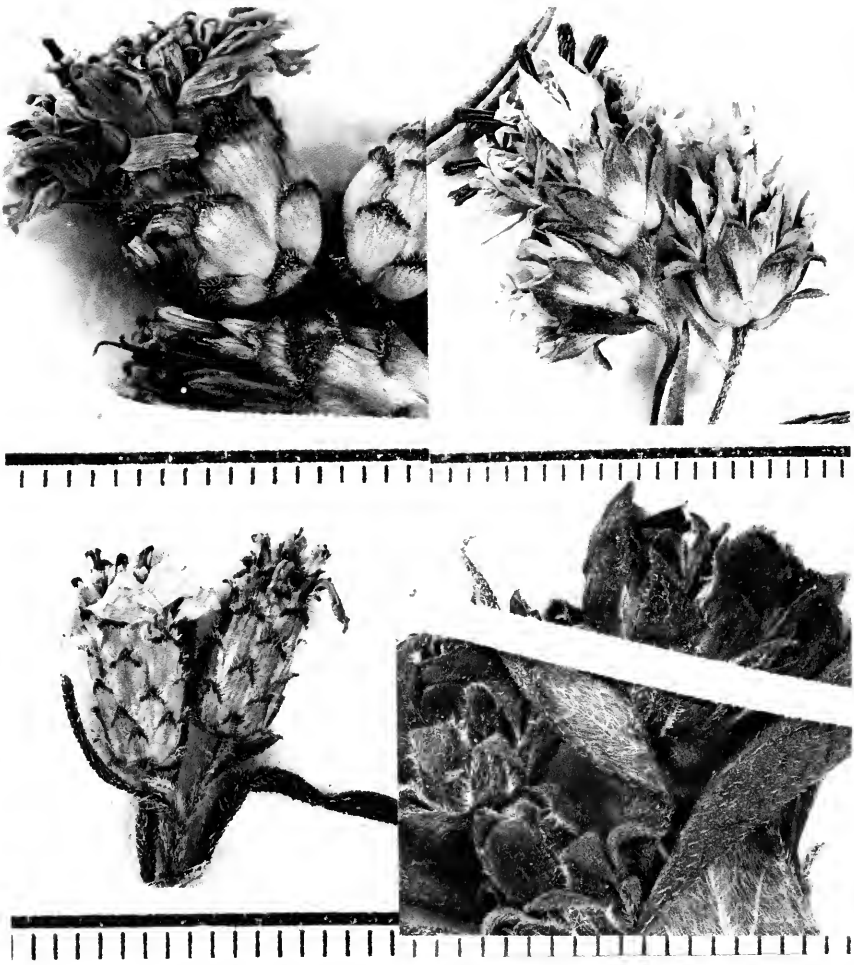


Aspilia pseudoviguiera H. Robinson, Isotype, United States National Herbarium.

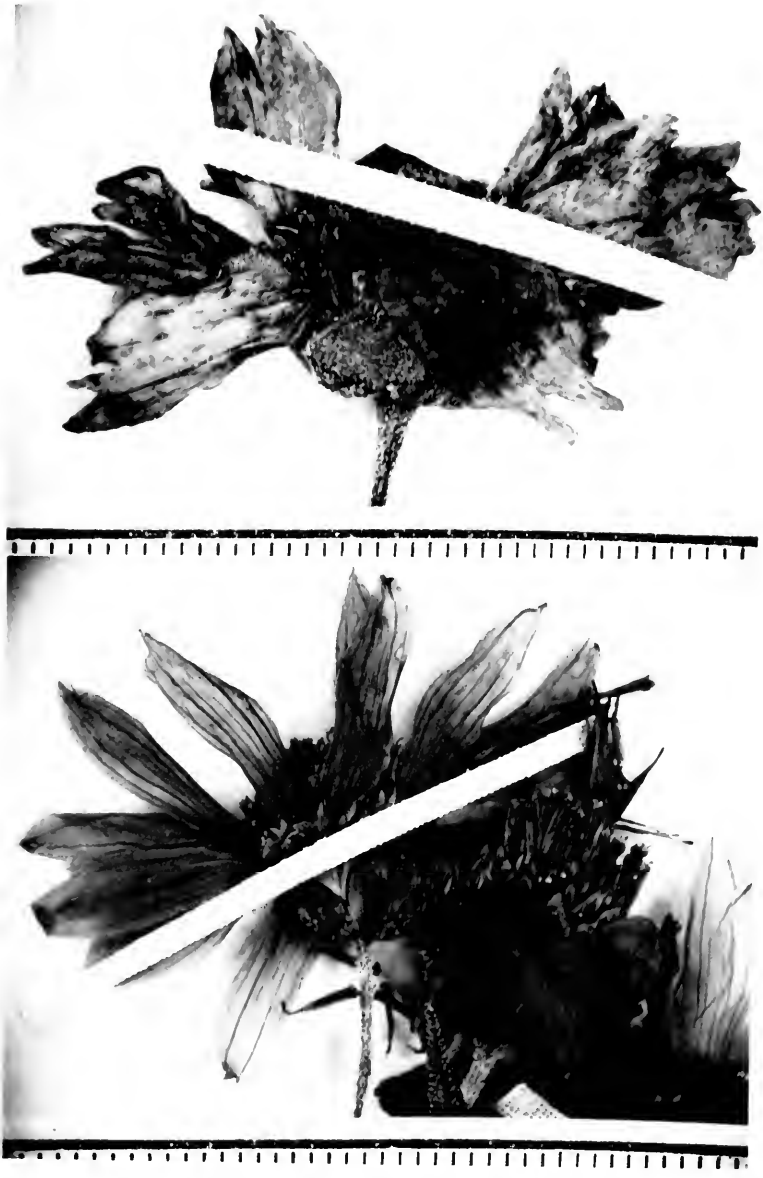
Aspilia pseudoyedaea H. Robinson, Isotype, United States National Herbarium.

Aspilia simpsonae H. Robinson, Holotype, United States National Herbarium.

Aspilia vieirae H. Robinson, Isotype, United States National Herbarium.



Enlargements of heads. Top left: *Aspilia bishoplecta*. Top right: *A. cardenasii*. Bottom left: *A. cylindrocephala*. Bottom right: *A. heringeriana*.



Enlargements of heads. Top: *Aspilia hispidantha*. Bottom: *A. pseudoviguiera*.

Enlargements of heads. Top: *Aspilia pseudoyedaea*. Middle: *A. simpsonae*. Bottom: *A. vieirae*.

STUDIES IN THE LIABEAE (ASTERACEAE). XVII.

TWO NEW SPECIES OF *MUNNOZIA*.

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Collections of two additional members of the genus *Munnozia* have been seen from the Andes of Ecuador and Peru. The new species both have some features of the subgenus *Kastnera*, but neither belongs to that subgenus. A relationship to the anomalous *M. ferreyrii* H.Robinson of Peru seems most likely.

MUNNOZIA HARLINGII H. Robinson, sp. nov.

Plantae herbaceae perennes decumbentes vel subscandentes ad 1 m vel ultra longae. Caules fulvescentes teretes leniter striati glabri. Folia opposita trans nodis connata, petiolis 1.5-4.5 cm longis late alatis inferne late auriculatis; laminae late deltoideo-ovatae plerumque 7.5-10.5 cm longae et 7-12 cm latae base truncatae in marginis lateralibus denticulatae dentatae et sublobatae apice acutae supra virides sparse pilosae subtus canescentiter arachnoideo-tomentosae base distincte ascendentiter trinervatae. Inflorescentiae solum in nodis basilaribus opposite ramosae superne alterne ramosae pauci-capitatae, bracteis sessilibus basilaribus oblongis ad 7 cm longis subfoliiformibus superioribus minutis, pedicellis 10-14 cm longis puberulis distaliter sensim albo-tomentosis. Capitula ca. 12-14 mm alta et radii exceptis 12-17 mm lata; bracteae involucri ca. 32 graduatae 3-4-seriatae 4-10 mm longae et ca. 3 mm latae exteriores late oblongae et apice rotundatae interiores argute acutae extus multicostatae plerumque glabrae distaliter sensim fulviores exteriores superne minute scabridulae; fimbriae receptacularum subnullae. Flores radii ca. 25 in capitulo; corollae flavae, tubis ca. 4 mm longis dense pilosis, limbis anguste ellipticis ca. 15 mm longis et 4 mm latis supra basem glabris. Flores disci ca. 45-50 in capitulo; corollae flavae ca. 6.5 mm longae, tubis ca. 2.5 mm longis basi exceptis dense pilosis, faucibus breviter campanulatis ca. 1.5 mm longis glabris, lobis linearibus ca. 2 mm longis et 0.5 mm latis extus glabris subapice breviter lobatis; filamenta in partibus superioribus ca. 0.35 mm longa; thecae ca. 2.5 mm longae nigrae, cellulis endothecialibus in parietibus transversalibus noduliferis; appendices oblongae ca. 0.3 mm longae et ca. 0.22 mm latae. Achaenia submatura ca. 1.5 mm longa glabra; setae pappi sordidae ca. 8 facile deciduae ca. 2 mm longae scabridulae, squamellae nullae? Grana pollinis in diametro ca. 35 μm.

TYPE: ECUADOR: Loja: Celica-Zapotillo Road, km 6-10, potre-

ros and remnants of seasonal evergreen forest, 1800-1900 m.s.m. Herb, growing on ground. 10.IV.1980. *G.Harling & L.Andersson 18127* (Holotype, GB; isotype, US).

The new species has the superficial look of a member of the subgenus *Kastnera*, and in fact seems very close to *Munnozia asplundii* H.Robinson which is a member of that subgenus from central Ecuador. The new species, however, has polarized thickenings on the endothecial cells of the anthers and has the expanded and somewhat lobed basal wings of the petioles narrowly connate across the nodes as in members of the subgenus *Munnozia*. It also differs from *M. asplundii* in many other details such as the glabrous stems, the lack of auricles on the base of the leaf blade, the distinct trinervation from at or even slightly below the base of the leaf blade, the more numerous rows of involucral bracts distinguished into outer ones with broadly rounded tips and inner ones that are sharply acute, and in the disk corollas the less abruptly campanulate bases of the throats and the glabrous lobes. The lack of obvious chaff on the receptacle, the reduction of the number of pappus setae, and the alternate branching of all but the lowest nodes of the inflorescence seems to indicate closer relationship to *M. ferreyrii* of northern Peru, but the general aspect of the plant shows that the relationship to the latter is not as close as that of the following species.

MUNNOZIA SAGASTEGUII H. Robinson, sp. nov.

Plantae herbaceae perennes ad 0.7 m altae. Caules rubrotincti leniter hexagonales dense breviter stipitato-glanduliferi. Folia opposita in nodis in discis latis connata, petiolis plerumque 1-3 cm longis inferne sensim late alatis superne vix vel non alatis; laminae late deltoideae plerumque 3.5-8.0 cm longae et 2.5-8.0 cm latae base hastatae in sinibus medialibus breviter acutae et ad marginem trinervatae in marginis basilaribus et lateralibus pluri-mucronato-denticulatae apice et in lobis basilaribus breviter argute acuminatae supra virides pilosae et sparse arachnoideo-pilosulae subtus canescentiter tomentosae et obscure glandulo-punctatae in nervis majoribus sparse pilosae. Inflorescentiae laxe cymosae in nodis basilaribus opposite ramosae in nodis superioribus plerumque alterne ramosae, bracteis basilaribus foliiformibus caetera minoribus maxime 10-12 mm longis linearibus, pedicellis 2-8 cm longis dense breviter stipitato-glanduliferis. Capitula ca. 10-12 mm alta et radii exceptis 8-12 mm lata; bracteae involucri ca. 20 inaequales 2-3-seriatae 4-8 mm longae et 2.0-2.5 mm latae oblongo-ovatae apice fulviores breviter vel angustius mucronato-acutae extus glabrae vix vel non striatae; receptacula non squamellifera distincte reticulato-cristata. Flores radii ca. 25 in capitulo; corollae flavae, tubis ca. 2 mm longis dense pilosis, pilis plerumque apice minute glanduliferis, limbis linearibus ca. 13 mm longis et 1.8 mm latis base dense longe stipitato-glanduliferis aliter subtus minute breviter glanduliferis. Flores disci 25-30 in capitulo; corollae

flavae ca. 6.5 mm longae, tubis 1.5-2.3 mm longis angustis dense longe stipitato-glanduliferis et in parte eglandulose pilosis, faucibus campanulatis ca. 4.5 mm longis base abrupte latioribus pauce pilosis et breviter glanduliferis, lobis linearibus ca. 3 mm longis et 0.45 mm latis extus perpauce breviter glanduliferis apice extus prologatis; filamenta in partibus superioribus ca. 0.35 mm longa; thecae ca. 3 mm longae nigrescentes, cellulis endothecialibus in parietubs transversalibus noduliferis; appendices antherarum ovales ca. 0.6 mm longae et 0.23 mm latae. Achaenia submatura 1.3 mm longa dense breviter setulifera; setae pappi nulli, squamellis distinctis numerosis brevibus ad 0.2 mm longis acutis. Grana pollinis in diametro ca. 37 µm.

TYPE: PERU: Cajamarca: Prov. Contumaza, Chausivolán, Guzmango. 2900 m.s.m. ladera. Hierba, flores amarillas. 31 Mayo 1959. *A.Sagastegui A. 2980* (Holotype, US).

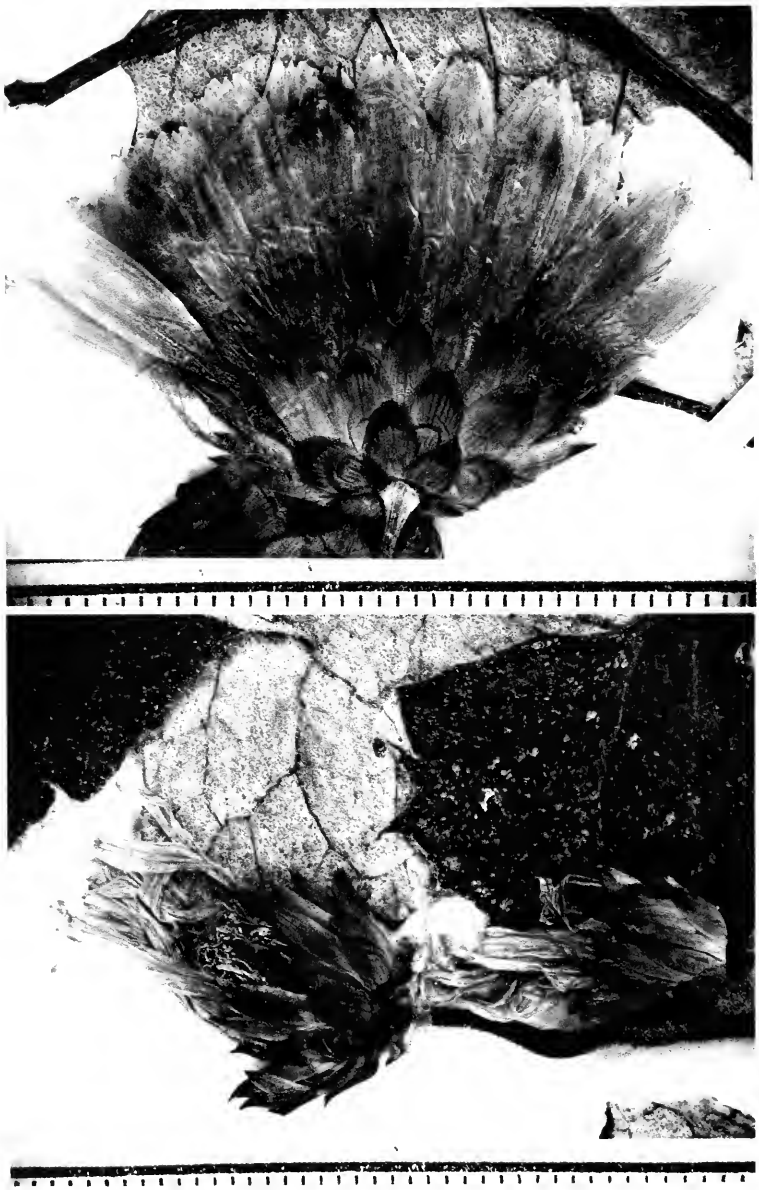
The new species is related to *Munnozia ferreyrii* which has the same general habit with the same type of mostly alternate branching of the inflorescence, the same lack of bristles in the pappus, six ribs on the achene and no obvious chaff on the receptacle. The species differs structurally in the basal sinus of the leaf blades reaching to the basal trinervation, by the broadly spreading hastate and acuminate basal lobes of the leaf, by the larger heads with essentially smooth and glabrous involucral bracts, by the larger disk corollas with longer more glabrous lobes, by the mostly glandular tips of the hairs on the tubes of the corollas, and by the separation of the squamellae of the pappus. The new species is also distinct in geography, being found on the Pacific slope of the outer Andean range in Cajamarca. The related *M. ferreyrii* occurs in eastern Cajamarca and farther eastward in Amazonas in the Amazonian drainage.

The lack of long chaff on the receptacle might seem to indicate that *Munnozia ferreyrii* and the present two species are related to the subgenus *Kastnera* which they also resemble in some aspects of their habit. Nevertheless, the fused leaf bases across the nodes and the polarized thickenings on the endothecial cells indicate that there is no close relationship to *Kastnera*.

The greater number of collections now known for *Munnozia ferreyrii* includes some variation. Most collections from Amazonas and those from Cajamarca are like the type with more remote leaf dentation, less densely pubescent leaves, and dense stipitate glandular pubescence on the involucral bracts. Two specimens from Amazonas, *King & Bishop 9147* and *Dillon & Turner 1724* (cytological voucher) have a tendency for denser dentation and pubescence on the leaves and have only evanescent arachnoid tomentum on the involucral bracts.

Munnozia harlingii H. Robinson, Holotype, Göteborgs Universitet Botaniska Museet. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Munnozia sagasteguii H. Robinson, Holotype, United States National Herbarium.



Enlargements of heads. Top. *Munnozia harlingii*. Bottom. *M. sagasteguii*.

GROWTH OF EPHEMERAL PLANTS FOR BIOREGULANT RESEARCH

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Recently there is increased interest in growth regulators and herbicides to modify plant growth and control weeds. Also, a vast number of chemicals are available for testing of biological activity. There is a necessity for broad primary screening methods that give maximum information in a short time concerning potential plant regulating chemicals.

Techniques for rapid screening have been developed using tissue culture, algae, and higher plant species. Detection of some types of bioactivity is possible by in vitro methods. However, completely controlled and unnatural growing conditions do not necessarily reflect the response of plants under outdoor field conditions. The reaction of plants that have different environmental requirements for growth and reproduction cannot be examined satisfactorily with a single species treated with chemicals and grown either under tissue culture or near tissue culture conditions.

In consideration of the limitations of available methods for detecting plant bioregulants, considerable thought and research was devoted to developing a rapid, space-conserving method for plant regulating chemicals. The original objectives were to domesticate plants that could complete their life cycle in 30 days or less, and that could be cultured in large numbers in confined space.

In initiating this project, it was recognized that the type of plants needed were short-lived, relatively small annuals (the type commonly referred to as ephemerals). Also, it was deemed necessary to grow the plants under standardized conditions in controlled environmental facilities. A search for potential test plants was made in four environments in southern California. These areas included the Mojave Desert, the San Gabriel and San Bernardino Mountain ranges, the Coastal Sage and grassland, and various cultivated areas in the region. The initial search was conducted during the flowering period of annuals that grew in each particular environment. Records were maintained concerning natural environmental and edaphic conditions under which the plants and set seed grew. All annuals that were small at maturity were marked and observed weekly. Seeds were collected during the normal period of dissemination, and type specimens were collected and mounted for future reference. Seeds from nearly 200 species were collected from the four natural environmental areas for research under controlled environmental conditions.

Germination tests were conducted on all seeds within 90 days after collection. Lots of 100 seeds were placed in petri dishes

between layers of filter paper and kept damp with distilled water. Initial tests were made in the dark at various constant temperatures ranging from 3 C to 27 C. The number of seeds germinating within a 20-day period was recorded, and this was considered to be the percent germination under the specific conditions used. Germination of 70% or better under any of the temperatures used was considered satisfactory. Seeds that did not have a high germination rate were subjected to specific pretreatments as follows: 50 C dry heat for seven days, 1 C under moist conditions in the dark for 20 days, a combination of the two treatments with the heat treatment preceding the cold treatment, running water for 48 hours, and scarification. Species whose seeds did not germinate more than 40% under any of the above treatments were discarded.

A series of experiments was initiated to develop and establish domestication conditions and practices for candidate bioregulant test species. The common garden weed, Senecio vulgare L., was used for initial evaluation of the system. This species was chosen because of the relative ease of obtaining seeds, culturing plants, and growing them to maturity. In the initial experiments involving temperature and photoperiod, the plants were grown in 150 ml styrofoam cups with holes punched in the bottom for drainage. The growing medium was washed river sand. The temperature regimes were 23 C day and 17 C night, 23 C day and 13 C night, 29 C day and 17 C night, and 29 C day and 23 C night. All temperature patterns were used with a 12-hr photoperiod and a 16-hr photoperiod. The S. vulgare strain used grew equally well with a single daily watering under either 23 C day and 17 C night, or 29 C day and 17 C night with either photoperiod. Therefore further experimentation with S. vulgare was confined to these specific culture temperatures and photoperiods.

Nutrients for ephemeral plants were examined from the standpoint of satisfactory plant growth, ease of application, and ready availability of the nutrient mixture in adequate quantities for large scale research projects. The complete inorganic fertilizer with a trade name of Kapco (15-30-15) was chosen as a standard. Two concentrations of Kapco, 10 g/l and 0.5 g/l were used. Other nutrient mixtures are available which are equally useful. The fertilizer solutions were applied in the place of water once a week, three times a week, and daily. Six cultures with three plants were used in each test replication. Controls were always used. Over 70% of the Senecio plants bloomed in 20 days or less with the nutrient solution, sand, and standard environmental conditions. All plants had excellent vegetative growth when 0.5 g/l of nutrient was applied daily with no other water applied. All other applications of Kapco resulted in less satisfactory plant growth. When 10 g/l was applied daily, all plants died. As a result of the data from the nutrient research, a practice of watering plants daily with 0.5 g/l Kapco solution was adopted.

Potting media were examined and sand was selected as the most desirable type. Therefore, washed river sand and graded silica sand were compared. Washed river sand varies considerably as to particle size, waterholding capacity, type of rock mixture, organic matter, and nutrients. Silica sand is a prepared mixture that is graded, with a consistent mineral content. An experiment was established with blocks of 30 plants each and 3 plants per culture; some blocks were planted in river sand, and the others in 1.6mm dia. silica sand. Plants were grown at 23 C day, 17 C night temperatures with a 12-hr photoperiod. All blocks of plants received daily Kapco nutrient treatments at 0.5 g/l. Twenty-six days after planting, all plants growing in river sand had flower buds, while only four plants in silica sand had flower buds. Vegetatively, plants in river sand were larger and more robust in appearance than those plants in silica sand.

Data from previous experiments demonstrated the presence of substantial variability of ephemeral plant growth at the various temperatures, photoperiods, culture media, and nutrient levels. Because of the possible variability of plant growth, standardized method of plant culture was established. Three groups of 5-10 seeds each were planted in washed river sand in 150 ml styrofoam cups with holes punched at the base for drainage. When the plants were in the cotyledon stage, they were thinned to 1 to 3 (depending on species), leaving the single strongest uniform plants. Plants were watered daily with Kapco, 0.5 g/l. Initial temperatures of 23 C day, 17 C night with a 12-hr photoperiod and temperatures of 29 C day, 17 C night with a 16-hr photoperiod were used. Plants were evaluated for rigor, growth pattern, size, time to flower, bud appearance, time to anthesis, time to seed maturity, and uniformity of all observed factors.

From the research outlined above, the following species selected as best suited for further investigation research; the group contains a wide range of natural morphological and physiological variations.

Chenopodium humile Hook is one of the common goosefoot group that are major weeds in temperature regions. C. humile grows at high elevations in moist alkaline places and is characterized by a decumbent rather than erect growth pattern. It is a short-day plant, blooming on a 12-hr photoperiod and remaining vegetative on a 16-hr photoperiod. When grown on a 12-hr photoperiod, plants bloom in as few as 14 days after planting the seed, when they are about 3cm in height. C. humile has a specific value in that it may be grown on a 16-hr photoperiod and treated by foliar chemical applications when desired plant size is reached. Then, the block may be divided, retaining one-half on the 16-hr photoperiod and the other one-half moved to a 12-hr photoperiod where flowering is induced. In this manner, in addition to observing the effects of chemicals on vegetative characters, observations may be made on

their effect of floral primordia initiation, development, and seed set. This series of vegetative and floral observations can be made in less than 30 days.

Lepidium flavum Torr. is one of the peppergrass group in the mustard family. L. flavum is native to the southwestern deserts of California. It is a winter annual and grows well at low temperatures. Therefore, it is not a satisfactory experimental ephemeral plant at higher temperatures. The plant is a day neutral rosette type with a central flower staff developing about 15 days after planting. It is a candidate experimental plant for screening of dwarfing and retarding plant growth regulators. L. flavum blooms in less than 30 days under the standard experimental conditions used in this research. Different plants of this species do not develop as uniformly as do the other species studied; it is, however, the best plant of a true rosette type investigated in the project.

Poa annua L. (Annual bluegrass) is practically a worldwide weed. It is an excellent grass for testing purposes, it germinates and grows rapidly. However, these are distinct P. annua strains. Seeds collected around Riverside, California, are from two distinct strains. One strain is heavier, robust, and flowers in 30-40 days. The other is slighter, with few stalks, and flowers under the conditions specified above in less than 20 days. The later strain has been isolated and can be maintained by growing seed plants in the greenhouse. Annual bluegrass is a typical grass and has the terminal meristem well protected from physical contact with materials applied during foliar treatment. It is good for screening for growth regulators and herbicides specific to grasses.

Rorippa obtusa (Nutt.) Britton belongs to the yellow cress group and a close relative of water cress. R. obtussa grows in damp places at higher elevations, particularly on lake shores and along streams. Although not common, it is generally distributed across the United States. It is a small, rapid-growing partial rosette type plant that flowers under the standard conditions of this research, in less than 25 days after planting. The plants are very consistent in growth habits and have excellent plant form; as such, they are of particular value in observing and separating multiple effects of plant regulating chemicals.

Rumex fueginus Phi. (Golden Dock) is an annual species of the Sorrel or Dock Family. It grows in wet and often brackish places. Although it is widespread across North America, it is only common on the Pacific Coast. R. fueginus is probably the smallest and most rapidly-growing species of the genus. It is a long-day plant, flowering on a 16-hr photoperiod and remaining vegetative on a 12-hr photoperiod. This photoperiod response is associated with day length and flower stalk initiation. If grown on a 16-hr photoperiod, R. fueginus can be induced to flower from seeding in about

30 days. It is a dicotyledonous plant that has a terminal meristem protected by an envelope of leaves and, hence, like the grasses, is protected from direct contact by foliar applied chemicals. Further, it is an acaulescent-type plant with the central stalk being initiated only for flowering.

Schismus arabicus Nees. is a low-tufted annual grass resembling the larger bunch grasses. It is native of Southest Asia and is widespread in the Mojave Desert. Under uniform growing conditions of this research, it matures rapidly but does not produce flowers until it is grown for more than three months. S. arabicus is a good experimental grass to observe possible dwarfing and lethal chemicals applied to grasses in a vegetative condition. Satisfactory seed germination occurs only after seeds are treated with running water. If exposed to running water for 24-hrs, germination of 90% or better will occur in one day. The characteristics of S. arabicus allow for exceptional uniformity of testing material.

Senecio vulgaris L. (Common Groundsel) is a common weed in gardens and waste places; it is practically worldwide in distribution. It is a well-rounded, multiple branched plant of excellent form when grown under a 12-hr photoperiod and a cool temperature. At higher temperatures and a 16-hr photoperiod, it generally forms a central stalk and does not produce the same multi-branched, well-rounded condition that exists at lower temperatures. Its terminal meristem and any axillary meristems that may be in active growth are unprotected and are directly contacted by any material that is generally sprayed on the plant. In this respect, it is a valuable partner of R. fueginus in comparing effects of treatment associated with transport of the experimental material applied to the foliage. S. vulgaris blooms in about 20 days from seeding at the longer photoperiod and higher temperatures and in about 30 days at the shorter photoperiod and lower temperature.

To determine the usefulness of groups of ephemeral plants in research, plants of C. humile, P. annua, R. fueginus, and S. vulgaris were treated with a series of growth and herbicides, at 1000 ppm, 500 ppm, 100 ppm, and 50 ppm. Two ml of test solution was sprayed on a container of three plants. Application was made 48 hours prior to the time that flower buds would be visible under the growing conditions used. A series of such compounds, including NAA, 2,4-D, phosphon, kinetin, MH, alar, ethrel, cycocel, and atrazine were applied. In most cases, the ephemeral plants reacted to the foliar applied chemicals in the same way that larger, longer-lived plants do.

Other research to determine response of ephemeral plants after treatment of the growing medium and uptake of the chemicals through the root system was conducted. The technique is useful since it simulates soil treatment and the concentration and time of application to the medium can be controlled. Several growth regulators

and herbicides listed above were applied to the growing medium with the watering solution. Typical responses resulted that have been noted for other plants in previous research widely reported in the literature.

An example of the use of ephemeral plants in bioregulant research follows: C. humile plants were placed in a controlled environment chamber with the long-day conditions (16-hr pp) and R. fueginus in the growth chamber with the short-day conditions (12-hr pp). At 15 to 18 days from seeding, the plants were in flower bud stage. Some were treated with growth regulators listed above and shifted to the other photoperiod, while others were left with the same photoperiod. After shift in photoperiod, other previously untreated plants were treated by foliar applicaiton of the same compounds. In 25 to 30 days from planting, the controls of those plants under the floral primordia initiating photoperiod produced large visible flowers. Vegetative effects of the test compounds were readily observable. Chemicals that affected either C. humile or R. fueginus plants were then used to treat P. annua, R. obtusa, and S. vulgare. P. annua and S. vulgare grown at 23 C day, 17 C night temperatures with a 12-hr pp, and R. obtusa grown at 29 C day, 17 C night temperatures with a 16-hr pp. were treated 48 hours prior to the average time for flower bud appearance and at chemical concentrations of 1000 ppm, 500 ppm, 100 ppm, and 50 ppm.

An adequate supply of seed of the species discussed as test plants here is easily maintained in a small greenhouse area. All of the plants have been grown in 150 ml styrofoam cups with river sand and nutrient solution, and in larger containers with the usual potting mixtures under average greenhouse conditions. No other conditions are required except in the case of C. humile and R. fueginus. These two species should be grown in a greenhouse or growth chamber under a vegetative photoperiod until an adequate-sized plant is obtained. At this point, they should be transferred to a floral primordia initiating photoperiod. Seeds are collected from greenhouse grown plants and stored for subsequent research.

If treatments are carefully timed, the method of research outlined here provides maximum information concerning vegetative effects, floral primordia initiation effects, and seed production effects in 30 days or less. The method produces information on the effect of a given compound on all phases of the morphological development of angiosperm over a wide taxonomial range of plants. The method is economical since many cultures of plants can be grown in limited space.

SCROTOCHLOA, A NEW GENUS OF PALEOTROPICAL PHAROID GRASSES

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The anomalous bamboo-like grass tribe Phareae Stapf (Poaceae) has long been known to include two genera, Pharus P. Browne (7 species) in the Neotropics and Leptaspis R. Br. in the Paleotropics. During the course of a biosystematic study of the tribe (a revision of Pharus has been completed and is being prepared for publication), examination of abundant material of the Old World genus on loan from major herbaria (AAU, BOGOR, BM, BR, BRI, GH, L, LE, M, NY, PNH, TAI, U, US, Z) soon showed that Leptaspis, despite its small size (5 species), should be split into two quite distinct and well-differentiated genera. The following new taxon is therefore proposed:

SCROTOCHLOA Judziewicz gen. nov.

(Poaceae: Bambusoideae (?): Phareae)

Gramen perenne monoecium sylvarum umbrosarum. Culmi cavi vel solidi, herbacei, erecti vel decumbentes. Folia pseudopetiolis prominentibus, laminis inversis, et venis lateralibus oblique divergentibus. Inflorescentia panicula umbelliformis nodo principali 1, ramis primariis 4-8, sub nodo principali disarticulans. Spiculae 1-florae, unisexuales, dimorphae, sine lodiculis. Spicula ♀ pedicello clavato, grandis, solitaria vel spicula ♂ pedicellata concomitata; glumae 2, ovatae, caducae, 5- ad 7-nervatae, spadiceae, apicis acutis; lemma urceolata-scrotiforme, marginibus connatis et poro terminali, indurescens, inflatum, dense uncinato-pubescens; palea linearis, 2-nervata; staminodia 6; stigmata 3, subplumosa. Spicula ♂ pedicello longo, parva, membranacea; glumae 2; flosculus caducus; stamina 6.

Perennial monoecious grasses of shaded forest understories; culms hollow (or apparently solid in S. tararaensis), herbaceous, erect or in age becoming decumbent and rooting at the nodes; leaves with open sheaths; ligule membranous, minute; pseudopetioles

prominent, twisted 180° at summit, inverting the blades; leaf blades narrow to broad, the lateral veins diverging obliquely from the midrib; minute longitudinal striations (intercostal bands) present between adjacent pairs of adaxial secondary lateral veins; inflorescence long-pedunculate, an umbelliform panicle with 1 principal node and 4-8 primary branches, the entire structure disarticulating just below the principal node; spikelets 1-flowered, unisexual, dimorphic, apparently lacking lodicules; pistillate spikelets borne on clavate pedicels, relatively large, solitary or more frequently accompanied by a pedicelled staminate spikelet; glumes 2, ovate, about as long as the lemma, caducous, 5-7-nerved, purplish-brown, their apices acute; lemma urceolate-scrotiform, with connate margins and a terminal pore through which the style exits, indurated, inflated, inconspicuously ribbed, densely uncinate-pubescent; palea linear, 2-nerved; staminodes 6, minute; stigmas 3, subplumose; staminate spikelets borne on long pedicels, much smaller than the pistillate spikelets, lanceolate; glumes 2, nearly as long as the floret; floret caducous; stamens 6; chromosome number unreported.

Type species: Scrotochloa urceolata (Roxburgh) Judziewicz comb. nov. (Basionym: Pharus urceolatus Roxb., Hort. Beng. [104]: Fl. Ind., ed. 2, 3: 611. 1832). Other known species: Scrotochloa tararaensis (P. Jansen) Judziewicz comb. nov. (Basionym: Leptaspis tararaensis Jansen, Reinwardtia 2: 304. 1953).

Scrotochloa is easily distinguished from all other grasses by its combination of inverted, obliquely-veined leaf blades and a detachable umbelliform panicle bearing densely uncinately hairy, pouch- or urn-shaped pistillate spikelets; the genus name was suggested by the latter feature. S. urceolata, with 3-7 cm wide glabrous leaf blades and 6-9 mm long pistillate spikelets, is widespread from Ceylon and Southeast Asia to New Guinea and the Solomon Islands; there is an excellent color photograph of this species on page 46 of Ayensu (1980). S. tararaensis, a rare endemic of western Papua, New Guinea, has leaf blades 1-1.5 cm wide and pistillate spikelets 4-5 mm long.

Leptaspis sensu stricto differs most obviously from the new genus in having cochleate pistillate lemmas and many-noded panicles in which the branches do not disarticulate from the rachis. It contains three species: L. angustifolia Summerhayes & Hubbard, endemic

TABLE 1. COMPARISON OF THE GENERA OF THE PHAREAE

Character	Pharus	Leptaspis	Scrotochloa
1. Culms	Solid	Solid	Hollow to solid
2. Intercostal bands between secondary lateral veins on adaxial (lower) leaf blade surface	Absent to prominent	Present but inconspicuous	Prominent
3. Principal nodes in inflorescence	(1-) 3-8	(2-) 3-7	1
4. Number of branches at each principal node of the inflorescence	1 (3 in one sp.)	1-3	4-8
5. Inflorescence and/or its branches disarticulating at maturity?	Yes	No	Yes
6. If yes to #5, where does disarticulation occur?	Between main branches and the rachis	---	Below the single principal node
7. Axis of inflorescence prolonged into a bristle?	Yes	No	No
8. Length of pistillate pedicel	0-1 mm	0-1 mm	Ca 5-10 mm
9. Summit of pistillate pedicel	Filiform	Filiform	Clavate
10. Sex ratio (staminate/ pistillate spikelets)	Ranging from about 0.5: 1 to about 1:1	1:1	Ranging from about 0.5: 1 to about 1:1

TABLE 1 (CONT.)

Character	Pharus	Leptaspis	Scrotochloa
11. Bract subtending spikelet branchlet	Absent	Often present	Absent
12. Number of pistillate glumes	2 (sometimes 3)	2 or often 3	2
13. Condition of pistillate gls.	Persistent	Persistent	Caducous
14. Number of nerves, pistillate glumes	3-7 (-11)	1-3	5-7
15. Apex of pistillate glumes	Acute	Cuspidate	Acute
16. Shape of pistillate lemmas (in profile)	Linear to sigmoid	Cochleate	Urceolate-scrotiform
17. Where does the style exit from the pistillate lemma?	Terminally	Laterally	Terminally
18. Margins of pistillate lemma	Free (fused in one species)	Fused	Fused
19. Stigmas	Hispid	Subplumose	Subplumose
20. Length of staminate pedicel	Ca 10 mm	1-5 mm	5-10 mm
21. Condition of staminate floret	Persistent	Caducous	Caducous
22. Staminate lodicules	Well-developed in one species only	Well-developed in at least one species	Absent
23. Range	Neotropical	Paleotropical (Africa to Fiji Islands)	Paleotropical (Ceylon to the Solomon Islands)

to the Fiji Islands; L. banksii R. Br., ranging from Indonesia and Taiwan south and east to Queensland (Australia) and New Caledonia; and L. cochleata Thwaites, widespread from western Africa to New Guinea. T.R. Soderstrom (pers. comm.) has found that an older specific epithet applies to the last taxon, and its nomenclature will be discussed in his forthcoming treatment of the genus in the "Grasses of Ceylon."

The three genera of the Phareae are compared in Table 1. Although relationships among them are far from clear, it appears that Leptaspis s.s. retains more unspecialized characters (especially the non-disarticulating panicle branches, the frequent presence of three pistillate glumes, and the frequent presence of a bract subtending the spikelet pair branchlet) than either Pharus or Scrotochloa. Considering its solid culms, the occasional presence of a third glume, and the persistence of the glumes in both sexes, Pharus may be more closely related to Leptaspis s.s. than it is to Scrotochloa. Anatomical research is in progress which has as its goal the elucidation of the intergeneric and intra-familial relationships of the Phareae. A taxonomic revision of Leptaspis and Scrotochloa is also under way.

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I am grateful for the very generous help that Thomas R. Soderstrom and Hugh H. Iltis have given me in my ongoing studies of the Pharoid grasses. Duane A. Kolterman kindly helped to prepare the Latin diagnosis. The E.K. and O.N. Allen and J.J. Davis Funds of the University of Wisconsin and the J. Harris Seed Company of Rochester, New York provided financial support for this research.

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Figure 1. Herbarium specimen of SCROTOCHLOA URCEOLATA from Sumatra (Jacobs 8275, A).


Photographed at the University of Wisconsin-Madison

CALYMPERES SCHMIDTII BROTH., AN EARLIER NAME FOR CALYMPERES NYMANII (FL.) REESE

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Brotherus (1901) reported on the mosses collected by J. Schmidt on the island of Ko Chang, off the southeastern coast of Thailand. When I examined the type collections of two of the new species of Calymperes he described--C. schmidtii and C. subintegrum--I found that the specimens all represented a single species that had later been redescribed several times under different names by subsequent authors. Brotherus' names for this moss take precedence over the later synonyms, and I here choose the name Calymperes schmidtii Broth. to represent the species.

Calymperes schmidtii Broth., Bot. Tid. 24: 119. 1901. TYPE: Thailand, Koh Chang, ad trunc. arb. in silva, 6/1 1900, J. Schmidt 14 (H!).

Calymperes subintegrum Broth., Bot. Tid. 24: 119. 1901. LECTOTYPE: Thailand, Koh Chang, ad trunc. arb. in silv. litor. 7/1 1900, J. Schmidt 23 (H!); SYNTYPE: Thailand, Koh Chang, Klong Majum, J. Schmidt 23 (H; NY!), syn. nov.

In an earlier publication (1984) I reviewed the nomenclature, diagnostic features, and distribution of this moss, which was already known from Thailand.

Acknowledgements

I thank the curators of H and NY for the loan of specimens, M. Crosby and C. Bauer for generous help with literature, and H. Mohamed for valuable consultation.

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Reese, W. D. 1984. Calymperes nymanii (Fl.) Reese, a new combination based on Syrrhopodon nymanii Fl. Phytologia 56(1): 17-18.

THE CORRECT NAME FOR CALYMPERES LONGIFOLIUM MITT. (MUSCI) IS SYRRHOPODON LOREUS (LAC.) REESE

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The nomenclatural history of Mitten's Calymperes longifolius was discussed recently by Reese and Tan (1983). However, in that article the authors failed to adopt the oldest name available for this species in Syrrhopodon, the genus to which this taxon properly belongs, and used instead the name S. perlongifolius Schultze-Motel. This lapse was called to my attention recently, and I here make the appropriate new combination, based on the oldest available epithet for this species in Syrrhopodon.

Syrrhopodon loreus (Lac.) Reese, comb. nov.

Basionym: Calymperes loreum Lac., Verhandl. K. Akad. Wetenschappen Amsterdam 13: 7. 1873. Type: Borneo, Laboean, Motley in herb. Mitten (L; isotype NY!).

Syrrhopodon perlongifolius Schultze-Motel, Willdenowia 7: 54. 1973, syn. nov.

I have not examined the holotype (L) but it is clear that Lacoste described his C. loreum from the same material that Mitten based his C. longifolium upon (Labuan, Borneo, Mr. Motley 23, NY!). This interpretation is confirmed by Lacoste's illustration of his C. loreum (Tab. IV, 1873), in which the habit of the plants and petiole-like constriction at the leaf bases are clearly shown, exactly as in the holotype of Mitten's C. longifolium. Evidently, Lacoste was unaware, at the time he published his C. loreum, that the same species had already been described by Mitten based on the same specimen.

Acknowledgements

I thank the New York Botanical Garden for the loan of specimens, and Bruce Allen for calling to my attention the incorrect application of nomenclature in Reese and Tan (1983).

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Reese, W. D. & B. C. Tan. 1983. The "petiolate" Calymperaceae: a review with a new species. Bull. Natn. Sci. Mus., Tokyo, Ser. B, 9(1): 23-32.

ON *ERIONEURON PILOSUM* VAR. *LONGEARISTATUM*: A RECTIFYING COMMENT

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En 1977 (Kurtziana 10: 58) I proposed a new combination: *Erioneuron pilosum* var. *longearistatum* (Kurtz) Anton, on the basis of *Triodia avenacea* var. *longearistata* Kurtz. At the same time, and according to Art. 7 of the International Code of Botanical Nomenclature (1972: 19; 1983: 7), I selected the specimen Kurtz 6729 (CORD) as lectotype of the variety, explaining in a footnote the reasons for such a decision. Furthermore, I clearly stated that Pringle 406 had to be excluded from the nomenclatural types of this entity, because it belongs to *Erioneuron avenaceum* var. *grandiflorum* (Vasey) Gould, a plant restricted to western Texas, southern New Mexico and northern Mexico (Gould, Grasses of Texas: 220, 1975).

At this point it seems worthwhile to remember that when describing his variety Kurtz (Revista Mus. La Plata 5: 301. 1893) cited, before the original description, two Argentinian specimens: Kurtz 6729 (from "Colinas secas cerca de la Estancia La Era", CORD) and Hieronymus s/n (from "Entre Malagueño y San Antonio", CORD); then, at the end of his diagnosis, appears Pringle 406 (from Chihuahua, Mexico).

The present commentary is pertinent to make clear the inconsistency of Beetle's criticism (Phytologia 49, n° 1: 39. 1981) when he stated that my point of view "...is clearly in error". Disregarding my statement in the mentioned footnote "...ha de excluirse como tipo nomenclatural a Pringle 406 pues se trata de *Erioneuron avenaceum* var. *grandiflorum*", Beetle insists in basing the varietal name of Kurtz upon Pringle 406. In so doing, he does not take into account neither the other two specimens cited by Kurtz nor my lectotype proposal, being this in discordance with Art. 8.1 of the Code (1983: 7), and producing an illegitimate name. In fact, Pringle 406 belongs to *E. avenaceum* var. *grandiflorum*, a name which ought to have been adopted for the plants growing in the United States and Mexico (Art. 63, ICBN, 1983: 55) instead of the one of Beetle, who mistakenly relegates the valid name to the list of synonyms.

TRANSFERS IN FLORIDA ORCHIDS

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The preparation of the Vascular Flora of Florida (D. S. Correll†, H. B. Correll, and R. P. Wunderlin) necessitates the following transfers in the Orchidaceae.

Pabst et al. (1981) recognize Anacheilium at the generic level, a segregate of Encyclia. The triandrous plants of Anacheilium cochleatum of Florida and the West Indies are usually treated at the varietal level. The applicable varietal epithet is mentioned incidentally by Small (1933), to whom it has been credited (e.g. Sauleda and Adams, 1983), but this combination was not validly published.

Anacheilium cochleatum (L.) Hoffsgg. var. triandrum (Ames) Sauleda, Wunderlin, et Hansen, comb. nov.

Basionym: Epidendrum cochleatum L. var. triandrum Ames, Contr. Orchid. S. Fl. 16. 1904.

The segregation of Sacoila Raf. from Stenorrhynchos by Garay (1982) necessitates the transfer of the following two varieties found in Florida.

Sacoila lanceolata (Aubl.) Garay var. luteoalba (Reichenb. f.) Sauleda, Wunderlin, et Hansen, comb. nov.

Basionym: Stenorrhynchos australis Lindl. var. luteoalbus Reichenb. f., Otia Bot. Hamburg 2: 83. 1881.

Sacoila lanceolata (Aubl.) Garay var. paludicola (Luer) Sauleda, Wunderlin, et Hansen, comb. nov.

Basionym: Spiranthes lanceolata (Aubl.) Léon var. paludicola Luer, Florida Orchidist 14: 19. 1971.

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Pabst, G. F., J. L. Moutinho, and A. V. Pinto. 1981. An attempt to establish the correct statement for genus Anacheilium Hoffmgg. and revision of the genus Hormidium Lindl. ex Heynh. Bradea 3: 173-186.

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Small, J. K. 1933. Manual of the Southeastern Flora. University of North Carolina Press, Chapel Hill.

ADDITIONAL NOTES ON THE GENUS *GMELINA*. VI

Harold N. Moldenke

GMELINA L.

Additional bibliography: Lour., Fl. Cochinch., ed. 1, imp. 2, 2: 376--377. 1967; V. & P. Singh, Journ. Econ. Tax. Bot. 2: 200. 1981; Shah & Gopal, Journ. Econ. Tax. Bot. 3: 362. 1982; Sharma, Journ. Econ. Tax. Bot. 3: 532. 1982; Yoganarasimhan, Togunashi, Keshav., & Govind., Journ. Econ. Tax. Bot. 3: 405. 1982; Mold., Phytologia 56: 154--182. 1984.

GMELINA ARBOREA Roxb.

Additional bibliography: V. & P. Singh, Journ. Econ. Tax. Bot. 2: 200. 1981; Shah & Gopal, Journ. Econ. Tax. Bot. 3: 362. 1982; Mold., Phytologia 56: 154, 168--171, 174, & 180. 1984.

Singh (1981) describes this species as a rare tree in forests, but commonly planted in gardens and parks in India, flowering there from April to June, noting that it "contains butyric acid, tartaric acid and saccharine matter". Shah & Gopal (1982) add that the ripe fruits are edible and the wood pulp is used in the paper industry in Gujarat (India).

GMELINA ASIATICA L.

Additional bibliography: Lour., Fl. Cochinch., ed. 1, imp. 2, 2: 376--377. 1967; Yoganarasimhan, Togunashi, Keshav., & Govind., Journ. Econ. Tax. Bot. 3: 405. 1982; Mold., Phytologia 56: 154, 167--169, 171, & 182. 1984.

Yoganarasimhan and his associates (1982) record an additional vernacular name for this species, "guldamara", and describe its economic uses in Karnataka (India) as "Roots demulcent, alterative, astringent, aromatic; used for rheumatism, gonorrhoea and catarrh of the bladder. Seeds contain fatty oil, sitosterol and colouring matter." Fernandes describes the plant as an "armed small tree, 10--15 feet tall", the corollas yellow, and found it in flower in February.

Additional citations: INDIA: Maharashtra: *J. Fernandes 88* (W--3004197).

GMELINA BRASSII Mold.

Additional bibliography: Mold., Phytologia 56: 32--33. 1984.

The *Brass 21915*, cited below, was previously incorrectly cited by me as representing the very closely related *G. dalrympleana* var. *schlechteri* (H. J. Lam) Mold. Brass describes the plant as a canopy tree, 25 m. tall, the corollas white or pinkish, and the ripe fruit black. They encountered it in rainforest on limestone, at an altitude of 30--60 m., in flower and fruit in April.

Additional citations: NEW GUINEA: Papua: *Brass 21915* (W--2603100) --isotype). MOUNTED CLIPPINGS: Mold., Phytologia 6: 324--325. 1957 (W).

GMELINA DALRYMPLEANA var. *SCHLECHTERI* (H. J. Lam) Mold.

Additional bibliography: Mold., Phytologia 56: 39--41. 1984.

The *Brass 21915*, mistakenly cited by me as this taxon in a previous paper, actually is the type collection of the closely related *G. brassii* Mold.

GMELINA DELAVAYANA Dop

Additional bibliography: Mold., Phytologia 56: 35, 41--43, & 108. 1984.

Additional citations: MOUNTED CLIPPINGS: W. W. Sm., Notes Bot. Gard. Edinb. 9: 107--108. 1916 (W).

GMELINA HAINANENSIS Oliv.

Additional bibliography: Mold., Phytologia 56: 154 & 175. 1984.

Taam describes this plant as an erect, woody shrub, 15--"26" feet tall, with fragrant flowers and "gray" fruit, referring to it as "rare, scattered" along roadsides, or abundant, in flower in May and in fruit in June.

Additional citations: CHINA: Kwangtung: *Taam 635* (Mi, *808* (Mi).

GMELINA PHILIPPENSIS Cham.

Additional bibliography: Lour., Fl. Cochinch., ed. 1, imp. 2, 2: 376--377. 1967; Sharma, Journ. Econ. Tax. Bot. 3: 532. 1982; Mold., Phytologia 56: 161--173. 1984.

Sharma (1982) lists this species from East Punjab (India), but fails to state if wild or cultivated. He claims that is flowers there from April to August and cites his *nos. 2676** & *4559*.

Loureiro, in his Flora Cochinchinensis, identified this taxon with *G. asiatica* L., but with a question. He assigns to it Rumpf's *Radix Deiparae spuria, Lowara*. commenting that "Quamvis in figurâ Rumphianâ folia sint 3-loba, in nostrâ vero integerrima, non judicavi diversam speciem decernere, cum pleraque alia conveniant, imprimis corollae forma personata. Pro hoc genere, & specie a Celeb. Lin. citatur *Jambosa sylvestris parvi-folia*,(Rumph. l. pag. 129. tab. 40.) quae procul-dubio *Eugeniae* species est, nullatenus *Gmelinae*."

In regard to its "virtues", he notes: "Calefaciens, Resolvens. Valent in doloribus articulorum, &c affectibus nervorum radix interne sumpta, folia externa applicata."

GMELINA RACEMOSA (Lour.) Merr.

Additional bibliography: Lour., Fl. Cochinch., ed. 1, imp. 2, 2: 376--377. 1967; Mold., Phytologia 56: 173--176. 1984.

In view of the fact that Loureiro went so far astray in assigning this plant to the genus *Lantana*, it may be important to quote his original description here: "Cây Tlai. Differ. spec. Lant. foliis oppositis, sub-rotundis: caule arboreo inermi: tacemis terminalibus. H., & notaE. Arbor magna, ramis patentibus inermibus. Folia subrotunda, acuminata, integerrima, plana, glabra, dura, obscuroviridia, subtus albicantia, opposita, petiolis longis, basi glandulosis. Flos albus, magnus, racemis compositis, nudis, vastis, terminalibus. Cal. sub-truncatus, denticulis 4-5, minimis. Corolla campanulata, 5-fida, sub-aequalis. Drupa carnosa, turbinata, compressa, apice re-

tusa: nuce 2-loculari. Stamina Didynamica. De stigmate (an unicatum?) non amplius recordor. Habitat in sylvis Cochinchinae: ubi ejus lignum caeditur pro aedificiis." The vernacular name, "cây tlai", which he records, is not otherwise recorded for the species.

Additional citations: MOUNTED CLIPPINGS: Dop, Bull. Soc. Bot. France 61: 322. 1914 (W).

GMELINA UNIFLORA Stapf in Hook., Icon. Pl. 24: pl. 2391. 1895.

Synonymy: *Gmelina uniflora* var. *typica* Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 66. 1921. *Gmelina spectabilis* Ridl., in herb.

Bibliography: Stapf in Hook., Icon. Pl. 24: pl. 2391. 1895; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 185. 1902; H. J. Lam, Verbenac. Malay. Arch. 215, 217, & 366. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 3 & 64--68. 1921; E. D. Merr., Bibliog. Enum. Born. Pl. 515. 1921; Stapf, Ind. Lond. 3: 299. 1930; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1074. 1932; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 185. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 65 & 93 (1942) and ed. 2, 146 & 186. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 185. 1959; Mold., Résumé 192, 193, & 456. 1959; Mold,., Fifth Summ. 1: 325 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 315 & 549. 1980; Mold., Phytologia 52: 23 (1982) and 55: 333 & 493. 1984.

Illustrations: Stapf in Hook., Icon. Pl. 24: pl. 2391. 1895.

A "small tree" or climber, to 20 m. long; stems cylindric, to 8 cm. in diameter; bark smooth; branchlets yellowish-hairy, eventually glabrescent; leaves decussate-opposite; petioles 1.5--2.5 cm. long, yellowish-hairy, eventually glabrescent; leaf-blades membranous or chartaceous, broadly elliptic or obovate-elliptic, 7--15 cm. long, 4--10 cm. wide, apically obtuse or shortly acuminate, marginally entire, basally rounded or truncate, glabrous and shiny (except for the midrib) above, not pubescent but very densely white-glandular beneath, the glands very small, the larger venation sparsely short-pilose; secondaries 3 or 4 pairs, with some (usually 2) large concave glands beneath the lowest pair; flowers solitary in the axils of the upper leaves, pendulous; pedicels 1.2--2.1 cm. long; bractlets 2, broadly ovate, 1--4 cm. long, 0.5--2 cm. wide, opposite, more or less foliaceous, sessile, concave, apically obtuse or short-acuminate, basally obtuse or broadly rounded, often subcordate, surrounding or subtending the calyx, 8--10-veined; calyx 2--2.5 cm. long, 7--12 mm. wide, 5-laciniate to about 1/3 its length, the lobes large, deltoid, 7--10 mm. long, 5--7 mm. wide, externally hirsute-hairy with dark-brown hairs, sometimes sparsely white-glandular; corolla yellowish-white or pale-yellow, dark-yellow on the inside of the throat, externally softly hairy and white-glandular, the tube 2.5 cm. long, the limb bilabiate, the upper lip with 2 small semicircular lobes, the lower lip with 2 semicircular and 1 (the middle) enlarged to 1 cm. in length; stamens included; style slender, about 3 cm. long; stigma shortly bifid, the lobes subulate; ovary apically narrowed and there covered with stiff hairs, 4-celled, 4-ovulate; fruit basally included by the enlarged fruiting-calyx, 2.5--3.2 cm. long.

Lam (1919) cites with a question *Haviland 919* from Borneo, of

which he saw only a sterile flowerless specimen which differed in its petioles being 2.5--3.5 cm. long and the leaf-blades oblong, 20--27 cm. long, 10 cm. wide, basally often subcuneate. Bakhuizen (1921) cites *Jaheri 526* for his *G. uniflora* var. *typica* from Borneo. He cites nothing else.

Van Steenis, in a personal communication to me, notes that "*Gmelina uniflora* Stapf is een liaan, fraaie klier a.d. blad-basis (schotelvormig) blad overstaand, triplinerf. Motley meent dat het small tree is aff. *G. spectabilis* Ridley."

Collectors have encountered this plant at 300--1300 feet altitude, growing in yellow sandy loam, in flower in April and in fruit in November. Kostermans refers to it as "rare".

Material has been misidentified and distributed in some herbaria as *Faradaya matthewsii* Merr.

Citations: GREATER SUNDA ISLANDS: Kalimantan: *Holttum 25116* (Bz--21337, Bz--21338, N); *Jaheri 526* (Bz--21339, Bz--21340); *Kostermans 10521* (N). Sarawak: *Garai s.n.* [10-2-1892] (Bz--21341). MOUNTED ILLUSTRATIONS & CLIPPINGS: Stapf in Hook., Icon. Pl. 24: pl. 2391. 1895 (Ut--74495).

GMELINA UNIFLORA var. *VILLOSA* Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 66. 1921.

Synonymy: *Gmelina quadrifida* H. J. Lam, in herb.

Bibliography: Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 66. 1921; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1074. 1932; Mold., Résumé 193 & 456. 1959; Mold., Fifth Summ. 1: 325 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 315 & 549. 1980; Mold., Phytologia 55: 333. 1984.

This variety differs from the typical form of the species in its leaf-blades being longer and wider, hirtellous above with sparse, long, simple hairs, densely pilose on the larger venation, subvillous beneath, the venation softly pilose, more densely glandular-punctate, basally scarcely or hardly at all glanduliferous, the secondaries 4--7 per side, basally subplinerved, the petioles to 6 cm. long, and the inflorescences 1--3-flowered.

The branchlets are densely ferruginous-tomentose, in age only densely resinous-punctate and sparsely lenticellate, the internodes glabrous; petioles terete, 1.5--6 cm. long, densely ferruginous-villous, obsoletely sulcate above; inflorescence axillary, solitary or paired, short-pedunculate, 1--3-flowered; peduncles 6.5--10 mm. long, densely rufous-tomentose; bracts and bractlets foliaceous, subsessile, lanceolate, 7--15 mm. long, 2.5--3 mm. wide, apically acute, hiding the calyx, rufous-tomentose on both surfaces; calyx infundibular, 1.5--2 cm. long, 5--10 mm. wide, externally rufous-pubescent and sparsely glandulose, internally very densely villous, unequally 5-laciniate, the segments deltoid, 5--10 mm. long, 2.5--3 mm. wide, apically acute, adhering to each other; corolla large, unequally 5-laciniate, the tube basally externally glabrous, apically densely pilose, internally glabrous, the lower 1/3 attenuate, apically abruptly campanulate and subventricose-ampliate, 2.5--3.5 cm. long or twice as long as the calyx, the limb subbilabiate, the upper lip 2-lobed, the lobes broadly ovate, 5--7 mm. long, apically obtuse

to rounded, the lower lip 3-lobed, the 2 lateral lobes similar to those on the upper lip, but the central one larger, 7--10 mm. wide; stamens didynamous, scarcely exserted, the shorter pair 10--12 mm. long, the longer pair 15--17 mm. long; filaments all basally laterally compressed and glabrous, apically incurved and sparsely glandular-hirsute; anthers introrse, bilocular, dorsifixed near the apex, the thecae widely divaricate basally, 3--3.5 mm. long, resinous-punctate; style filiform, terete, 2.5--3.5 cm. long, scarcely exserted, apically incurved; stigma obscurely and unequally bifid, pseudo-subulate; ovary sessile, ovate, apically externally villous and glandular-punctate, 4-locular, each cell 1-ovulate; fruiting-calyx somewhat expanded radially, unilaterally incised almost to the base; fruit drupaceous, medium-sized, oblong or obovate, 2.5--3.5 cm. long, 1.5--2 cm. wide, fleshy, apically externally densely farinose, eventually glabrescent, the endocarp thickly woody.

This variety is based on *Jaheri 1109, 1300,* & *1463* from Soengei Bloe-oe, Borneo, deposited in the Buitenzorg herbarium.

Citations: GREATER SUNDA ISLANDS: Kalimantan: *Jaheri 1109* (Bz--21347--cotype), *1300* (Bz--21345--cotype, Bz--21346--cotype, N--cotype), *1463* (Bz--21342--cotype, Bz--21343--cotype, Bz--21344--cotype, Ld--photo of cotype, N--photo of cotype).

GMELINA? VESTITA Wall., Numer. List 49 [=50], no. 1820 hyponym. 1829.

Bibliography: Wall., Numer. List 49 [=50], no. 1820. 1829; Schau. in A. DC., Prodr. 11: 680. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 200. 1858; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1040 (1893) and imp. 2, 1: 1040. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 127 & 186. 1949; Mold., Résumé 163 & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew.., imp. 3, 1: 1040. 1960; Mold., Fifth Summ. 1: 276 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 263 & 550. 1980.

Nothing is known to me of this plant except that Wallich (1829) bases the name on a collection from Kyunk-Talong on the Irrawaddy, a 1250-mile long river in Burma, emptying into the Bay of Bengal, collected in 1826, but without fruit. The type is probably deposited in the East India Company herbarium at Kew.

Schauer (1847) also regarded this species as a doubtful member of the genus, although Jackson (1893) seems to accept it without question.

GMELINA VITIENSIS (Seem.) Seem., Viti 440 nom. nud. 1862; Mold., Alph. List Inv. Names 56. 1942; A. C. Sm., Allertonia 1: 414. 1978

Synonymy: *Gmelina vitiensis* Seem., Viti. 440 nom. nud. 1862. *Vitex (Euagnus) vitiensis* Seem., Fl. Vit. 190, pl. 45. 1866. *Vitex vitiensis* (Seem.) Seem. ex Mold., Alph. List Inv. Names 56 in syn. 1942.

Bibliography: Seem., Viti 440. 1862; Seem., Fl. Vit. 190--191, pl. 45. 1866; Horne, Year Fiji 269. 1881; Drake del Castillo, Illustr. Fl. Ins. Mar. Pacif., imp. 1, 260 & 432. 1886; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1040 (1893) and imp. 1, 2:

1214. 1895; Stapf, Ind. Lond. 6: 479. 1931; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 69 & 93. 1942; Mold., Alph. List Inv. Names 56. 1942; H. B. R. Parham, Fiji Nat. Pl. 68. 1943; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1040 (1946) and imp. 2, 2: 1214. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 151 & 186. 1949; A. C. Sm., Journ. Arnold Arb. 36: 287. 1955; Mold., Résumè 207, 391, & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1040 (1960) and imp. 3, 2: 1214. 1960; J. W. Parham, Pl. Fiji Isls., ed. 1, 214, fig. 77. 1964; Uphof, Dict. Econ. Pl., ed. 2, 246. 1968; Mold., Fifth Summ. 1: 343 (1971) and 2: 731 & 880. 1971; J. W. Parham, Pl. Fiji Isls., ed. 2, 300, fig. 90. 1972; Drake del Castillo, Illust. Fl. Ins. Mar. Pacif., imp. 2, 260 & 432. 1977; A. C. Sm., Allertonia 1: 414--415. 1978; Mold., Phytol. Mem. 2: 333 & 550. 1980; Mold., Phytologia 55: 333 & 468. 1984.

Illustrations: Seem., Fl. Vit. pl. 45 (in color). 1866; J. W. Parham, Pl. Fiji Isls., ed. 1, 214, fig. 77 (1964) and ed. 2, 300, fig. 90. 1972.

A tall tree,to 27 m. tall, with a trunk diameter to 75 cm.; leaves simple, decussate-opposite; petioles 1.2--2.4 cm. long; leaf-blades ovate or ovate-oblong, 7.5--12.5 cm. long, 3.5--6.5 cm. wide, apically acuminate, glabrescent; inflorescence paniculate, terminal, the cymes pedunculate, erect, narrow; calyx cyathiform, the rim shortly and acutely 5-repand-dentate, externally puberulent; corolla showy, blue, bilabiate, externally puberulent, the upper lip 2-lobed, the lower lip 3-lobed; filaments puberulent; anthers ovate; stigma unequally bifid, the branches acute; ovary 4-celled.

This species is based on *Milne 224*, collected on Ngau, Fiji Islands, in October, 1855, and deposited in the Kew herbarium. Actually, Seemann (1866) merely cites an unnumbered Milne collection, but Smith (1978) has designated the Kew material of *224* (2 sheets) as holotype. He also asserts that the binomial, *Gmelina vitiensis* (Seem.) Seem., should be credited to my Known Geogr. Distrib. Verbenac., ed. 1, 69 (1942), but it only occurs there as *G. vitiensis* Seem. and is as truly a nom. nud. there as it is in Seemann's original 1862 work; similarly, in my Alph. List Inv. Names 56 (1942), which he also cites, the combination is not validly published in accordance with the provisions of the Code. It would appear to me that it was not validly made until by Smith himself in 1978. He comments that "Although *Gmelina vitiensis*, endemic to Fiji, is considered a good furniture wood and is a large tree 6--27 m. high, with a trunk diameter of 70--75 cm., it is not well represented in herbaria, only some 16 collections being known to me. These come from the islands of Viti Levu, Kandavu, Ngau, and Vanua Levu, where the tree occurs in dense forests at altitudes of 90--600 m."

Seemann (1866) comments that "Milne collected only one specimen of this singular plant, all the leaves of which are truly simple; but it may be that the species has also compound leaves, like most of its congeners. The unequal lobes of the stigma point to a certain relationship with *Gmelina*, but all the other characters are those of a genuine *Vitex*." Drawings, made by McDonald and on which Seemann's original illustration was based, are preserved on the holotype material at Kew.

Parham (1943) also refers to this plant as a moderately common, fine timber tree, which "Grows to great height in the forests of Bua. Timber suitable for furniture, etc." Uphof (1968) reports for *Gmelina arborea* Roxb. that "Parts of the plant form with the roots of *Epipremnum pinnatum* yoro or awalho of the Fiji islanders", but it may be assumed that this Fiji reference is to *G. vitiensis*, the only *Gmelina* known from these islands.

The *J. P. Mead 2010*, distributed as *Gmelina vitiensis*, certainly is a misidentification.

Citations: FIJI ISLANDS: Viti Levu: *A. C. Smith 5505* (Bi, N, N, S), *5822* (Bi, N, N, S). MOUNTED ILLUSTRATIONS: Seem., Fl. Vit. pl. 45, 1886 (Ld).

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ADDITIONAL NOTES ON THE GENUS *CORNUTIA*. VIII

Harold N. Moldenke

CORNUTIA Plum.

Additional & emended bibliography: Plum., Nov. Cat. Pl. Amer. Gen. 32--33, pl. 17. 1703; J. Burm., Thes. Zeyl. 209. 1737; Lour., Fl. Cochinch., ed. 1, imp. 1, 2: 387. 1790; Link, Enum. Hort. Berol. 2: 127. 1822; Hubert, Trav. Lab. Mat. Med. Fac. Pharm. 13: [Verb. Util. Mat. Med.] 3. 1921; Lour., Fl. Cochinch., ed. 1, imp. 2, 2: 387. 1967; Mold., Phytologia 55: 276--278 & 507. 1984.

Plumier's original (1703) description of this genus is worth reproducing here, especially for its dedicatory paragraph: "*Cornutia* est plantae genus flore A monopetalo, personato, cujus labium superius surrectum, inferius vero tripartitum; ex calyce autem C surgit pistillum, posticae floris parti B, ad instar clavi infixum, quod deinde abit in fructum, sed baccam D succi plenam, sphaericam, & semine E foetam plerumque reniformi. Cornutiae unicam speciem. *Cornutia* flore pyramidato caeruleo, foliis incanis. Clarissimus D. Jacobus, Cornuti D. Medicus Parisiensis, Canadensium plantarum, aliarumque nondum editarum Historiam conscripsit, adjectis iconibus; cui additum est ad Calcem Enchiridion Botanicum Parisiense, continens indicem plantarum quae in pagis, sylvis, pratis & montosis juxta Parisios locis nascuntur. Extat Opus Parisiis apud Sim. le Moyne, via Jacobaea 1635 - in quarto."

CORNUTIA COERULEA (Jacq.) Mold.

Additional bibliography: Link, Enum. Hort. Berol. 2: 127. 1822; Mold., Phytologia 55: 278. 1984.

CORNUTIA GRANDIFOLIA (Schlecht. & Cham.) Schau.

Additional bibliography: Mold., Phytologia 55: 278. 1984.

The corollas are described as having been "blue" on *Calzada 383 & 397*, *Croat 40597*, *Moreno 241, 476, 540, & 1839*, and *Zelaya 107*, "lavender-blue" on *Croat 41933*, "blue-violet, the lower lip with a

dark-yellow spot" on *Cochrane & al. 8628*, "light-violet" on *Vincelli 333*, "violet" on *Araquistain & Moreno 999*, *Fay & al. 783* & *823*, and *Neill 2492*, "lavender" on *Hammel 3884*, *4333*, & *5285*, and *Liesner & Judziewicz 14968*, "lilac" on *Wendt & al. 2563*, "light-purple" on *Guzman & al. 465*, and "purple" on *Castro T. 122*, *Diaz Z. 160*, *Grijalva & Araquistain 237*, *Moreno 79*, *1018*, & *1308*, *Stevens 3355*, *3524*, *9189*, *9601*, & *11448*, *Todzia 1843*, and *Vincelli 829*.

Todzia describes the plant as a small tree, 4 m. tall, the crushed leaves with a pungent odor, and encountered it in remnant forests and pastures, at 1500 m. altitude, in flower in June. Croat refers to it as a shrub, 2 m. tall, the stems square, the sap "with a foul aroma", and found it growing among disturbed vegetation in volcanic ash, at 1300 m. altitude, in Guatemala, in flower in July, and as a 3.5 m. shrub on limestone outcrops at 900 m. altitude in Mexico. Chez-Pompa & Riba refer to it as "rare". Cochrane and his associates found "several stems, 2 m. tall, sprouting from an old stump" and collected cytological material. Dr. Sousa, in a personal communication to me, records the species from Quintana Roo, Mexico. Seymour (1980) cites *Atwood A.79* from Esteli, Nicaragua.

Additional vernacular names recorded for the species are "palo de hormiga", "palo quadrodo", and "tres vatas".

Material of this taxon has been misidentified and distributed in some herbaria as *C. grandifolia* var. *normalis* (Kuntze) Mold., *C. pyramidata* L., and even *Solanum* sp. On the other hand, the *Dorantes & Acosta 2147bis* and *Wedel 2173* distributed as typical *C. grandifolia*, actually are var. *intermedia* Mold., *Skutch 2642* and *Tyson 1874a* are var. *normalis* (Kuntze) Mold., *Skutch 1326* is *C. latifolia* (H.B.K.) Mold., *Atwood & Neill AN.79* is *C. lilacina* var. *velutina* Mold., *Moreno 876* and *Wiley 430* are *C. pyramidata* var. *isthmica* Mold., and *Velazquez L. 64* is not verbenaceous.

Additional citations: MEXICO: Chiapas: *Croat 40597* (Ld); *Lathrop 6251* (Me--167593), *6718* (Me--167579). Oaxaca: *Martínez-Calderon 15* (W--1840978). Veracruz: *Calzada 383* (Me--154676), *397* (Me--154675); *Chavelas P., Zamora S., & Soria R. ES.4210* (Me--176845); *Cochrane & al. 8628* (Ld); *Fay, Byrne & Hernandez 823* (Au, N, W--2879380); *Fay & Calzada 783* (Au, N, W--2879409); *Gomez-Pompa & Riba 140* (Me--118518); *Ventura A. 5863* (Mi); *Wendl, Villalobos, & Lara M. 2563* (Ld). GUATEMALA: El Petén: *Ortíz 1318* (W--2925227). Escuintla: *Muenscher 12414* (It). Sacatepéquez: *Croat 41933* (Ld). BELIZE: *Gentle 7968* (W--2434859). HONDURAS: Atlántida: *Yuncker, Koepper, & Wagner 8298* (W--1747729). El Paraiso: *Castro T. 122* (E--2903435); *Díaz Z. 160* (Ld); *Zelaya 107* (E--2903444). EL SALVADOR: San Salvador: *González & Pérez 261* (Me--188474). NICARAGUA: Boaco: *Araquistain & Moreno 999* (Ld); *Moreno 241* (Ld), *3258* (Ld); *W. D. Stevens 9309* (Ld). Chontales: *W. D. Stevens 2492* (Ld). Esteli: *Moreno 1308* (Ld); *Neill N.204* (Ln--266881, N); *Stevens, Geijalva, & Araquistain 14375* (Ld). Granada: *Atwood & Neill AN.79* (N); *Moreno 79* (Ld). Jinotega: *Grijalva & Araquistain 237* (Ld); *Moreno 476* (Ld), *540* (Ld), *1114* (Ld), *1839* (Ld); *W. D. Stevens 9189* (Ld), *11448* (Ld). Madriz: *Moreno 2767* (Ld); *Vincelli 829* (Ld). Managua: *Guzman, Castro, & Montiel 465* (Ld); *W. D. Stevens 3524* (Ld). Matagalpa: *Moreno 1018* (Ld); *W. D. Stevens 9601* (Ld); *Tomlin 73* (Ld); *Vincelli 333* (Ld).

(to be continued)

BOOK REVIEWS

Alma L. Moldenke

"SHRUBS IN THE LANDSCAPE" by Joseph Hudak, ix & 292 pp., 4 color pl. of 80 photo., 598 b/w photo., 1 vegetation hardiness zone map & 19 charts. McGraw-Hill Book Company, New York, N. Y. 10020. 8th printing. 1984. $34.95.

"This [really valuable] book is primarily concerned with the ornamental attractions of shrubs in the landscape and the proper handling of them for practical and aesthetic satisfaction throughout the United States and the lower part of Canada." The highly regarded author's motivating objectives are: "to select only shrubs with a large number of desirable features, to include representative examples for all the hardiness zones across the United States and southern Canada, to list superior types cultivated today in commercial nurseries and to identify those shrubs with a relative freedom from important diseases and insect pests." This book will serve amply both the professional landscaper and the careful home gardener. The many illustrations enhance the book but a few are printed so small and so dark as to be recognizable only if one already knows the species depicted.

"THE OXFORD BOOK OF INSECTS" text by John Burton & illustrations by Joyce Bee, Derek Whiteley & Peter Parks, viii & 213 pp., 96 multi-fig. color pl. & 72 b/w line draw. Oxford University Press, London, England, and New York, N. Y. 10016. 1982. $6.95 paperbound pocket edition.

Every right-hand page is a color plate of several related British insects and the plant parts on which they are found: every left-hand page bears descriptive text. In all, 780 creatures are illustrated and described with common, scientific and family names, brief life histories, habitat notes and proportionate size. Like the "Oxford Book of Wild Flowers" and the "Oxford Book of Birds" this one's "main purpose is to encourage people to observe and identify the vast range of very varied insects to be found around them.....but still a small proportion of the 20,000 or more species which exist in Britain." Most of the insects are skillfully drawn from life and the drawings are very attractively printed in this fine little book.

"ENVIRONMENTAL TOXICOLOGY BOOKS, REPORTS, AND JOURNALS: An Annotated Bibliography", EPAD Report No. 26, xi & 25 pp. National Audubon Society, New York, N. Y. 10022. 1984.

"This [mimeographed, effectively prepared] report is intended for the use of National Audubon Society members and staff as well as the general public." It is composed of reliably annotated bibliog-

raphies of toxicology and cancer books, journals, standard texts and reports, and therefore should prove quite useful.

"THE ENCYCLOPEDIA OF NORTH AMERICAN WILDLIFE" by Stanley Klein, 320 pp., 250 color photo, 1 b/w photo & 1 map in color. Facts on File, Inc., New York, N. Y. 10016. 1983. $35.00.

This is a fine book for school and public libraries and for a treasured possession of youngsters fascinated with the vertebrate animal life of this country and continent who may become the biological scientists, hobby naturalists and conservationists of the next generation. The illustrations are copious and excellent. The text is arranged according to classes and alphabetically within them, embracing over 300 kinds of creatures, giving habit, habitat, physical traits, mating patterns, economic importance and special items of interest. The first sentence on mammals defines the term as including a "backbone" which the animals possess because they are vertebrates; the same statement is made in the introductory definition of reptiles -- they possess a backbone because they are vertebrates, not because they are mammals or reptiles. Surely the authors knows this!

"FLOWER ARRANGEMENT: The Ikebana Way" by Minobu Ohi, Senei Ikenobo, Houn Ohara, & Sofu Teshigahara, edited by William C. Steer, 286 pp., 63 full color pl. & photo., ca. 400 b/w pl. & photo., & ca. 100 line draw. 8th printing. Charles E. Tuttle Co., Inc., Rutland, P. O. Box 410, Vermont 05701. $19.50.

Dr. Steere, in his preface to this beautifully illustrated, very well printed, enduring book, explains for the westerner how this art form was introduced into Japan from China with Buddhism as temple floral offerings whose arrangement had special religious significances. The first chapter gives an interesting history of ikebana. The others present the views of the headmasters of three of the most outstanding schools: the classical Ikenobo and the 20th century Ohara and Sogetsu Schools. "The deeper one's insights are into Ikebana, the greater will be his understanding of the philosophical concepts and the emotional message intended by the arranger to be conveyed by his composition -- and to give such insights is the purpose of this book."

"THE ESSENTIALS OF BONSAI" by the Editors of Shufunotomo, 108 pp., 26 color pl. & photo., 74 b/w pl. & photo. & 77 line draw.. Charles E. Tuttle Company, Inc., Rutland, P. O. Box 401, Vermont 05701. 2nd printing. 1984. $9.95.

The preface and introduction by Donald Richie state that "this book offers the essentials of bonsai to those who would like to get started and to those who already have some experience in this fas-

cinating field" and also to armchair readers because of its interesting presentation and effective illustrations. This skilled art form also came from China with Buddhism, with records extending back to the 12th century. Bonsai is not considered deforming but as a garden is regarded as controlled nature in miniature, so are bonsai trees regarded. There is even a section in the book dealing with rock plants, herbs and grasses.

"THE JAPANESE ART OF STONE APPRECIATION -- Suiseki and Its Use with Bonsai" by Vincent T. Covello & Yuji Yoshimura, 166 pp., 71 full color photo., 81 b/w photo., 15 line draw. & 1 map. Charles E. Tuttle Company, Inc., Rutland, P. O. Box 401, Vermont 05701. 1984. $21.50.

Miniature landscape stones of special intrinsic beauty, carefully aligned in trays and often adorned with bonsai plantings, were introduced from Chinese temples to Japan in about 600 A.D. More of their history is traced in this book, including the many shows devoted to them, such as in the 1964 Tokyo Olympics and the bicentennial ones given by the Japanese nation to the United States National Arboretum in 1976. There are chapters on characteristics and important aesthetic qualities, classification by shape, color, etc., display, bonsai and collecting. Much more has to be "seen" in these stones than just their physical appearance. This book provides interesting reading.

"A GUIDE TO THE GARDENS OF KYOTO" by Marc Treib & Ron Herman, xv & 202 pp., 13 color pl., 107 b/w photo. 18 maps, 1 tab. & 15 line draw. Charles E. Tuttle Company, Inc., Rutland, P. O. Box 410, Vermont 05701. 2nd printing. 1983. $9.95 paperbound.

If you or any of your friends are going to visit Kyoto and would like to see some of the many gardens in the city, do take this pocket-sized book with you because of its concentrated descriptions, histories, maps, hours, regulations, etc. for these beautiful areas usually associated with ancient or modern Buddhist temples, Shinto shrines and palaces. Some are of sand mouldings, suiseki stone forms, the Moss Temple with over 40 kinds of moss blending into a single, fine, luxuriant textured carpeting for the entire maple-wooded garden, pond gardens, etc.. Without the ability to read and speak Japanese these beauty spots might prove difficult or very time-consuming to find. This book should also be of interest to former travelers to Kyoto and to professional gardeners, landscapers and horticulturists.

"A REVIEW OF THE SOUTHERN AFRICAN SPECIES OF *CYRTANTHUS*" by C. Reid & R. Allen Dyer, iv & 68 pp., 16 color photo., 47 b/w fig. & 21 geog. dist. maps. American Plant Life Society, P. O. Box 150, La Jolla, California 92038. 1984. $12.00 in U.S.A. & Canada, $14.00 elsewhere; paperbound.

This attractive issue represents a special 50th anniversary production under the new editor, R. Mitchel Beauchamp, after the long, fine service to amaryllid aficionados and specialists of the previous editor of "PLANT LIFE", Dr. Hamilton Traub, recently deceased. The cover illustrates in color *Cyrtanthus tuckii* var. *transvaalensis* and was first used as a cover in 1939 for the related journal "HERBERTIA". For the herein recognized 50 species there are given a key to the species, a systematic treatment, literature citations, geographic distribution maps, color plates and line drawings of definitive characteristics. Only pertinent synonymy and literature is cited, making this special issue both very attractive and taxonomically valuable.

"SPIDERS OF THE WORLD" by Rod & Ken Preston-Mafham, 191 pp, 66 color photo, 38 b/w photo. & 47 line draw. Facts on File Publications, New York, N. Y. 10016. 1984. $17.95.

This delightful book is prepared for interested naturalists (especially well travelled ones) rather than accomplished arachnologists (who would, however, also certainly enjoy this beautifully illustrated overview). Some biology, entomology and beginning arachnology students should find this book excellent supplementary reading especially for such topics as courtship and mating, prey capture and defense mechanisms and the closing statement that "whatever the shape or form of man's future follies, it is certain that spiders will still be laying traps for flies long after man has finally disappeared from the earth."

"NUTRITION UPDATE" Volume I by Jean Weininger & George M. Briggs, xiii & 386 pp., 34 tab. & 8 fig. Wiley Interscience Publication of John Wiley & Sons, Inc., New York, N. Y. 10158. 1983. $32.50.

This volume of papers is excellently prepared and presented by cognizant and known author-specialists. It deals clearly, scientifically and with particularly well documented evidence (rather than with a dozen rats or a score of humans under highly variable conditions) about (1) such current issues in nutrition as caffein, additives, dietary sodium, and alcohol, (2) recent progress re zinc, selenium, and fiber, (3) minerals throughout the life cycles for pregnancy, infant feeding and metabolic bone diseases and (4) nutrition policy and food advertizing. It makes an excellent text and/or reference book for nutrition educators, dieticians, college and nursing school teachers of nutrition and related fields, public health nutrition students, practitioners and professionals as well as the intelligent lay person who wants levelheaded evaluations of well intentioned food faddist advocacies.

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UNA NUEVA ESPECIE DE STACHYS (LABIATAE) DEL CENTRO DE MEXICO*

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Con algo de retiscencia se describe como nuevo a este miembro de la flora del Valle de México, perteneciente a un género de taxonomía difícil, lejos de estar cabalmente comprendida y resuelta. Para mayor abundamiento, la planta en cuestión no destaca de manera claramente contrastante de lo que parecen ser sus allegados más próximos, pero tampoco es fácil ubicarla en alguno de ellos sin forzar considerablemente los límites de su variabilidad conocida.

Stachys sanchezii sp. n.

Herba perennis usque ad 60 cm alta, rhizomatosa; caules praecipue ad angulos retrorse hispiduli; folia

*Trabajo parcialmente subvencionado por el Consejo Nacional de Ciencia y Tecnología.

oblonga, ovata vel triangulari-ovata, usque ad 5 cm longa et 3 cm lata, apice rotundata, margine crenata, basi cordata vel truncata, subtus conspicue nervata; verticillastri (2) 4-6-flori, interrupti; calyx 5-8 mm longus, segmentis spinosis; corolla rosea vel lilacina, tubo 8-11 mm longo, infra medium leviter annulato, labio superiore 3-4 mm longo, inferiore 6-8 mm longo et lato; stamina 2-3 mm e tubo exserta.

TIPO: Cerca de Casas Viejas, municipio de Zinacantepec, alt. 3400 m, 1.VII.1984, Rzedowski 38408 (ENCB).

Planta herbácea perenne, hasta de 60 cm de alto, a menudo formando colonias grandes, a partir de un conjunto de rizomas subterráneos; tallos erectos o ascendentes, poco o nada ramificados, a veces enraizando en los nudos inferiores, densa a muy esparcidamente hispídulos con pelos retrorsos de 0.5 a 1 mm de largo, la pubescencia concentrada en forma total o preferente sobre los ángulos del tallo; hojas con peciolos de (0.1) 0.5 a 4 cm de largo, por lo general más cortos hacia la parte superior de la planta, limbo oblongo a ovado o triangular-ovado, de 1 a 5 cm de largo, de 0.5 a 3 cm de ancho, ápice redondeado a subagudo, borde crenado, base cordada a truncada, 5-9-palmatinervado a partir de la base, con la venación muy conspicua en el envés, que suele ser pálido (al menos en ejemplares de herbario), haz uniforme y más bien esparcidamente estriguloso, en el envés la pubescencia restringida a las nervaduras; inflorescencia hasta de 10 (15) cm de largo, verticilastros de (2) 4 a 6 flo-

res, interruptos, separándose con la edad hasta 5 cm entre sí, flores sobre pedicelos hasta de 2 mm de largo, brácteas inconspicuas, filiformes o subuladas, de 1 a 2 mm de largo; cáliz acampanado a subcilíndrico (en fruto a menudo urceolado), de 5 a 8 mm de largo, más o menos densamente hispídulo por fuera, sus lóbulos triangulares, agudos, terminados en una espina larga, en conjunto abarcando 2 a 3 mm de largo; corola rosada o de color violeta con manchas lineares más oscuras y más claras en los labios, tubo de 8 a 11 mm de largo, levemente anillado en la parte inferior, labio superior de 3 a 4 mm de largo, el inferior de 6 a 8 mm de largo y de ancho, pubérulos por fuera y también por dentro cerca de la garganta; estambres exsertos 2 a 3 mm del tubo de la corola, filamentos pubescentes, anteras negruzcas, de ±1 mm de largo, estilo glabro; mericarpios ovoides, de ±2 mm de largo, de color café a negruzco.

Material adicional examinado:

DISTRITO FEDERAL: Cañada de Contreras, VIII.1952, F. Gallegos Harking 398, 401 (MEXU); Desierto de los Leones, V. 1953, L. Paray 999 (ENCB); ibid. IX.1962, I. Rojano 37 (ENCB); WSW of Mexico City and ca. 5 mi. (8 km) by road NW of Parque Nacional Desierto de los Leones along side road ca. 2 mi. (3.2 km) above pueblo of Cruz Blanca, alt. 3210 m, 27.VI.1974, R. Sanders 74102 (ENCB); cerca de los Llanos de Acopilco, próximos al 4° dinamo de Contreras, alt. 3000 m, 4.VIII.1984, Rzedowski 38429 (ENCB).

ESTADO DE MEXICO: Nevado de Toluca, alt. 3500 m,

20.XI.1961, L. Paray 814 (ENCB); ibid., alt. 2800 m, 19.VIII.1962, R. Vázquez Bravo 39 (ENCB); ibid., alt. 3000 m, 19.VIII.1962, R. Vázquez Bravo 68 (ENCB); Mex. hwy 130, 22.3 miles north of Temascaltepec, alt. 3060 m, 5.VIII.1969, W.R. Anderson y C. Anderson 5025 (ENCB); along highway S of Capulin past Nevado de Toluca, alt. 10300', 30.VII.1977, Wieder, Torke, Bennett y Dunn 110 (ENCB); alrededores de Cerro Gordo, Parque Nacional Nevado de Toluca, alt. 3400 m, 27.VIII.1983, R. Galván 1409 (ENCB); Loma Alta, cerca de Raíces, municipio de Zinacantepec, alt. 3350 m, 1.VII.1984, Rzedowski 38409 (ENCB).

HIDALGO: El Chico, VI-VII.1927, E. Lyonnet 166 (MEXU).

El ejemplar Pringle 5341, colectado en el Valle de Toluca, el 29.VIII.1882, citado por Epling como paratipo de *S. radicans* Epl., también posiblemente pertenece aquí, aunque es poco representativo por sus hojas pequeñas y por la escasez de pubescencia.

S. sanchezii parece encontrar acomodo en el grupo VI de la clasificación provisional de las especies americanas de *Stachys*, propuesta por Epling (Repert. Spec. Nov. Beih. 80: 1-75. 1934) y ahí, al parecer, se acerca más a *S. pringlei* Greenm., de Hidalgo, y a *S. mexicana* Benth., de Oaxaca. Se trata de un conjunto de taxa muy relacionados entre sí, cuyo correcto arreglo taxonómico requiere todavía de profundos estudios. En la siguiente tabla se resumen las principales diferencias entre estas 3 especies.

	S. pringlei	S. mexicana	S. sanchezii
segmentos del cáliz floríf<u>e</u>ro	angostamen-te triangu-lares, de ±3 mm de largo	anchamente triangula-res, de ±2 mm de largo	triangulares, de ±2 mm de largo
margen de la hoja	crenado-as<u>e</u>rrado a as<u>e</u>rrado	crenado	crenado
inflorescen-cia	ramificada, hasta de 25 cm de largo	simple, has<u>t</u>a de 15 cm de largo	simple, hasta de 10 (15) cm de largo
nervaduras en el envés de la hoja	moderadamen<u>t</u>e pronun-ciadas	muy conspi-cuas	muy conspi-cuas
pubescencia del tallo	hispídula, concentrada en los ángu<u>l</u>os	setosa, más o menos uni<u>f</u>ormemente distribuida	hispídula, concentrada en los ángu-los

Varios ejemplares de S. sanchezii fueron identifica dos por C. Epling como S. grahamii Benth., pero la descripción original de esta última especie excluye toda posibilidad de acomodar ahí individuos con flores tan grandes como las de la planta que aquí se describe.

S. sanchezii prospera a lo largo de arroyos y en ca

ñadas en medio del bosque de coníferas, en altitudes cercanas a 3000 m. Parece concentrar el mayor número de sus poblaciones en la región próxima al Nevado de Toluca; en el Valle de México no es frecuente y en los últimos años ya ha sido difícil localizarla.

Los ejemplares estudiados del taxon nuevo manifiestan una notable variación en la densidad de la pubescencia, en el largo de los peciolos y en el número de flores por verticilastro, a pesar de lo cual existen pocas dudas de que todos pertenecen a la misma especie.

El nombre de la planta se dedica como homenaje al recién fallecido Prof. Oscar Sánchez Sánchez (1923-1983), quien durante 12 años fue catedrático de botánica en la Escuela Normal Superior de la Ciudad de México. Impartió clases asimismo en la Facultad de Ciencias de la Universidad Nacional Autónoma de México. El Maestro Sánchez publicó en 1958 "Las excursiones botánicas en el Distrito Federal" y en 1969 "La flora del Valle de México", fruto de largos años de empeñoso y entusiasta trabajo. Ambas obras, profusamente ilustradas, son guías útiles para la identificación de las especies vegetales de los alrededores de la capital de la República y han contribuido a despertar el interés del público citadino por el mundo de las plantas.

Hypericum silenoides var. mexicanum, NUEVA COMBINACION

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En trabajo previo sobre el género Hypericum (Rodríguez, 1973), se indicó que en la especie H. silenoides Juss., se observaron, en un limitado número de ejemplares, variaciones morfológicas relacionadas con el tamaño de la planta y la forma de la hoja; sin embargo, las características de flor y fruto se mantenían constantes. De acuerdo con estas observaciones se estableció que la especie H. confusum Rose, era sinónimo de H. silenoides.

Estudios posteriores efectuados en mayor número de colectas, corroboraron las variaciones indicadas y se observaron modificaciones en el número de estilos de la flor (3, 4 y 5), así como en el tamaño del fruto. Asimismo, se pudo correlacionar las diferencias morfológicas con la altitud en que habitan los individuos de esta especie.

En base a lo anterior, se juzga apropiado restablecer la independencia de H. confusum a nivel de variedad y en consecuencia se propone la nueva combinación.

Hypericum silenoides Juss. var. mexicanum (Keller) Rodríguez comb. nov.

H. confusum Rose, Contr. U. S. Nat. Herb. 10:124. 1906. Tipo: México, Serranía del Ajusco, Pringle 6440 (holotipo US, isotipos BR, G, GOET, P)

H. brevistylum var. mexicanum Keller, Bull. Herb. Boiss. ser. 2, 8:188. 1908. Tipo: México, Serranía del Ajusco, Pringle 6440 (holotipo G)

La diferencia con la variedad silenoides se manifiesta en el habitat cespitoso, generalmente perenne; la escasa altura de

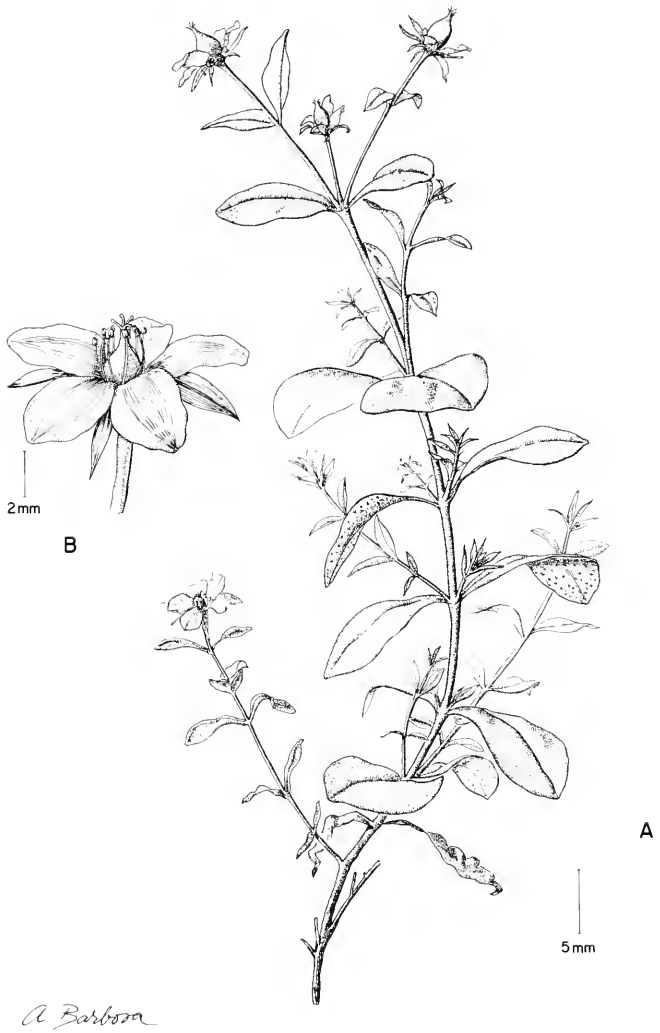

Fig. 1. Hypericum silenoides Juss. var. mexicanum (Keller) Rodríguez
A. Aspecto de la planta; B. flor

la planta (2 a 7 cm.), el tamaño y forma de las hojas (de 3 a 9 mm. de largo y oblongas a elípticas); y en el variable número de estilos, generalmente 4, en ocasiones 3 ó 5. Se le encuentra principalmente en bosques de coníferas de algunas de las sierras que rodean el Valle de México, en altitudes que fluctúan de 3,000 a 3,500 m.s.n.m., a diferencia de la variedad silenoides la que se localiza en altitudes de 2,250 a 3,050 m.s.n.m.

Los granos de polen en la especie son tricolporados, tectados, prolatos y con ornamentación reticulada. De menor tamaño en la variedad mexicanum (17 a 19 μ) que en la variedad silenoides (26 a 30 μ). Asimismo, existen diferencias en el grosor de la exina, la cual es de hasta 2.5 μ en silenoides, mientras que en mexicanum mide aproximadamente 1.5 μ.

Bibliografía

Robson, N.K.B. 1981. Studies in the genus Hypericum L. (Guttiferae). 2. Characters of the genus. Bull. Mus. Nat. Hist. (Bot.) 8(2): 55-226.

Rodríguez, J.C. 1973. Recherches sur Hypericum L., section Brathys (Mutis ex L. f.) Choisy, sous-section Spachium Keller (Guttiferae). Mem. Soc. Cien. Nat. La Salle 33 (94, 95): 5-151.

Se agradece al M. en C. Rodolfo Palacios la preparación y toma de fotografías de los granos de polen.

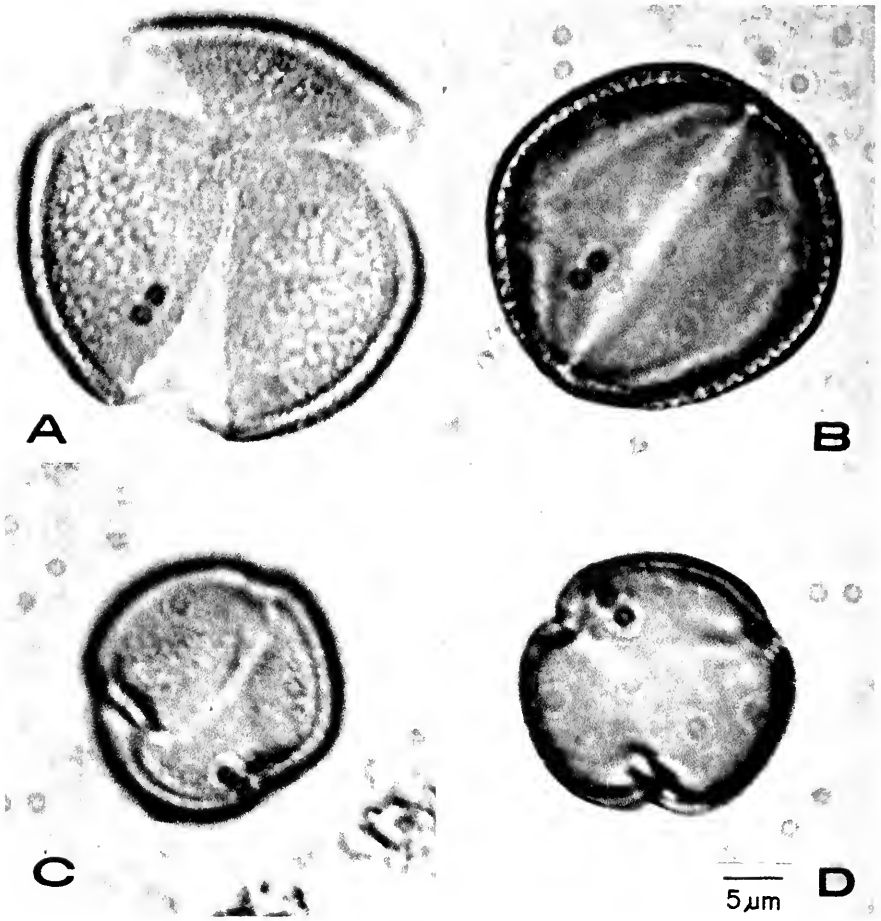

Fig.2. Granos de polen A.Hypericum silenoides var. silenoides ,vista polar superficial;B.H.silenoides var. silenoides,vista ecuatorial mostrando el grosor de la exina;C.H.silenoides var.mexicanum,vista polar superficial;D.H.silenoides var.mexicanum,vista ecuatorial mostrando el grosor de la exina.

DOS NUEVAS ESPECIES DE *EUPATORIUM* (*COMPOSITAE*) DEL VALLE DE MEXICO

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Al llevar a cabo la revisión del género *Eupatorium* de la familia *Compositae* para la Flora del Valle de México, nos encontramos con dos grupos de ejemplares cuyas características no corresponden a las que se mencionan en la descripción de las especies hasta ahora conocidas, razón por la cual, pensamos que se trata de dos nuevas entidades a las que hemos denominado *Eupatorium parayanum* y *Eupatorium ramireziorum*. La primera en honor al Dr. Ladislao Paray, incansable excursionista quien ha aprovechado esta afición en beneficio del conocimiento botánico, especialmente del grupo de las Compuestas, y la segunda en honor, tanto a la profesora Débora Ramírez Cantú, quien durante muchos años estuvo a cargo del herbario MEXU, como al naturalista José Ramírez, quien a fines del siglo pasado publicó la "Introducción para una flora del Valle de México", aportando así, una de las primeras publicaciones referentes al conocimiento de nuestra Cuenca.

Eupatorium parayanum Espinosa sp. n.

Herba perennis usque ad 1 m alta; caulis erectus, dense glanduloso-pubescens; folia opposita, petiolus 3-7 mm longus, glanduloso-pubescens, lamina ovata vel ovato-lanceolata, 6-10 cm longa, 3-6 cm lata, apice acuta, margine grosse serrato-dentata, basi rotundata, supra densius pubescens, praesertim versus marginem cum pilis glandulosis, e basi 3-5-nervata; capitula numerosa, 7-9 mm longa; pedicelli glanduloso-pubescentes; involucrum 5-6 mm longum, 6-7 mm latum, ultra corollarum longitudinis dimidium obtegens; phyllaria aequilonga, acuta, glanduloso-pubescentia; flores 30-40; corollae lobi pilosi; achaenium costis pubescentibus.

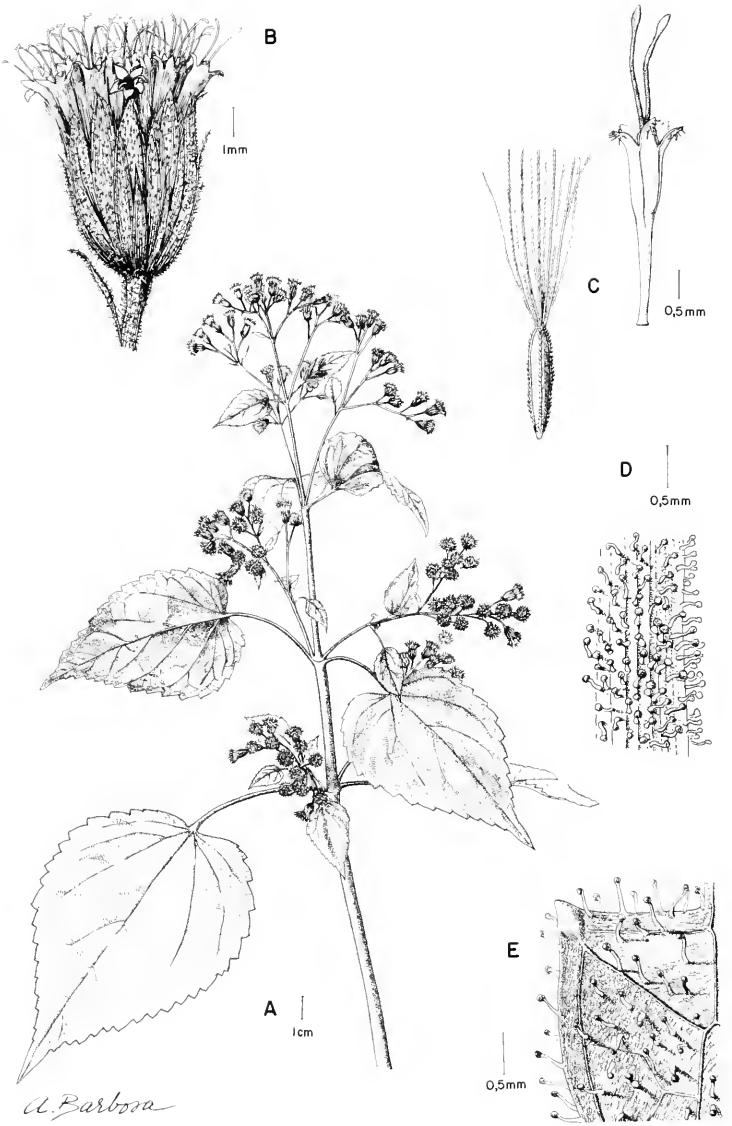

Fig. 1. Eupatorium parayanum Espinosa sp. n.
A. Aspecto general de la planta; B. Cabezuela;
C. Aquenio con vilano, corola; D. Fragmento de tallo;
E. Fragmento de hoja.

Planta herbácea perenne hasta de 1 m de altura; tallo erguido, cilíndrico, de 2 a 3.5 mm de diámetro, blanco-amarillento, densamente glanduloso-pubescente; hojas opuestas, membranáceas, pecíolo de 3 a 7 cm de largo, amarillento, glanduloso-pubescente, lámina ovada u ovado-lanceolada, de 6 a 10 cm de largo por 3 a 6 cm de ancho, ápice agudo o ligeramente acuminado, borde toscamente aserrado-dentado, los dientes agudos, base redondeada, haz y envés con pelos cortos, rígidos, la pubescencia más densa en el haz, frecuentemente con pelos glandulares especialmente en el borde, tri a pentanervada desde la base; numerosos capítulos de 7 a 9 mm de largo dispuestos en corimbos compuestos terminales y axilares; pedicelos glanduloso-pubescentes; involucro turbinado, de 5 a 6 mm de largo por 6 a 7 mm de ancho, cubriendo más de la mitad del largo de las corolas, sus brácteas dispuestas en 3 series de aproximadamente igual longitud, oblongo-lanceoladas, agudas, verdes, glanduloso-pubescentes; flores 30 a 40; corola de 4.5 a 5 mm de largo, blanca, pilosa en los lóbulos; aquenio de 2 mm de largo, pubescente en las costillas; vilano ligeramente más corto que la corola, cerdas blancas. Florece y fructifica a fines de invierno y principio de primavera.

Habitat: Se ha colectado en bosque de Abies entre 2600 y 3200 m de altitud, en la delegación de Cuajimalpa y en el municipio de Amecameca.

Tipo: MEXICO: ESTADO DE MEXICO: MUNICIPIO DE AMECAMECA: Ladera norte del Cerro Venacho; alt. 3000 m; bosque de Abies religiosa; 6 III 1981; J. Espinosa 1510 (ENCB).

Otros ejemplares examinados: MEXICO: ESTADO DE MEXICO: MUNICIPIO DE AMECAMECA: Cerro Venacho, al E de Amecameca; alt. 3000 m; bosque de Abies; 21 III 1976; J. Rzedowski 33967 (ENCB). 10 km al E de Amecameca; - alt. 3200 m; bosque de Abies; 10 III 1963; E. Chávez s/n (ENCB). Faldas del Iztaccihuatl (Papaloaque); 13 II 1955; L. Paray 1520 (ENCB, MEXU). DELEGACION DE CUAJIMALPA: Desierto de los Leones; 3 III 1940; F. Miranda 123 (MEXU).

Esta nueva especie parece ser bastante cercana a Eupatorium viscosissimum Rolfe, siendo las principales diferencias entre ellas, las siguientes: en E. parayanum la pubescencia glandulosa del tallo es muy densa; las hojas son de base redondeada, borde con dientes largos

y agudos y abundantes pelos glandulares; la inflorescencia es muy densa y las corolas tienen lóbulos pilosos; en E. viscosissimum la pubescencia del tallo es poco densa, las hojas tienen base cordada, borde con dientes cortos y redondeados y menor cantidad de pelos glandulares, la inflorescencia es poco densa y los lóbulos de la corola son glabros.

Agradecemos a Annetta Carter el haber comparado nuestro material con el ejemplar tipo de E. viscosissimum Rolfe depositado en el herbario UC.

Eupatorium ramireziorum Espinosa sp. n.

Herba perennis usque ad 2 m alta; caulis erectus, puberulus; folia opposita, petiolus 2-4 cm longus, lamina ovata vel rhombica, 8-15 cm longa, 5-10 cm lata, apice acuta vel aliquot acuminata, margine crenato-dentata, basi decurrens et plerumque obliqua, supra pilis brevissimis, infra praecipue nervisequens pubescens, 3-5-plinervia; capitula numerosa, 5-7 mm longa; pedicelli villosi; involucrum 3.5-4.5 mm longum, 5 mm latum, flores longitudine subaequans; phyllaria aequilonga, acuta, omnia sed praecipue exteriora pubescentia; flores 20-30; corolla 3.5-4 mm longa, lobis pilosis; achaenium pilosum, pappus corollam longitudine subaequans.

Planta herbácea perenne hasta de 2 m de altura; tallo erguido, cilíndrico, de unos 3 mm de diámetro, café-amarillento, puberulento; hojas opuestas, membranáceas, pecíolo de 1 a 4 cm de largo, puberulento, lámina ovada o rómbico-ovada, de 8 a 15 cm de largo por 5 a 10 cm de ancho, ápice agudo o algo acuminado, borde crenado-dentado, base cuneada o decurrente, haz con pelos muy cortos, envés pubescente sobre todo en la nervadura, 2 a 4 nervios laterales salen por arriba de la base del nervio central; numerosos capítulos de 5 a 7 mm de largo dispuestos en corimbos compuestos terminales y axilares más largos que las hojas, pedicelos vellosos; involucro campanulado, de 3.5 a 4.5 mm de largo por ±5 mm de ancho, casi del largo de las flores, sus brácteas dispuestas en tres series de la misma longitud, lanceoladas, agudas, verdosas, pubescentes sobre todo las externas, con dos costillas prominentes; flores 20 a 30; corola de 3.5 a 4 mm de largo, blanca, pilosa en los lóbulos; aquenio de ±1.5 mm de largo, piloso, vilano casi del largo de la corola, cerdas blancas. Florece y fructifica a fines de invierno y principio de primavera.

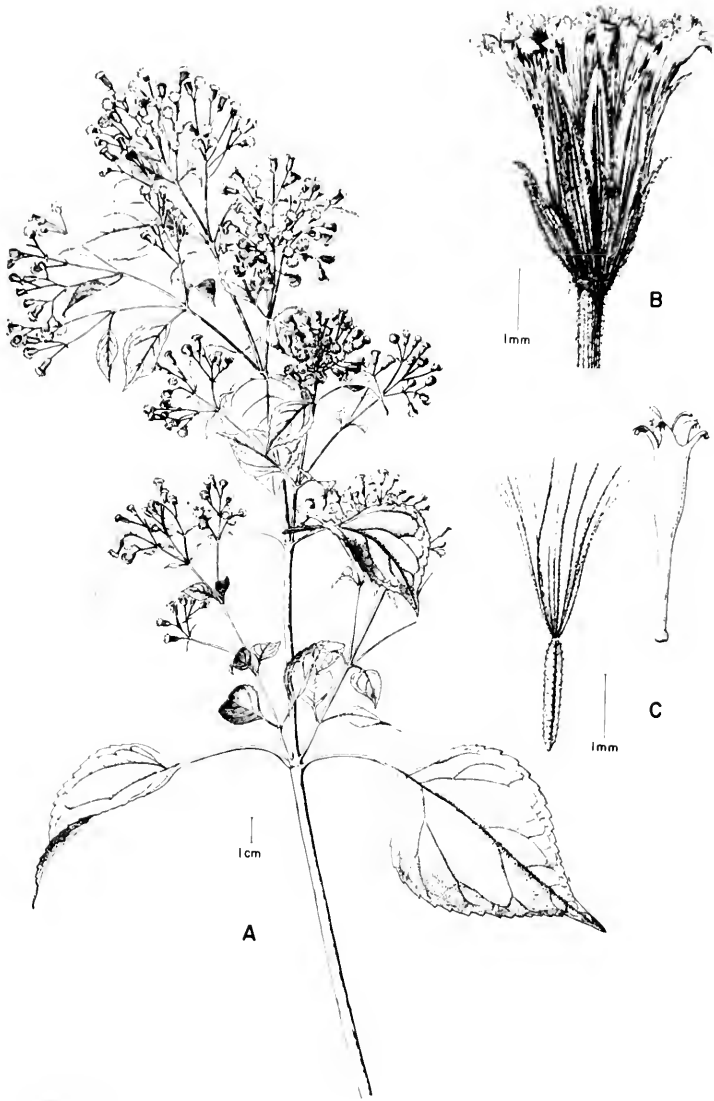

Fig. 2. Eupatorium ramireziorum Espinosa sp. n.
A. Aspecto general de la planta; B. Cabezuela;
C. Aquenio con vilano, corola.

Habitat: Se ha colectado en bosque de encino y en bosque mesófilo, entre 2500 y 3000 m de altitud, en los municipios de Villa Nicolás Romero y Amecameca y en la delegación de Cuajimalpa.

Tipo: MEXICO: ESTADO DE MEXICO: MUNICIPIO DE AMECAMECA: 2 km al E de la Hacienda de Tomacoco; alt. 2650 m; fondo de cañada con bosque mesófilo; 22 III 1981; J. Espinosa 1525 (ENCB).

Otros ejemplares examinados: MEXICO: DISTRITO FEDERAL: Desierto de los Leones; II 1953; L. Paray 1116 (ENCB, MEXU). III 1954; L. Paray 1386 (ENCB, MEXU). III 1959; L. Paray 2914 (ENCB). Cerca de la Venta; III 1963: L. Paray 3381 (ENCB, MEXU). ESTADO DE MEXICO: MUNICIPIO VILLA NICOLAS ROMERO: Entre Progreso Industrial y Cahuacán; alt. 2600 m; ladera con bosque de encino; 14 III 1981; J. Espinosa 1517 (ENCB).

Los ejemplares que corresponden a esta especie se han identificado frecuentemente como *E. aschenbornianum* Schauer, especie ésta que seguramente corresponde a lo que De Candolle determinó anteriormente como *E. bustamenta*.

Agradecemos al Dr. J. Rzedowski la traducción al latín de la descripción de ambas especies, así como algunos comentarios de él recibidos; al biólogo A. Barbosa la elaboración de las láminas que ilustran las especies descritas.

A NEW COMBINATION IN AMBROSIA (HELIANTHEAE-ASTERACEAE) FROM PERU

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Ambrosia dentata (Cabr.) Dillon, comb. nov.

Franseria dentata Cabr., Bol. Soc. Argent. Bot. 10: 25. 1962. TYPE: PERU. Depto. Arequipa. Prov. Caraveli: lomas del Puerto Lomas, 390 m, 13 Nov 1957, N. Angulo 2554 (holotype: LP, not seen).

Ambrosia parvifolia Payne, Brittonia 18: 35. 1966. TYPE: PERU. Depto. Arequipa. Prov. Caraveli: Nazca-Chaviña, desert, 200 m, 16 Mar 1951, W. Rauh & D. Hirsh P498 (holotype: NY, not seen).

A recent collecting trip in the lomas formations of coastal Peru yielded a small subshrub with ambrosioid characteristics. Cabrera (1962) described this unusual species within Franseria, a genus now considered congeneric with Ambrosia (Payne, 1964), thus necessitating the present combination. Payne (1966), apparently unaware of Cabrera's earlier description, redescribed the species as an Ambrosia, and stated that it resembled no other species known to him. Its shrubby habit and involucral morphology suggested affinity to an assemblage of relict species found in Baja California and adjacent Sonora, Mexico.

This subshrub has small (10-15 mm long), sessile, entire to dentate leaves unlike any others within the genus. The totally epaleate receptacles of the staminate capitula is another character not found elsewhere in the genus.

Phytochemical analysis of this species (Aregullin et al., in press) has shown it to elaborate a unique complement of flavonoids and sesquiterpenes. These data suggest its closest affinity is with Ambrosia dumosa (Gray) Payne, a species of the western United States, and Baja California and Sonora, Mexico. It probably represents a long-time occupant of the southern Peruvian desert and is best considered an allodisjunct (Turner, 1972) whose immediate ancestors are no longer extant.

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A NEW COMBINATION IN JUNIPERUS BARBADENSIS L. (CUPRESSACEAE).

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Linneaus (1753) originally recognized two species of Juniperus in the Caribbean. Uncertainty as to the number of native taxa of the genus Juniperus in the Caribbean Islands has existed ever since several new species were proposed in the early 1900's. However, as far as I can determine Linneaus originally had a more accurate understanding of the classification of the Caribbean Junipers than later botanists. It is interesting to note that Dallimore & Jackson (1966) also followed the treatment of Linneaus, recognizing J. barbadensis as native from the Bahamas to Barbados and J. bermudiana from Bermuda. Similarly, Silba (1984) recognized two species in his checklist of the Coniferae.

An increasing number of recent chemotaxonomic studies of the Caribbean Junipers by Adams (1983) has prompted me to take a closer examination of the literature and of type herbarium material. It seems evident that a third taxon of Juniperus is worthy of taxonomic recognition, however only at the varietal level. A new combination is proposed as J. barbadensis var. urbaniana (Pilg. et Ekman) Silba for a taxon present in S.E. Haiti and W. Dominican Republic.

Zanoni (1978) had claimed that the taxonomy of the Caribbean Island Junipers could not be solved on the basis of examination of herbarium material alone. While it is true that herbarium collections of the Caribbean Junipers are poorly represented in most herbaria it is my belief that an examination of type specimens can solve these discrepancies in taxonomy in all but one instance. Since J. saxicola Britt. et Wils. is only represented by juvenile collections which have juvenile leaves and galls instead of true cones only taxonomic conclusions based on its branching pattern can now be drawn. Until adult foliage of J. saxicola is collected from Cuba no definite conclusion can be completely confirmed.

It is odd that neither Zanoni (1978) or Adams (1983) make any statement as to why they do not accept the name J. barbadensis L. for the taxon endemic to the Bahamas, Cuba, Haiti and Jamaica. Instead these authors accept the name J. lucayana Britt. for the taxon distributed most widely in the Caribbean. However, the name J. barbadensis was validly published by Linneaus and takes precedence according to the ICBN. At the same time Adams & Hogge (1983) recognize two other species (J. ekmanii & J. gracilior) from Hispaniola on the basis of chemotaxonomic studies of volatile oils.

I have accepted J. barbadensis L. as the correct name for the taxon present from the Bahamas to Jamaica. This species is charact-

erized by its rounded branchlets and its obtuse leaves with a relatively inactive glandular pit on the dorsal side of the leaf. Herbarium specimens of J. saxicola also have rounded branchlet systems and leaves in similar arrangement of that of J. barbadensis. R.P. Adams had made an annotation on the type specimen of J. saxicola at NY that it is "probably J. barbadensis, needs field work." It is my belief that at most J. saxicola would only be considered as a variety of J. barbadensis if other characteristics besides differences in length of leaves were to be found later. At present J. saxicola is best to be considered as a synonym of J. barbadensis.

An isotype of J. urbaniana (Ekman 3140) at NY differs considerably from typical J. barbadensis in its quadrangular branchlets and its acuminate leaves with an acute to sharply acute apex. An isotype of J. ekmanii (Ekman 3140) at NY also has these features, but it is somewhat smaller in branchlet size and leaf size. These differences in size of branches and leaves may well be due to differences of plants growing in shade or sun. Adams (1983) states other populations from Haiti are similar to J. ekmanii, but since I have not seen these dried herbarium specimens and since photographs look more similar to J. barbadensis I conclude that these N. Haitian populations are conspecific with J. barbadensis.

The type specimen of J. gracilior well agrees with J. barbadensis in its rounded branchlets and obtuse leaves. However, the name has been misapplied to populations of J. urbaniana growing in the W. Dominican Republic. Specimens labeled as J. gracilior as Schrenk 25 (NY) from Arroya La Vora and Allard 16501 (NY) from Constanza, La Vega Province are actually typical of J. urbaniana, in that they have quadrangular branchlets with acuminate leaves with an acute apex.

The taxon I will name as J. barbadensis var. urbaniana actually resembles J. bermudiana. Adams & Hogge (1983) had suggested that the Bermuda Juniper may have evolved by long seed dispersal from the Haitain Juniper (under the name J. ekmanii). Juniperus bermudiana also has quadrangular branchlets, however its leaves grow in sets of four to six and they are much thicker in width than the Haitian Juniper. Also, J. bermudiana has obtuse leaves, its leaf apex is not sharply acute as in J. barbadensis var. urbaniana, neither is its leaf acuminate . These two taxa are also widely separated geographically. It seems more probable that the Haitian Juniper is a variety of the West Indies Juniper on the basis of the similarity in cones and distribution .

JUNIPERUS BARBADENSIS L. "West Indies Juniper"
Sp. Pl. 1039 (1753)= J. lucayana Britt., N. Am. Trees. 121 (1908)= J. saxicola Britt. et Wils., Bull. Torr. Cl. 50: 35 (1923).

As it is presently understood typical J. barbadensis is

recognized as occuring in the Bahamas, Cuba, N. Haiti, W. Dominican Republic and possibly still in Barbados.

JUNIPERUS BARBADENSIS var. URBANIANA (Pilg.**et** Ekman) Silba, comb.nova
"Haitian Juniper"

Synonymy : J. urbaniana Pilg. et Ekman, Arik. Bot. Stockh. 20a. no.15. 9 (1926)= J.ekmanii Florin, Acta Hort. Gothoburg. 3 (1928).

Juniperus barbadensis var. urbaniana is native to S.E. Haiti and W. Dominican Republic,and is an endangered plant (Adams, under the name J. ekmanii, 1983).

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NOTES ON NEW AND NOTEWORTHY PLANTS. CLXXVIII

Harold N. Moldenke

AEGIPHILA PARANENSIS Mold., sp. nov.

Frutex ramulis densissime villosis, pilis brunneis; foliis decussato-oppositis; petiolis brevibus usque ad 1 cm. longis densissime villosis; laminis membranaceis fragilibus (in sicco) elongato-ellipticis ca, 25 cm. longis 5.5--6.5 cm. latis apicaliter acuminatis marginaliter integris basaliter longe attenuatis supra sparse strigillosis subtus dense villosulo-pubescentibus dense punctatis; infructescentiis axillaribus parvis breviter pedunculatis 3--6-fructis.

Shrub, 5--6 m. tall; branches gray, pubescent, longitudinally striate; branchlets more slender, subterete, very densely short-villous with brown hairs; leaves decussate-opposite, concentrated on the new growth; petioles very short, to 1 cm. long, densely villosulous like the branchlets; leaf-blades membranous, fragile in drying, dark-green above, lighter beneath, apically acuminate, marginally entire, basally rather long-attenuate, sparsely strigillose with somewhat bulbous-based hairs above, densely villosulous-pubescent and punctate beneath; flowers not seen; infructescences axillary, borne on the leafless branches of the previous season, small, mostly 3--6-fruited; peduncles very short, to 1 cm. long at most, densely brown-pubescent; fruiting pedicels short, rigid, rather stoutish, to 5 mm. long, densely brown-pubescent; fruiting-calyx incrassate, cupuliform, about 8 mm. long and 10 mm. wide, at first externally pubescent, later glabrescent, the rim truncate and entire or subentire, internally smooth and shiny; fruit drupaceous, oblong-rotund, about 1 cm. long and wide, externally glabrous.

This species is based on *J. Fernandez Casas & J. Molero* FC.5668, collected in a dense shady woods at km. 12, Escuela Técnica Forestal, Puerto Presidente Strossner, at 250 m. altitude, Paraguay, on January 28, 1982, and is deposited in the Britton Herbarium at the New York Botanical Garden.

LIPPIA LUPULINA f. *ALBA* Mold., f. nov.

Haec forma a forma typica speciei corollis albis recedit.

This form differs from the typical form of the species only in having white corollas.

The form is based on *J. Fernandez Casas & J. Molero* FC.6409 from Caaguazu, in the neighborhood of Yhu, in sandy soil of a typical cerrado, Paraguay, on February 22, 1982, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collectors note that the plant was 60 cm. tall, with white "flowers".

THE ALGAE OF NEW JERSEY. (U.S.A.)
VIII. PHAEOPHYTA (BROWN ALGAE). B. ADDITIONS

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In the fourth paper of this series, the register of the brown algae of the state of New Jersey was presented. Further research has yielded a number of species omitted from this first list.

PHAEOPHYTA BROWN ALGAE

Chorda filum (L.) Stack
Perth Amboy; Ocean Beach (1)
Chordaria flagelliformis (Fl. Dom.) Ag.
Atlantic City, not common (1)
Desmarestia aculeata (L.) Lamour
Communipaw; Beesley's Point (1)
Desmarestia viridis Lamour
Sandy Hook; New York Bay (1)
Dictyocystis hitchcockii (Wolle) Lagerheim
state (1)
Dictyosiphon foeniculaseus (Huds.) Grev.
Atlantic City on stones and other algae near low-water mark; Longport; New York Bay (1)
Ectocarpus confervoides (Roth) LeJolis
common along coast (1)
Ectocarpus confervoides var. siliculosus Kjellman
Beesley's Point on Zostera in bays; Atlantic City; Ocean Grove; Tuckerton; South Amboy (1)
Ectocarpus fasciculatus Harv.
Communipaw; Perth Amboy (1)
Ectocarpus granulosus (Smith) Ag.
Atlantic City on an old mast (1)
Ectocarpus littoralis Lyngb.
Egg Harbor; Atlantic City; Longport; New York Bay; Tuckerton; South Amboy (1)
Ectocarpus littoralis var. ramellosus Hauck.
Atlantic City (1)
Ectocarpus lutosus Harv.
Pleasure Bay (1)
Ectocarpus terminalis Kutz.
Atlantic City (1)
Ectocarpus tomentosus (Huds.) Lyngb.
Atlantic City, rather common (1)
Elachistea fucicola (Velley) Fr.
common on rockweed along coast (1)

Laminaria saccharina (L.) Lamour
Long Branch; Sandy Hook; Asbury Park; Atlantic City; occassional, Longport; New York Bay (1)
Myrionema vulgare Thur.
common on various algae and occasional on stones along entire coast (1)
Punctaria latifolia Grev.
Atlantic City; Perth Amboy; New York Bay (1)
Punctaria latifolia var. zosterae Le Jolis
Atlantic City; Longport; Communipaw (1)
Punctaria plantaginia (Roth) Grev.
on pilings between tide marks, Atlantic City (1)
Ralfsia clavata (Carm.) Crouin
Somers Point; Atlantic City; Cape May (1)
Ralfsia verrucosa (Aersch.) J. Ag.
Atlantic City, on old shells and woodwork; Cape May (1)
Scytosiphon lomentarius (Lyngb.) J. Ag.
on stones between tide marks, common (1); common, Atlantic City (2)

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ADDITIONAL NOTES ON THE GENUS *CORNUTIA*. IX

Harold N. Moldenke

CORNUTIA GRANDIFOLIA (Schlecht. & Cham.) Schau.

Additional bibliography: Mold., Phytologia 56: 315--316. 1984.

Additional citations: NICARAGUA: Nueva Segovia; *W. D. Stevens 3355* (Ld). COSTA RICA: Alajuela: *Liesner & Judziewicz 14968* (Ld); *A. Smith 185* (W--2086104). Puntarenas: *Dryer 1508* (E--2889939). San José: *Todzia 1843* (Au, N). PANAMA: Canal Zone: *Sullivan 602* (E--2889929). Coclé: *Allen 1637* (W--1820159), *1795* (W--1820224); *Folsom & Kauke 2775* (Ld); *Hammel 3884* (Ld); *Huft 1915* (Ld). Herrera: *Hammel 5285* (E--2889961). Veraguas: *Hammel 4333* (Ld). CULTIVATED: Florida: *Gillis 8464* (Ba--387253).

CORNUTIA GRANDIFOLIA var. *INTERMEDIA* Mold.

Additional bibliography: Mold., Phytologia 41: 124--127. 1978; F. C. Seymour, Phytol. Mem. 1: 243. 1980; Mold., Phytol. Mem. 2: 61, 71, 75, 78. 81, 83, 352, & 545. 1980; Mold., Phytologia 56: 316. 1984.

Recent collectors refer to this plant as a shrub, 2--4 m. tall, or a tree, 10--"25" [*Reveal & Balogh 4964*] m. tall, and have found it growing on weedy roadsides, among stream edge vegetation and in adjacent forests, in cutover areas of moist subtropical forests, and in clay oxysol of cow pastures associated with *Paspalum*, at 600--1500 m. altitude, in anthesis in February, May, and June, and in fruit in August. Poole and his associates refer to it as "infrequent". The corollas are said to have been "purple" on *Dorantes & Acosta 2147bis* and *Poole & al. 1533*, "lilac" on *Guzmán & al. 608*, "blue" on *D'Arcy 5273* and *Reveal & Balogh 4964*, and "violet" on *Wedel 2173*.

Seymour (1980) cites *Robbins 6178* and *Zelaya 2319* from Matagalpa, Nicaragua.

Material of this taxon has been misidentified and distributed in some herbaria as *C. pyramidata* L. On the other hand, the *Bartlett & Lasser 16329*, distributed as *C. grandifolia* var. *intermedia*, seems actually to be var. *normalis* (Kuntze) Mold.

Additional citations: MEXICO: Veracruz: *Dorantes & Acosta 2147bis* (Ld); *Poole, Pollock, & Levy 1533* (Au). NICARAGUA: Granada: *Guzmán, Castro, & Montiel 608* (Ld). COSTA RICA: Alajuela: *Taylor & Taylor 11700* (W--2906323). PANAMA: Bocas del Toro: *Wedel 2173* (W--1920359). Coclé: *Reveal & Balogh 4964* (E--2889919). Veraguas: *D'Arcy 5273* (Ld).

CORNUTIA GRANDIFOLIA var. *NORMALIS* (Kuntze) Mold.

Additional bibliography: Mold., Phytologia 41: 124 & 125. 1978; Mold., Phytol. Mem. 2: 61, 81, 83, 85, 352, & 545. 1980; Mold., Phytologia 56: 316. 1984.

Recent collectors describe this plant as a shrub, 1--4 m. tall, the flowers "visited by many bees", and have encountered it along roadsides and in disturbed and waste areas, at 150--900 m. altitude, in anthesis in April, May, and July, and in fruit in May. The corollas

are said to have been "blue" on *Antonio 3971* and *Folsom & Edwards 3386*, "lavender" on *Sytsma & Andersson 4646*, and "purple" on *Sullivan 413*.

Material of this taxon has been misidentified and distributed in some herbaria as var. *intermedia* Mold. On the other hand, the *Allen 1637 & 1795*, distributed as var. *normalis*, seem to represent the typical form of the species instead.

Additional citations: MEXICO: Veracruz: *Sousa 2748* (Me--112582). COSTA RICA: Guanacaste: *Rowlee & Rowlee 111* (It). Puntarenas: *Rowlee & Rowlee 178* (It). San Jose: *Skutch 2642* (W--1642564). Province undetermined: *Weston, Weston, & Weston 1859* (N). PANAMA: Canal Zone: *Rowlee & Rowlee 449* (It); *Tyson 1874a* (W--2512633). Panamá: *Bartlett & Lasser 16329* (Mi). Veraguas: *Antonio 3971* (Ld); *Folson & Edwards 3386* (Ld); *Sytsma & Andersson 4646* (Ld); *Sullivan 413* (Ld).

CORNUTIA GRANDIFOLIA var. *PURPUSI* Mold.

Emended synonymy: *Hosta longifolia* Humb. ex Spreng. in L., Syst. Veg., ed. 16, 1: 39. 1825.

Additional bibliography: Walp., Repert. Bot. Syst. 4: 81. 1845; Mold., Phytologia 41: 125. 1978; Mold., Phytol. Mem. 2: 62 & 545. 1980.

CORNUTIA GRANDIFOLIA f. *QUADRANGULARIS* (Ørst. & Mold.) Mold.

Additional bibliography: Mold., Phytologia 41: 125. 1978; Hocking, Excerpt. Bot. A.33: 5 & 165. 1979; Mold., Phytol. Mem. 2: 81. 395, & 545. 1980.

CORNUTIA GRANDIFOLIA var. *STORKII* Mold.

Additional bibliography: Mold., Phytologia 41: 125--126. 1978; Mold., Phytol. Mem. 2: 81 & 545. 1980.

CORNUTIA JAMAICENSIS Mold.

Additional bibliography: C. D. Adams, Flow. Pl. Jamaic. 636. 1972; Mold., Phytologia 41: 126. 1978; Mold., Phytol. Mem. 2: 93 & 545. 1980.

CORNUTIA LATIFOLIA (H.B.K.) Mold.

Emended synonymy: *Hosta latifolia* Humb. ex Spreng. in L., Syst. Veg., ed. 16, 1: 39. 1825.

Additional & emended bibliography: G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; Walp., Repert. Bot. Syst. 4: 81. 1845; Mold., Phytologia 41: 126. 1978; Mold., Phytol. Mem. 2: 62, 71, 74, 352, 412, & 545. 1980; Mold., Phytologia 52: 116. 1982; C. L. & A. A. Lundell, Wrightia &: 119 & 159. 1983; Raj, Rev. Palaeobot. Palyn. 39: 355, 371, 394, 406, & 412, pl. 11, fig. 4. 1983; Mold., Phytologia 56: 316. 1984.

Illustrations: Raj, Rev. Palaeobot. Palyn. 39: 412. 1983.

Recent collectors have found this plant growing at lagoons and in "acahual of 2 years of *Acalypha diversifolia* derived from a forest of *Robinsoniella mirandae*", at an altitude of 1.8--3 m., in a region of "3995.6 mm. precipitation, 24.9° C. temperature", in full an-

thesis in August, reporting for it the local name, "lengua de vaca".

The *Gentle 186* and *Lundell & Lundell 7888*, distributed as and cited by me in previous installments of these notes as *C. latifolia*, seem on further examination actually to represent *C. pyramidata* var. *isthmica* Mold. instead.

Additional citations: MEXICO: Oaxaca: *Dioscoreas 3407* (Me--104715), *3578* (Me--103432). Veracruz: *R. M. King 992* (W--2397524). GUATEMALA: Quezaltenango: *Skutch 1326* (W--1644114). BELIZE: *Wiley 90* (Ld).

CORNUTIA LATIFOLIA f. *ALBA* Mold.

Additional bibliography: Mold., Phytologia 41: 126. 1978; Mold., Phytol. Mem. 2: 62 & 545. 1980.

CORNUTIA LILACINA Mold.

Additional bibliography: Mold., Phytologia 41: 125, 126, & 130. 1978; Mold., Phytol. Mem. 2: 71, 75, 77, 78, 352, & 546. 1980; F. C. Seymour, Phytol. Mem. 1: 243. 1980; Mold., Phytologia 50: 243 (1982), 52: 116 (1982), 54: 299 & 231 (1983), and 56: 316. 1984.

Recent collectors describe this plant as a shrub, growing in pinelands, the leaves lighter in color beneath, the midrib reddish, and the fruit black. They found it in fruit in June. The corollas are described as having been "purple-blue" on *Herb. Sec. Bot. 171* and "bluish-purple" on *Howard & al. 514*. Seymour (1980) cites *Salas 58* from Nicaragua.

The *Molina R. 3082* and *Steyermark 30338 & 37427*, distributed as typical *C. lilacina*, actually represent its var. *velutina* Mold., while *Molina R. 5222* is *C. pyramidata* var. *isthmica* Mold.

Additional citations: HONDURAS: Province undetermined: *Howard, Briggs, Kamb, Lane, & Ritland 514* [Los Dragos] (W--2988363). EL SALVADOR: San Salvador: *Herb. Sec. Bot. 171* (Me--172261).

CORNUTIA LILACINA var. *VELUTINA* Mold.

Additional bibliography: Mold., Phytologia 41: 125, 126, & 130. 1978; Mold., Phytol. Mem. 2: 71, 75, 77, 78, 352, & 546. 1980; Mold., Phytologia 50: 243 (1982), 52: 116 (1982), 54: 229 & 231 (1983), and 56: 316. 1984.

Recent collectors describe this plant as a shrub or small tree, 2--4 m. tall, or a slender, rounded tree, 4--10 m. tall, the leaves firmly membranous, dull rich-green above, pale-green beneath, pungently malodorous, with a gray-white or dull-rose midrib. They have found it growing in alluvial plain fields, along roadsides and disturbed roadsides, in gallery forests, and on slopes of open brushy semi-plains, from sealevel to 1500 m. altitude, in flower in March and June to September, in fruit in August and September. Allen reports it only "occasional" or "infrequent" in El Salvador, but Stevens found it "common on inland side of ridges" in Nicaragua. The vernacular name, "zapulote morada", is recorded for the plant.

The corollas are said to have been "blue" on *Allen & Severen 6923* and *Moreno 1886 & 3082*, "blue-violet" on *Croat 42504*, "purple" on *Guzman & al. 379*, *Moreno 1289 & 2996*, and *Stevens 2945, 9744, & 9932*, "violet" on *Neill 2447*, "deep-violet" on *Allen 7073*, and

"lilac-lavender with 2 buff-yellow spots below the center, the center deeper purple" on *Steyermark 37427*.

Material of this taxon has been misidentified and distributed in some herbaria as typical *C. lilacina* Mold., *C. grandifolia* (Schlecht. & Cham.) Schau., and *C. pyramidata* L. It is possible that *Croat 42504* may actually represent a form of *C. grandifolia*.

Additional citations: MEXICO: Veracruz: *Gentry, Lott, & Bot. Class 32580* (Ld). GUATEMALA: Chiquimula: *Steyermark 30338* (W--1842172). San Marcos: *Steyermark 37427* (W--2022057). HONDURAS: Copán: *Croat 42504* (Ld). Morazán: *Molina R. 3082* (W--2022482). EL SALVADOR: Sonsonate: *Allen 7073* (W--2296043); *Allen & Severen 6923* (W--2296011). NICARAGUA: Chontales: *Guzman, Castro, & Montiel 379* (Ld). Estelí: *Moreno 1289* (Ld), *1886* (Ld); *W. D. Stevens 9932* (Ld). Granada: *Atwood & Neill AN.79* (Ln--266880). Madriz: *Moreno 2996* (Ld). Managua: *Chaves 376* (W--1637370); *W. D. Stevens 2945* (Ld). Rivas: *Neill 2447* (Ld); *W. D. Stevens 9744* (Ld).

CORNUTIA MICROCALYCINA Pavon & Mold.

Additional bibliography: Mold., Phytologia 41: 124--128. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 41. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 22. 1979; Mold., Phytologia 47: 143. 1980; Mold., Phytol. Mem. 2: 82, 83, 107, 128, 133, 352, 395, & 546. 1980; Mold., Phytologia 52: 120. 1982.

Recent collectors describe this plant as a shrub or tree. 1.5--10 m. tall, the stems square, the leaves dark-green above, grayish-green beneath, the inflorescence axis dark-green to purple, and the fruit at first green, later maturing purple. They have encountered the species along roadsides, "in forest patches and secondary areas", in the transition zone between dry and wet tropical forest, in riverside vegetation, in open areas, dry tropical forests, and "in full sun in bottom pastures except for tree border along streams", at 20--1650 m. altitude, in flower in February, May to August, and December, and in fruit in July and August.

The corollas are described as having been "blue" on *Aristeguieta 3255* and *Foster & Wright 8052*, "blue with a yellow spot on the lip" on *Folsom 3460*, "blue with yellow in the throat of the large lobe" on *Liesner & al. 8325*, "blue-purple" on *Dodson & Gentry 12485*, "purple" on *Berti & Peña S. 176-181*, "lavender" on *Knapp 5966*, "lilac" on *Forero & al. 45* and *Øllgaard & Balslev 7529*, and "violet" on *Escobar 1359* and *Madison & al. 4816*. Escobar describes the fruit as "white"!

Material of this species has been misidentified and distributed in some herbaria as *Cornutia odorata* var. *calvescens* Mold., *C. pyramidata* L., and even *Citharexylum* sp.

Additional citations: PANAMA: Panamá: *Folsom 3460* (Ld); *Knapp 5966* (E--2940930). COLOMBIA: Chocó: *Forero, Jaramillo, Espina Z., & Palacios H. 7188* (Ld); *Forero, Jaramillo, Pabén, Espina Z., & Piñeres 2345* (N). VENEZUELA: Barinas: *Aristeguieta 3255* (W--2882107); *Berti & Peña S. 176-981* (W--2977400). Falcón/Lara: *Liesner, González, & Wingfield 8325* (Ld, N). Mérida: *Berti 1111* (W--2976563). ECUADOR: Carchi: *Madison, Plowman, Kennedy, & Besse 4816* (Ac, W--

2850631). El Oro: *Escobar 1359* (Ld). Guayas: *Asplund 5734* (W--2223731); *Dodson & Gentry 12485* (Ld); *Øllgaard & Balslev 7529* (Ac, Ac). PERU: Pasco: *Foster & Wright 8052* (N).

CORNUTIA MICROCALYCINA var. *ANOMALA* Mold.

Additional bibliography: Mold., Phytologia 41: 125, 127, & 128. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 22. 1979; Mold., Phytol. Mem. 2: 83, 107, 128, & 546. 1980.

CORNUTIA MICROCALYCINA var. *PULVERULENTA* Mold.

Additional bibliography: Mold., Phytologia 41: 125, 127, & 128. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 22. 1979; Mold., Phytol. Mem. 2: 83, 107, 128, & 546. 1980; Mold., Phytologia 52: 120. 1982.

Recent collectors describe this plant as an aromatic, coarse, much-branched shrub or shrubby tree, 3--12 m. tall, the trunk to 20 cm. in diameter at breast height, the primary branches often arching, the secondary ones erect until too heavy, the leaves opposite, light-green above, pale beneath, the fruit at first green, later "white, juicy, the seed angular, verrucose, nigrescent-purple". They have encountered it along roadsides, in rainforests with coffee and cocoa plantations, and very tall forests being partially cleared of the understory for the planting of coffee, at 50--410 m. altitude, in both flower and fruit in June and October.

The corollas are said to have been "violet" in color on *Holm-Nielsen & al. 2801*, "lavender" on *Juncosa 1142*, "blue" on *Davidse & al. 18519*, and "deep-blue" on *Camp E.3681*.

Material of this taxon has been misidentified and distributed in some herbaria as *Aegiphila* sp.

Additional citations: PANAMA: Coiba Island: *Antonio 2287* (Ld). COLOMBIA: Chocó: *Juncosa 1142* (Ld). VENEZUELA: Zulia: *Davidse, González, & León 18519* (Ld, N). ECUADOR: Carchi: *Boeke 844* (N). Esmeraldas: *Játiva 470* (W--2962102), *749* (W--2962103); *Little 96778* (W--1854905). Guayas/Cañar/Chimborazo/Bolívar: *Camp E.3681* (W--2057117). Los Ríos: *Holm-Nielsen, Jeppesen, Løjtnant, & Øllgaard 2801* (Eu--55245, Ut--352581b).

CORNUTIA OBOVATA Urb.

Additional bibliography: Urb., Symb. Antil. 4: 537. 1911; Mold., Phytologia 41: 128. 1978; J. T. & R. Kartesz, Syn. Checklist Vasc. Fl. 2: 466. 1980; Mold., Phytol. Mem. 2: 97 & 546. 1980; Liogier & Martorell, Fl. Puerto Rico 152 & 311. 1982.

Recent collectors describe this plant as a small tree, 5--7 m. tall, or large shrub, the trunk 7.5--15 cm. in diameter at breast height, the bark gray, with many long fissures, and the leaves very thick and leathery, those on sterile shoots mostly apically sharp-toothed. Liogier & Martorell (1983) refer to it as "Rare and local in moist limestone and in forests at lower and middle elevations". Collectors encountered it at 300 m. altitude, in flower in June, and record the vernacular names, "capa" and "jiguerilla". The corollas are said to have been "blue" on *Sargent 410* and "purple" on *Little 13012*.

Material of this species has been misidentified and distributed in some herbaria as *C. pyramidata* L.

Additional citations: PUERTO RICO: *Little 13012* (N), *13500* (N); *F. H. Sargent 410* (W--1780946); *Woodbury s.n.* [Nov. 19, 1960] (N, W--2942315), *s.n.* [La Torrecilla, June 2, 1961] (N).

CORNUTIA ODORATA (Poepp. & Endl.) Poepp.

Additional bibliography: Walp., Repert. Bot. Syst. 4: 80--81. 1845; Bodley, Lab. Anthrop. Wash. St. Univ. Rep. Invest. 55: 20. 1978; Mold., Phytologia 41: 127--129. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 22. 1979; Mold., Phytol. Mem. 2: 107, 115, 128, 130, 133, 352, & 546. 1980.

Additional synonymy: *Cornutia odorata* (Poepp. & Endl.) "Poepp. ex Schau." apud López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 22. 1979.

Recent collectors refer to this plant as a shrub or treelet, 3--9 m. tall, with subscandent branches, the calyx buff, and the fruit "orange" or "dark-purple when mature". They have found it growing in thickets and also cultivated (or, at least, in cultivated ground), at 450 m. altitude, in anthesis in April and December, and in both flower and fruit in October.

The corollas are described as having been "violet" in color on *Ayala 513* and *Torres 815* and "the tube purple, the limb blue-purple" on *Plowman 7508*.

The vernacular name, "toé shingure", is reported for the species in Peru, where, according to Plowman, the leaves are mixed with those of *Banisteriopsis caapi* to make a stronger hallucinogen.

Material of this species (*Cornutia odorata*) has been misidentified and distributed in some herbaria as *Aegiphila elegans* Mold.

Additional citations: ECUADOR: Esmeraldas: *Mexia 8497* (W--1707484). PERU: Loreto: *Asplund 12975* (W--2224793); *Ayala 513* (Ld); *J. Torres 815* (Ld). San Martín: *Plowman 7504* (N).

CORNUTIA ODORATA var. *CALVESCENS* Mold.

Additional bibliography: Mold., Phytologia 41: 128--129. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 22. 1979; Mold., Phytol. Mem. 2: 107, 115, & 546. 1980.

Recent collectors have encountered this plant at 400 m. altitude, in flower in September. The corollas are said to have been "purple" on the González & Ortega collection cited below.

The *Berti 1111*, distributed as this taxon in some herbaria, seems actually to be *C. microcalycina* Pavon & Mold.

Additional citations: COLOMBIA: Caldas: *Sneidern 6061* (W--2056578). VENEZUELA: Miranda: *González & Ortega 1389* (Ld); *Steyermark 90054* (W--2430205). Zulia: *Steyermark 99904* (W--2622371).

CORNUTIA ODORATA var. *COLOMBIANA* Mold.

Additional bibliography: Mold., Phytologia 41: 128 & 129. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 22. 1979; Mold., Phytol. Mem. 2: 107 & 546. 1980.

Additional citations: COLOMBIA: Caldas: *Haught 2130* (W--1742377). Cundinamarca: *Haught 6066* (W--1709862). Huila: *Little 7929* (W--

CORNUTIA PUBESCENS Gaertn. f.

Additional bibliography: Mold., Phytologia 41: 129. 1978; Mold., Phytol. Mem. 2: 126, 352, & 546. 1980.

Additional citations: FRENCH GUIANA: *Granville 5092* (Ld); *Herb. Maire s.n.* (P).

CORNUTIA PYRAMIDATA L.

Additional synonymy: *Cornutia piramidata* Mold., Phytologia 54: 242, in syn. 1983.

Additional & emended bibliography: Poir. in Lam., Tabl. Encycl. Méth. Bot. 3: pl. 541. 1819; G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; Walp., Repert. Bot. Syst. 4: 80--81 & 125. 1845; Bocq. in Baill., Rec. Obs. Bot. 3: 234. 1863; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 169. 1895; Millsp., Field Co,umb. Mus. Publ. Bot. 1: 316. 1896; Urb., Symb. Antil. 4: 537. 1911; Mold., Suppl. List Comm. Vern. Names 13 & 16. 1940; Savage, Cat. Linn. Herb. Lond. 107. 1945; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 313 & 314, fig. 135. 1957; Serbanescu-Jitariu & Mitroiu, Act. Bot. Hort. Bucurest. 1972-73: 110, 111, & 116, pl. 2, fig. 6. 1973; Fournet, Fl. Illust. Phan. Guad. Mart. 1412. 1978; Mold., Phytologia 41: 124 & 129--130. 1978; J. T. & R. Kartesz, Syn. Checklist Vasc. Fl. 2: 466. 1980; Mold., Phytol. Mem. 2: 62, 71, 74. 89, 93, 95, 97, 100, 102, 103, 124, 352, 395, & 546. 1980; F. C. Seymour, Phytol. Mem. 1: 243. 1980; Liogier & Martorell, Fl. Puerto Rico 152 & 311. 1982; Mold., Phytologia 52: 117 & 230. 1982; Rees & Lipp, New Pl. Sources Drugs 251. 1982; Mold., Phytologia 54: 242. 1983; Raj, Rev. Palaeobot. Palyn. 39: 355, 371, & 394. 1983; Mold., Phytologia 56: 316. 1984.

Additional & emended illustrations: Poir. in Lam., Tabl. Encycl. Méth. Bot. 3: pl. 541. 1819; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 313, fig. 135. 1957; Serbanescu-Jitariu & Mitroiu, Act. Bot. Hort. Bucurest. 1972-73: 111, pl. 2, fig. 6. 1973.

Recent collectors describe this plant as a single-stemmed, much-branched, most attractive shrub or small tree, 2--10 m. tall, with fruit that is black when mature. They have found it growing in secondary bush, on serpentine formation rocks, along roadsides with "farmside vegetation", on coralliferous limestone riverbanks, in serpentine charrascal, in deciduous seasonal forests, along railroad tracks, in basalt regions, savanna land and lake areas, and at the edges of thickets in alluvial soil, from sealevel to 400 m. altitude, in flower from April to July and September to December, in fruit in January, July, September, and December. Jimenez reports it "fairly common" in the Dominican Republic. The vernacular names, "bois cassave", "bois coral", and "bois pou-poule", are listed for it.

The corollas are described as having been "blue" on *Beard 1244* and *Howard & Howard 9909*, "bluish-purple" on *Webster 3877*, "purplish-blue" on *Mejía & Zanoni 6796 & 6937*, "purple" on *Allard & Allard 13875*, "lilac" on *Morton & Acuña 3006*, "lavender-blue" on *Philcox & Kalloo 7220*, and "mauve" on *Beard 1052*.

Rees & Lipp (1982) cite *Beard 502* from St. Lucia. The *Allard & Allard 13875* collection exhibits unusually small leaves, but is actually only in beginning anthesis.

Serbanescu-Jitariu & Mitroiu (1973), on the basis of *Herb. Univ.*

Cluj 147204, describe the pollen of this species as follows: "subprolat; 4--5-colporat; văzut apical 70,2--75,4 mu in diam., din profil înalt 44,2--83,2 mu, lat 33,8--70,2 mu. Polenul scuturat din antere şi văzut cu ochiul liber, este galben-deschis, in apă la microscop este galben-portocaliu, iar in cloralhidrat galben-verzui. Sporoderma de 3,9 mu grosime este crassissexinată; în sect. optică exina prezintă o structură pilat-reticulată (retipilată); ochiutile (brochi) reţelei variate ca formă şi mărime se micşorează in jurul colpilor. Colpii lungi (4/5 din raza microsporilor) cu suprafaţa fin ornată, sînt brusc îngustaţi spre poli şi ascuţiti la capete."

Seymour (1980) cites *Seymour 6378* from Nueva Segovia, Nicaragua, but this record seems questionable -- the species is not otherwise known from Nicaragua.

The *Calzada 383* & *397*, distributed as *C. pyramidata*, actually are *C. grandifolia* (Schlecht. & Cham.) Schau., while *Taylor & Taylor 11700* is *C. grandifolia* var. *intermedia* Mold., *Allen 7073*, *Allen & Severen 6923*, and *Chaves 376* are *C. lilacina* var. *velutina* Mold., *Dodson & Gentry 12485* is *C. microcalycina* Pavon & Mold., *Sargent 410* is *C. obovata* Urb., and *Gentle 186* and *Webster & Lynch 17672* are *C. pyramidata* var. *isthmica* Mold.

Additional citations: CUBA: Oriente: *Ekman 3425* (W--2113463); *López Figueiras 1251* (W--2227022); *Morton & Acuña 3006* (W--1782780); *Webster 3877* (W--2284062). HISPANIOLA: Dominican Republic: *Allard & Allard 13875* (W); *Canela L. s.n.* [19-V-1957] (N, W--2989718); *Ekman H.10893* (W--1710853), *12464* (W--1711446); *Howard & Howard 9909* (W--2111107); *J. J. Jiménez 8561* (Ld); *Mejía & Zanoni 6937* (N). LEEWARD ISLANDS: Guadeloupe: *Questel 2379* (W--1881887), *4953* (W--2453680); *Stehlé 467* (W--1558751). WINDWARD ISLANDS: Grenada: *Beard 1244* (W--1883643). Martinique: *Stehlé 1050* (W--1712113, *5399* (W--1880436). St. Lucia: *Beard 1052* (W--1882203). TRINIDAD & TOBAGO: Trinidad: *Philcox & Kalloo 7220* (N). CULTIVATED: Dominican Republic: *Mejia & Zanoni 6796* (N).

CORNUTIA PYRAMIDATA var. *ISTHMICA* Mold.

Additional synonymy: *Cornutia piramidata* var. *isthmica* Mold., Phytologia 54: 242 in syn. 1983.

Additional bibliography: Mold., Phytologia 41: 124 & 130. 1978; Mold., Phytol. Mem. 2: 62, 71, 74, 395, & 546. 1980; Mold., Phytologia 52: 47 (1982), 54: 242 (1983), and 56: 316. 1984.

Recent collectors refer to this plant as a shrub or tree, 1--6.5 m. tall, the trunk sometimes to 15 cm. in diameter at breast height, and the fruit "blue". They have encountered it in potreros with *Sida*, *Hyptis verticillata*, and *Cassia*, in scrubby woods on limestone, at the edges of high bush zone along ravines, on flat terrain of savannas with dark-red clay soil, in dooryards, and along streets, at 90--200 m. altitude, in flower from June to October, and in fruit in October and November. The Lundells refer to it as "rare" in Yucatan.

The corollas are said to have been "blue" on *Molina R. 5222*, *Téllez & al. 3360*, and *Téllez & Cabrera 2490*, "bluish-purple" on *Lundell & Lundell 7888*, "purple" on *Moreno 876*, *Téllez & al. 3462*, and *Téllez & Cabrera 2792*, "bright-lilac" on *Cowan 3232*, and "dull-

violet" on *Webster & Lynch 17672*.

Material of this taxon has been misidentified and distributed in some herbaria as *C. grandiflora* Steud., *C. grandifolia* (Schlecht. & Cham.) Schau., *C. latifolia* (H.B.K.) Mold., and *C. lilacina* Mold.

Additional & emended citations: MEXICO: Quintana Roo: *Cabrera & Cortez 366* (N); *Moreno 876* (Me--300481); *Téllez & Cabrera 2490* (Ld), *2792* (N); *Téllez, Cabrera, & Rico 3360* (N), *3462* (N); *Webster & Lynch 17672* (Me--286493). Tabasco: *Cowan & Magaña in C. Cowan 3232* (N). Yucatán: *Lundell & Lundell 7888* (W--1888275). GUATEMALA: El Peten: *Harmon & Fuentes 5820* (W--2923350, Ws); *Ortíz 1330* (W--2925228). BELIZE: *Gentle 186* (F--662519, Mi, N, W--1585899, W--1636835); *Wiley 430* (Ld). HONDURAS: Cortés: *Molina R. 5222* (W--2189005).

CORNUTIA PYRAMIDATA var. *ISTHMICA* f. *ALBIDA* Mold.

Additional bibliography: Mold., Phytologia 41: 130. 1978; Mold., Phytol. Mem. 2: 71, 395, & 546. 1980.

CORNUTIA PYRAMIDATA f. *SERRATA* Mold., Phytologia 52: 230. 1982.

Bibliography: Mold., Phytologia 52: 230. 1982.

Citations: LEEWARD ISLANDS: Guadeloupe: *Questel 2388* (E--photo of type, W--1881896--type.

CORNUTIA THYRSOIDEA Banks & Mold.

Additional bibliography: Mold., Phytologia 41: 130. 1978; Hocking, Excerpt. Bot. A.33: 91. 1979; Mold., Phytol. Mem. 2: 93, 352, & 546. 1980.

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ADDITIONAL NOTES ON THE GENUS *LIPPIA*. XVIII

Harold N. Moldenke

Since the publication of the last previous notes on this genus so many hundreds of herbarium specimens have come to hand from collectors in the field and from herbarium curators and so much new bibliographic information has become available that another in my ongoing series of notes has become justified. Herbarium acronyms are those used in all previous papers and most recently explained in Phytologia Memoirs 2: 463--469 with a supplement in Phytologia 50: 268.

LIPPIA Houst.

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Duval (1982) gives some interesting details about the life and work of Auguste Lippi (1678--1704), the unfortunate French naturalist to whom the present genus is dedicated: "In 1705 [date?], one of Fagon's protégés, the young botanist Augustin Lippi, together with an entire diplomatic mission, was assassinated on the way to Abyssinia. Lippi was only twenty-seven years old. After landing in Cairo, the mission was blockaded somewhere along the Ethiopian border, and finally massacred. Augustin Lippi had been able, however,

to send off a few messages before the disaster, and he had also dispatched some seeds to Fagon. The latter was convinced that Lippi would have been a great botanist, and there is much to confirm his view. Lippi was the first to be interested in algae, for example, which no one before him had seriously thought of including in the realm of botany. Before leaving for Egypt, he sent numerous algae specimens to the garden from Marseilles along with a lengthy report. Danty d'Isnard, a professor at the King's Garden, sought to reconstitute Lippi's work about 1710, but it was too widely dispersed. At least 200 specimens sent back in his name had been classified in other herbaria. Later, Michel Adanson was to pay tribute to the perceptiveness of Lippi's observations on palms and fig trees, noting that his predecessor had been the first to call attention to the existence of the baobab (*Adansonia digitata*), which Adanson was to introduce into Europe. And as a posthumous tribute, Linnaeus dedicated to the murdered botanist a plant of the *Verbenaceae* family, the lippia." He goes on to remind us that "The massacre of the Abyssinian mission helps us understand the perpetual state of anxiety experienced by members of most of the scientific expeditions of the period." The Corrells (1982) give "1703" as the date of Lippi's death, but the late Dr. John Hendley Barnhart, pre-eminent botanical biographer and bibliographer, has adopted 1704 as the actual date. The Corrells assert that the genus contains "about 206 species" -- actually, as of the present date, I accept 300 taxa in the genus proper. Lindley, in 1870, commented that it contained "nearly a hundred species" at that time, "generally with glands containing an aromatic volatile oil".

Durand (1888) divided the genus into 2 sections: *Aloysia* Schau. (comprising our present genera *Aloysia* Ort. and *Acantholippia* Griseb.) and *Zapania* Benth. & Hook. (including the present genus *Phyla*). Dalla Torre & Harms (1904) divided it into subgenus *Aloysia* Schau. and subgenus *Zapania* Benth., the latter into 5 sections: *Gonostachyum* Schau., *Acantholippia* Briq., *Dipterocalyx* Schau., *Euzapania* Briq., and *Rhodolippia* Schau. -- *Euzapania* divided again into 3 subsections: *Axilliflorae* Schau., *Paniculatae* Schau., and *Corymbosae* Schau.

Jafri, as late as in 1966, still gave "about 100" as the number of species in *Lippia*, but his generic description clearly indicates that he was referring to the segregated genus *Phyla* ("Usually creeping herbs").

Rzedowski (1978) tells us that in Mexico *Lippia* grows in secondary lower woods along with such genera as *Annona*, *Casearia*, *Castilla*, *Cochlospermum*, *Conostegia*, *Cordia*, *Croton*, *Gliricidia*, *Guazuma*, *Leucaena*, *Luehea*, *Muntingia*, *Pithecellobium*, *Sapindus*, *Spondias*, *Trema*, *Trichilia*, and *Zanthoxylum*.

Wright and his associates (1978) record the common name, "lippea", for members of the genus. Heath (1981) lists "oregano" and "Mexican sage" for unidentified species of the genus which yield a "camphoraceous, thyme-like" flavone. Gardner & Bennetts (1956) report that in western Australia members of the genus cause a disease in domestic animals called "lippia poisoning", the sen-

sitiving agent being phylloerythrin and the liver damage being caused by icterogenins.

Riddick (1955) reports the scale-insect, *Aspidiotus lantaniae* Sign. attacking member of the genus *Lippia* in Florida, but he is here probably referring to *Phyla*.

Excluded species: *Lippia stoechas* Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 152, nom. nud. 1895 = *Lavandula stoechas* L., *Lamiaceae*.

The *Mejía & Zanoni 6748*, distributed as *Lippia* sp., actually is *Aloysia looseri* Mold., while *Burkart & al. 30593* is *Aloysia scorodonioides* (H.B.K.) Cham., *Venturi 7344* & *9898* are *Lantana aristata* var. *angustifolia* (Kuntze) Mold., *Elias 654* is *Lantana camara* var. *moritziana* f. *parvifolia* (Mold.) López-Palacios, *Pennell 3589* is *Lantana fucata* f. *albiflora* Mold., *Lyonnet 1322* is *Lantana hirta* Grah., *Palmer 551* is *Lantana macropoda* Torr., *Cook 124*, *Herb. Inst. Physico-geogr. Nat. Costaric. 16389*, and *Miller & Griscom 40* are *Lantana maxima* Hayek, *Purpus 5297*, *Rose*, *Painter*, & *Rose 9036*, and *Sousa 4892* are *Lantana microcephala* A. Rich., *Fournier 143* is *Lantana peduncularis* Anderss., *Johnson 73* is *Lantana trifolia* L., *Cook 62* is *Lantana trifolia* f. *hirsuta* Mold., *Palmer 28* and *Perry & Palmer 709* are *Lantana velutina* Mart. & Gal., *Héringer 17074* is a *Hyptis* sp., and *Héringer 16937*, *16937a*, & *17074*, *Héringer*, *Filgueiras*, *Mendonca*,& *Pereira 6398*, *Héringer*, *Paula*, *Mendonça*, & *Salles 314*, and *Silva 273* are not verbenaceous.

LIPPIA ABYSSINICA (Otto & Dietr.) Cuf.

Additional & emended bibliography: Walp., Repert. Bot. Syst. 4: 53, 55--56, & 69. 1845; Bocq., Adansonia, ser. 1, 3: 244. 1863; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 151 & 152, 1895; Wehmer, Pflanzenst. 2: 1022. 1931; Meikle in Brenan & al., Kew Bull. 17: 173--174. 1963; Mold., Phytologia 48: 155. 1981.

Gilbert describes this plant as a 6-foot shrub, known as "kesho" in Ethiopia. and there found growing at the edges of shrubbery and "used in cleaning milk cans, giving a smoky flavor" to the milk. He found it in flower in December and mistakenly distributed his material as *Lantana* sp.

Wehmer (1931) reports the herbage containing 0.753% of a volatile oil, of which carvon comprises 72%, d-limonol 5%,phellandrol 2.4%, and terpene 3.4%. As authority he cites Rovesti, Ann. Chim. Appl. 17: 553. 1927 ("C. C. 1928. I.1105). Constanten! -- de Benedictis 1926, ibid. cit."

Additional citations: ETHIOPIA: *E. F. Gilbert 521* (Mi). MOUNTED ILLUSTRATIONS: Burger, Fam. Flow. Pl. 198, fig. 60. 1967 (Ld).

LIPPIA AFFINIS Schau.

Additional bibliography: Mold., Phytologia 48: 156. 1981; Raj, Rev. Palaeobot. Palyn. 39: 350, 364, & 396. 1983.

This plant has been found in flower in May and the corollas are said to have been "rose" in color on the collection cited below.

Additional citations: BRAZIL: Minas Gerais: *Gibbs*, *Abbott*, & *An-*

drade 5235 (N).

LIPPIA ALBA (Mill.) N. E. Br.

Additional synonymy: *Lantana canescens* Clarke ex Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. 13: 42 in syn. 1921 [not *Lantana canescens* Benth., 1959, nor H.B.K., 1817, nor Kunth, 1825]. *Lantana lippioides* Hook. ex Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. 13: 42 in syn. 1921. *Lippia alba* (Mill.) Britton & Wilson ex Mold., Phytologia 50: 262 in syn. 1982. *Lippia alba* (Mills) N. E. Br. ex Mold., Phytologia 50: 262 in syn. 1982.

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Additional illustrations: Hubert, Trav. Lab. Mat. Med. Pharm. 13: [31], pl. 3, fig. 5 & 6. 1921; D. S. & H. B. Correll, Fl. Bahama Arch. 1235, fig. 531. 1982.

The *Lantana canescens* accredited to Kunth and to H.B.K. in the synonymy (above) apply to a valid species of *Lantana*, *L. canescens* H.B.K., while the homonym accredited to Bentham belongs in the

synonymy of *Lippia tepicana* Mold.

Recent collectors describe this plant as a highly aromatic low shrub or spreading subshrub, 1--2 m. tall, the branches few, long, slender, procumbent to trailing, sprawling, or arching, to 2 m. long, rooting at the tips, the leaves fragrant, with a lemon or caraway scent when crushed, rugose and pale-green above, gray-green beneath, the floral bracts pale grayish-green, and the flowers odorous. They have encountered it on savannas and saline plains, in dry or swampy places, in sandy soil, in dry or grassy thickets, along disturbed roadsides, in low ground and weedy fields,, on steep exposed or sandy riverbanks and ledges, along railroad embankments, at the edge of gallery forests, in mezquital, subtropical matorral and acahual, in fields of cultivated cucurbits, and on heavily wooded pine and oak slopes, from sealevel to 2200 m. altitude, in anthesis from January to April and June to November, and in fruit from January to March, as well as in June, August, September, and November. Wedster & Wilbur found it in "weedy areas at edge of palm grove with *Sabal texana, Celtis, Zanthoxylum, Tournefortia volubilis*, etc. on raised ground above level of cotton fields" in Texas. In Ecuador Dodson refers to the species as "common low plants in marshy areas along highways". Davidse & González found it "very common" in Venezuela and Runyon reports it "common" in the Rio Grande valley of Texas. Lott & Hernández found it inhabiting the selva mediana subperennifolia zone in Mexico, where it grows along with such genera as *Ficus, Coccoloba, Cynometra*, and *Couepia*. Iltis & Doebley found it growing with *Zea mays* ssp. *mexicana* in Mexico.

The corollas are described as having been "white" on *Harris 11737* and *Maxon & Killip 1636*, "lavender and white" on *Gilly & Hernandez 253*, "lilac-white" on *Pittier 2563*, "lavender" on *Leonard 8515*, "pale-lavender" on *Murry 428*, "lavender with a yellow eye" on *Lundell 10644*, "pale-lavender with a central purple or brown spot" on *Webster & Wilbur 3023*, "lilac" on *Brigada 369, Calzada & Marquez R. 4487, Harris 11911, Lott & Hernandez M. 1471, Maciel & Cordeiro 145*, and *Souza Nuncio 268*, "light-lilac" on *Bunting & Aristeguieta 6068*, "lilac with a yellow center" on *Davidse & Gonzalez 13941 & 14071*, "lilac with an orange throat" on *Harley 23020*, "violet with a yellow throat" on *Jiménez 1173*, "violet" on *Davidson & Martinelli CD.10689*, "pale-violet" on *Chiang 266*, "purple" on *Martínez Calderón 1924, Stevens 19992*, and *Wright 3159*, "pale-purple" on *Standley & Valerio 46697*, "rose" on *Casas & Molero FC.4419, Liogier & Liogier 27590*, and *Martínez Calderon 2228*, "rosy-white" on *Llates Q. 543*, and "pink" on *Dodson & Dodson 11229, Ferris 5927, Hart 1215, Hinton 12844, Mexia 819, Solomon 6136*, and *Staudt 30010*. The Corrells (1982) describe them as "violet, pink, or white"; Millspaugh says (1896) "white with a yellow throat", while Pio Corrêa & Pena (1931) say "flores insignificantes, brancas".

Vernacular names recently reported are: basula, bush lippia, cidraero, daru haini ba, juanilana, lopong-brik, mastranso, mastrante, mastranto, mastranza, mastranzo, mostran, naga-aieri, orega, oregano, orozuz, pampa-oregana, pan poregano, pichae-lakri, pichas-bon, poley, salvia siga, sideraera, sonora lila, te de playa, wild mint,

and wild sage.

Liogier & Martorell (1982) assert that in Puerto Rico the species occurs in thickets at lower elevations, giving its extralimital distribution as the West Indies, Texas, and Mexico to Argentina. Ekman (1929) asserts that it is cultivated and escaped throughout Haiti, citing his *no. 9808*. Lace & Hemsley (1891) list it from Baluchistan. Merrill (1923) excludes it from the flora of the Philippine Islands. Haines (1910) lists it from Chota Nagpur, but comments that "It is an erect shrub 'so closely resembling *Lantana indica* that without fruit it is difficult to distinguish.'"; he describes the branches and leaves as softly strigose., the leaves ovate-oblong and crenate, the peduncles mostly opposite, and the bracts ovate, acuminate, and softly hairy.

The Corrells (1982) report that in the Bahamas it occurs in thickets, coppices, and gravelly waste places, flowering from March to October.

Kanjilal and his associates (1939) lists the species from Assam, where, he says, the leaves are used as a vegetable and it flowers "nearly all the year round", though mostly in bloom in February and March. Varma (1981) describes the corollas as "pinkish-purple" and avers that in Bhagalpur it is "Abundant in the district along the river Ganges where it grows in association with *Tamarix dioica* Roxb. and *Saccharum spontaneum* Linn. Also found in marshy lands and wet situations. The characteristic lemon scent is an important field character. A tropical American species that was introduced into Bengal in 1872--97. Since then it has migrated towards the west and became common in Bihar by 1921--25." He also reports that it flowers and fruits there throughout the year, citing *Varma 322 & 1480*. Millspaugh (1896) cites *Millspaugh 478, 503, & 830* and *Pringle 215 & 960* from Yucatán. Fox reports that in Antigua the species is "very rare in the driest parts of the limestone region".

It should be noted that the Murry collection, cited below, exhibits the sharply pointed leaf-blade apices just as are present in the type collection. The *Burgot 1423*, *Paul 25*, and *Shafer 2428* collection, cited below, exhibit leaves somewhat larger than usual for the typical form of this species (although not sufficiently large to justify their inclusion in f. *intermedia* Mold.); in *Liogier & Liogier* and *Townsend 85* only some of the leaves are larger than normal; in *Hanson 434* they definitely approach those of f. *intermedia*. *Bruff 1408* and *Harris 11737* are definitely anomalous collections; the unnumbered Levy collection bears striking habital resemblance to *L. graveolens* f. *macrophylla* Mold., while the material grown from the seed of *Teppner 81/453*, grown at Graz, seems to represent *L. alba* f. *intermedia*.

Ferreyra reports that in Peru *Lippia alba* is considered medicinal; López-Palacios (1982) asserts that in Venezuela it is used in the treatment of asthma; Standley and Souza Novelo state that an infusion of the leaves is used in Central America as a stomachic; Ruano reports its use as a sudorific. Reis & Lipp (1982) aver that in Guatemala it is "Reputed to be effective in treating coughs" and in Puerto Rico the "Natives believe this plant to be medicinal, it is used by them in baths." Williams (1981) states that "An in-

fusion of the leaves is used as a remedy for internal or respiratory ailments. Sometimes planted as an ornamental." Chopra & Varma (1969) tell us that "The strongly aromatic plant is used as a sage in cookery. The leaves, which are used as vegetable in Khasi Hills, are considered stomachic and nervine in some parts of Brazil and Paraguay." The leaves, on distillation, yield an essential oil containing 50% of the ketone lippione. They assert that the plant is found "in wet situations and muddy river banks from Bihar to Assam, Orissa, Madhya Pradesh, Nilgiris and Anaimalais up to 900 m."

Pio Correa & Pena (1931, 1969) give the following synonymy for this species, adopting *Lippia asperifolia* Rich. as its accepted name in their 1931 work and *Lippia geminata* H.B.K. in their 1969 work: *Lantana lavandulacea* Willd., *Lippia scabra* Hochst., *Verbena globiflora* L'Her., *Zapania globiflora* Poir., *Zapania lantanoides* Lam., *Zapania odorata* Pers., *Zapania odoratissima* Scop., *Lantana lippioides* Hook., *Lantana mollissima* Desf., *Lantana odorata* Weigelt, *Lippia alba* Gardn., *Lippia citrata* Cham., *Lippia lantanoides* [Coult.], and *Lippia lippioides* Hook. & Arn. Obviously they have here combined as one species the American *Lippia alba* and the African *L. javanica* (Burm. f.) Spreng. They list as vernacular names for the American element, alecrim do campo, cidrila, cidró, oregano, oroquez morada, salsa brava, salva salva brava, salva limão, and salvia. They speak of its medicinal properties: "Planta medicinal, antispasmódica, estomáquica e emenagoga, sucedânea da *Salvia*, e da *Melissa officinalis* em quase todo o nosso pais. Contém saponina e nas fôlhas frescas um óleo essencial. -- Esta planta tem a propriedade de produzir raízes nos galhos, quando êstes tocam no solo."

Because of the question in at least some quarters as to the actual valid application of the specific name here adopted for this taxon, it seems worthwhile to quote here Miller's original (1768) description: "LANTANA (*Alba*) caule inermi, foliis ovatis serratis, floribus capitatis alaribus sessilibus. Lantana with a smooth stalk, oval sawed leaves, and flowers growing in heads proceeding from the wings of the leaves, sitting close to the stalks. *Camara foliis urticae, floribus minoribus albis, ex alis foliorum prodeuntibus*. Houst. Camara with a Nettle leaf, and smaller white flowers proceeding from the wings of the leaves. The eighth sort was sent me by the late Dr. Houstoun, from Campeachy; this hath a slender shrubby stalk which rises three or four feet high, dividing into many slender, smooth, square branches, which are garnished with small, oval, sawed leaves placed opposite; from the wings of the stalks, at every joint, come out the flowers; they are small, white, and are collected in close heads; these come out by pairs, and sit close to the branches. This flowers at the same time with the former."

The corollas are described as having been "rose" on *Hage 244* and *Silva 4858*, "lilac" on *Vincelli 830*, and "purple" on *Stevens 12390*, while Lobo and his associates describe the "inflorescence" as "lilac" and encountered **the plant in "**capoeira de terra firme". Davidse & González report the "corolla-lobes lilac, throat yellow, area between white". Hage records the vernacular name, "cidreira-

melissa", while Rose & Vilar report merely "cidreira".

Much of the material cited by me under this species in previous installments of these notes should be re-examined in view of the more recently described infraspecific taxa. It is also very probable that what has hitherto passed as *Lippia rondonensis* Mold. may actually represent a variety or form of *Lippia alba*.

Material of typical *L. alba* has been misidentified and distributed in some herbaria as *Lippia berlandieri* Schau., *Lantana involucrata* L., *Lantana macropoda* Torr., *Lantana recta* Ait., *Lantana trifolia* L., *Lantana* sp., and *Phyla stoechadifolia* (L.) Small. On the other hand, the *Renvoize 3283 & 3656*, distributed as typical *Lippia alba*, actually represents its var. *globiflora* (L'Hér.) Mold., while *Davidse & Gonzalez 13779*, *Duss 4552* *4765*, *Leonard & Leonard 15470*, *Liogier & Liogier 27590*, and *Prance & al. 16311* are f. *intermedia* Mold., *Ostenfeld 30* is *Lippia americana* L., *Baker 660*, *Case & al. 159*, *Chaves 55*, *Garnier 1069*, *Holway 617*, *Maxon, Harvey, & Valentine 7446*, *Pittier 1941*, and *Wright s.n.* [Nicaragua] are *L. cardiostegia* Benth., *González-Medrano 9041*, *Hanson 614 & 709*, *Johnston 2766*, *Medrano 1019*, and *Pringle 215* are *L. graveolens* H.B.K., *Boege 616* and *Miranda 677* are *L. oaxacana* Robinson & Greenm., *Cook 106 & 107* are *Lantana involucrata* var. *odorata* (L.) Mold., *Cory 51332*, *Gentry & Engard 23227*, and *González-Medrano 9040* are *Lantana macropoda* Torr., *Hanson 346* is *Lantana macropoda* f. *parvula* Mold., *Gaumer 478*, *Gold 529*, *Gonzalez-Medrano & al. 1789*, *9858*, & *9863*, *Hiriart & al. 102*, and *Medrano & al. 8969 & 9642* are *Lantana microcephala* A. Rich., *Ortega 4136* is *Lantana notha* Mold., and *Gaumer 830* and *Gonzalez-Medrano & al. 1781* are *Lantana velutina* Mart. & Gal.

Additional citations: TEXAS: Cameron Co.: *J. M. Coulter 113/364* in part (W--81918); *G. L. Fisher 352* (W--1224999), *41011* (W--1825517); *Hanson 434* (W--982796); *C. L. Lundell 10644* (W--1926927); *R. Runyon 228* (W--1114276), *898* (W--1287408); *Shiller 425* (W--1812066); *Tharp 1847* (W--1203137); *Townsend 85* (W--279236); *Webster & Wilbur 3023* (W--2067828). Montague Co.: *Havard s.n.* [Havana Ranch, Sept. '84] (W--155943). Wharton Co.: *J. K. Small s.n.* [April 12, 1925] (W--1739015). MEXICO: Campeche: *Houstoun s.n.* [Bailey Hort. neg. 5057] (Ba--photo of type, Ld--photo of type, Mi--photo of type, W--photo of type). Chiapas: *Matuda 5213* (Me--86180), *16645* (Me--86178), *17502* (Me--86179); *Ton 2506* (Me--141195). Guerrero: *Boege 882* (Me--96103). Jalisco: *Duncan 2556* (Mi); *Lott & Hernández M. 1471* (Ld); *E. W. Nelson 4142* (W--203180); *Edw. Palmer 33* (W--81847), *33/686* (W--81845); *Pringle 11085* (W--400469); *Puga & Carvajal H. 9963* (Me--254175); *Rose & Hough 4798* (W--346795). Michoacán: *Hinton 12844* (Me--100235); *Iltis & Doebley 186* (N); *Langlasse 168* (W--385760). Nayarit: *Ferris 5927* (W--1491689); *Mexia 819* (W--1317834). San Luis Potosí: *Crutchfield & Johnston 5135* (Me--59087). Sinaloa: *Ortega 5650* (W--1208681); *Rose 1862* (W--300745); *Rose, Standley, & Russell 14124* (W--636985). Tabasco: *Gilly & Hernández 253* (Me--76537). Tamaulipas: *Berlandier 2304* (W--1169437); *R. M. King 4035* (W--2364824); *Medrano 548* (Me--127776); *Pringle 1960* (W--155944); *Viereck 1110* (W--1687554). Veracruz: *Brigada Veg. Acuat. 369* (Me--204308); *Calzada & Marquez R. 4487* (Ws); *Chiang 266* (Me--215664);

Martínez Calderón 1924 (Me--145317), *2228* (Me--145289); *C. L. Smith 1332* (Mi). Yucatán: *Bruff 1408* (Me--46995); *Souza Novelo 268* (W--2087139). Zacatecas: *Taylor & Taylor 6052* (W--2914865). State undetermined: *Collector undetermined s.n.* [San Antonio, Lake Chapala, Feb. 8, 1893] (W--1082142); *Liebmann 11356* [Rio Vuellos] (W--1315107). GUATEMALA: Alta Verapaz: *Cook & Griggs 561* (W--408269). Escuintla: *J. D. Smith 2062* (W--1322923). Guatemala: *Ruano 329* (W--1168394). Zacapa: *Bartlett 360* (W--576980). HONDURAS: Colon: *Murry 428* (E--2889912). EL SALVADOR: La Libertad: *Calderón 1507* (W--1168794); *N. L. H. Krauss 1394* (W--2926891). NICARAGUA: Jinotega: *Sandino 2* (Ld). Madriz: *Vincelli 830* (Ld). Managua: *Stevens & Stergios 166* (Ln--242454). Matagalpa: *W. D. Stevens 9879* (Ld). Zelaya: *W. D. Stevens 12390* (Ld). State undetermined: *Lévy s.n.* (P). COSTA RICA: Guanacaste: *Standley & Valerio 46697* (W--1254801); *Tonduz 13627* (W--472335). PANAMA: Canal Zone: *Pittier 2563* (W--677226). Chiriquí: *Pittier 3329* (W--716108), *5122* (W--715304). Colón: *Fendler 220* (W--81849). Panamá: *Paul 331* (W--1589496). Province undetermined: *Paul 25* (W--1586924). CUBA: Las Villas: *Britton, Britton, & Wilson 5492* (W--658777); *Ekman 16988* (W--2113436); *J. G. Jack 8407* (W--1556373). Oriente: *León 11917* (W--2289318). Province undetermined: *C. Wright 3159* (W--81753, W--1361154). JAMAICA: *W. Harris 11737* (W--790799), *11911* (W--790959); *HaRRIS & Britton 10593* (W--656410); *Maxon & Killip 1636* (W--1046637). HISPANIOLA: Dominican Republic: *Fuertes 586* (W--658428); *J. J. Jiménez 1173* (W--1883234); *Liogier & Liogier 27590* (N, N). Haiti: *Ekman H.3514* (W--1303743). PUERTO RICO: *Eggers 1166* (W--1322918); *Sintenis 786* (W--1322920); *Velez 280l* (W--1906741). PUERTO RICAN OFFSHORE ISLANDS: Vieques: *Shafer 2428* (W--759979). LEEWARD ISLANDS: Antigua: *Box 1570* (W--1714534). VENEZUELA: Apure: *Davidse & Gonzdlez 13779* (Ld), *13941* (E--2985541), *14071* (E--2985538). Zulia: *Bunting & Aristeguieta 6068* (Ld). FRENCH GUIANA: *Burgot 1423* (Cy). ECUADOR: Guayas: *Dodson & Dodson 11229* (Ld). Moreno-Santiago: *J. Hart 1215* (W--2936995). PERU: La Libertad: *Ferreyra 20003* (W--2977605). Lambayeque: *Llates Q. 543* (Ld). Pasco: *Teppner 81/226* (Ld), *8l/453* (Ld). BRAZIL: Amapa: *Austin, Nauman, Rabelo, Rosdrio, & Santos 7381* (N, W--2937864). Amazônas: *F. J. Hermann 11282* (W--2592959). Bahia: *Hage 244* (Ld); *Harley, Bromley, Carvalho, Nunes, Hage, & Santos in Harley 23020* (W--2965504). Goiás: *Silva 4858* (N). Maranhão: *Rosa & Vilar 2964* (N). Matto Grosso: *Mizoguchi 346* [Herb. Oomoto Kam. Bot. Gard. 14585] (E--2978850). Pará: *Archer 8266* (W--2592876); *Davidson & Martinelli CD.10689* (Ld, N, W--2986371); *Lobo, Vilhena, & Ribeiro 158* (N); *Maciel & Cordeiro 145* (N). BOLIVIA: El Beni: *H. H. Rusby 916* (W--1934994); *Solomon 6136* (Ld). PARAGUAY: *Casas & Molero FC.4419* (E--2978895. N); *Schinini & Bordas 16503* (N). ARGENTINA: Corrientes: *Cristõbal, Krapovickas, Gonzdlez, & Tressens 1480* (Mi, Ws). Misiones: *Cabrera, Botta, Kiesling, Rotman, Tur, & Zuloaga 28645* (N). Soto Island: *Renvoize, Wilmot-Dear, & Tur 3656* (N). CULTIVATED: Canal Zone: *Standley 30010* (W--1219019). Dominican Republic: *Ekman H.15802* (W--1555140). Haiti: *E. C. Leonard 8515* (W--1149982). Nicaragua: *W. D. Stevens 19992* (Ld). Panama: *Heriberto 73* (W--1084294); *Standley 30528* (W--1219348). Peru: *Treacy & Alcorn 410* (F--1925498). [to be continued]

Use Of Picloram To Obtain ROOTkill Of Unwanted Woody Plants, In Practicable Rightofway Vegetation Management, 1983*.

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In 1983, the use of picloram was continued. Dow's Tordon RTU was used, containing 5.4% picloram (triisopropanolamine salt of 4-amino-3-5-6 trichloropicolinic acid, with 20.9% of a comparable salt of 2,4-D) diluted with equal parts of water. Picloram is said to "translocate" within the plant. The mixture was specifically applied to 55,667 stubs of the same 97 species of woody plants (including a few critical herbaceous species) as in 1982, occuring on 25 acres researched since 1925, and used since 1946 for the development of relatively stable (i.e. non-successional) shrubby and herbaceous plant-communities, within a beech-birch-maple-hemlock Vegetation Zone. The technique of application is completely stub-specific, with woody stubs up to 8 cm. in diameter. (Low stumps of larger trees are known to be rootkilled by picloram application). Stubs 2-10 cm. in dm. are sawed with a small folding saw. Stubs under 2 cm. (often bent over by stepping on them) are cut with an anvil-blade pruning shears held in the right hand, and sprayed with a 1½ pint or a 3½ pint plastic garden sprayer, held in the other hand. The saw is also used to chafe the bark, and expose the cambium close to the ground, with downward strokes. A small hatchet is sometimes used for "cups" or "frills", and the injuries are then sprayed. Approximately four gallons of Tordon RTU were used, now selling at $28.16 a gallon. It took 242 hours actually to spray the 55,667 stubs. Trees and shrubs are cut at varying heights, and varying percentages of the branches and shrub-stems were cut to seek economically the most efficient technique for root-killing. No attempt was made - considering the highly varying state of nature itself - to quantify categorized data for mathematical operations. Such methodologies are inappropriate. By the end of 1983, the following operations can be made, verifying and supplementing those made in 1982.

In general, for all species, picloram is a more efficient root-killer than the older chlorophenoxies 2,4-D and 2,4,5-T. As with the chlorophenoxies, by far the major part of the translocation is UP (conspicuously killing the top foliage, which then often adheres to the top branches in early winter, and is called "kill" by many engineers, "control" by other engineers).

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Tordon INEFFICIENTLY moves DOWN, to kill the roots, which is the objective of the honest Vegetation Manager. Picloram does pass readily thru the roots on some clonal species (on its way UP to adjacent stems) such as Bristly Locust and Trembling Aspen, killing ramets up to 2 m. distant. Tordon does not seem to move thru the roots of beech, when sucker-stubs are treated.

The terms "control" and "kill" are not used, tho they are popular in the commercial literature. "Control" is the commercial term for a temporary reduction in the population of a weed species. "Kill" inadvertantly refers to visible top-kill, a cosmetic effect, which if it is the only effect, is considered a failure in this study.

No data are presented for "per acre averages". As in all such non-indiscriminate species-oriented operations, the extraordinary variability in the abundance of each species in plant-communities make per-acre data irrelevant.

Inevitably, some spray gets onto the ground, some of which then washes into the soil. If there is movement of the soil solution down slope, picloram is apparently picked UP by other plants, even 15 m. away, with highly injurious results to those plants. i.e. treatment must not be near desirable shrubs and herbs. However, most of these plants recover after 2 years.

In general, cutting higher stubs (waist high to head high) and the cutting of a small percentage of several ground-arising stems from one shrub or tree clump does not lead to effective rootkilling. This treatment was emphasized in 1982, but re-sprouting (tho with small and distorted growth) was considered undesirable.

Saw-scraping near the ground on 5-7 m. high saplings and picloram treatment produces a quick and most conspicuous leaf-kill. Leaves begin to drop or turn color by two days to two weeks, but resprouting the next year, from the base, indicates the frequent failure to rootkill.

When resprouting occurs in a second year, it is probable that the plant will recover in a third or fourth year. Even shrubs severely damaged after accidental contamination may send out new and apparently healthy shoots at various heights among the branches in a later year. (There is no field evidence yet, that picloram is released from decaying roots, causing delayed damaging effects.)

There is NO evidence that any individual woody plants develop an immunity or resistance to picloram, allowing them to become more abundant in the future. Any resurgence is simply due to the original failure to rootkill. Mice and deer may then "control" these shoots, depending on the abundance of the animals. The apparent

increase of such plants as oaks, ashes and maples on transmission lines is simply the iatrogenic effect of a quarter-century of never rootkilling these plants, together with additional invasion of such woody plants in the bare spots left by killing the non-target plant species.

The bulk of the unwanted woody plants in the research areas of A.F. are "old" plants, there for 5-50 years or more, unkilled by past chemical treatments, and variably controlled by herbivores. Successful new invasion of trees and shrubs into herbland is a variable and unpredictable complex phenomenon, occurring at intervals of decades. There is essentially no invasion into pure stands of most shrubs and ferns, and a few herbs.

Heaviest new invasion of unwanted woody plants is clearly at the sides of the fields, within 15 m. of the forest edge, and dependent even there on the coincidence of seed trees in that edge. On the other hand, if the 15-m.-wide edge is dominated by certain pure low stands of such as Hayscented Fern, Low Juniper, Rough-stemmed Goldenrod, there is no such invasion, even if clearly in the seed-fall shadow and leaf-fall shadow of large trees. (These plants are often destroyed by unreasonable R/W management practices.)

The trees most easily root-killed, even by stubbing at heights of 1½ to 2 m., are the Birches, White, Gray, Yellow and Black. Red Maple, the most abundant single species in these tests, and Red Oak, are usually rootkilled if all stubs are cut and treated within 15 cm. of the ground. White Ash, with its massive tap root, should be treated close to where the "root collar" is, but since a seedling-stem is often flattened by falling grass in autumn (to grow upward from the tip, leaving a horizontal stem section up to 30 cm. long, itself developing adventitious roots), effective stub-application is a problem. It may be wise to ring and rootkill the fruiting large ash from which the seedlings came.

The search for a yet cheaper and more efficient mode of chemically rootkilling unwanted woody plants in R/Ws continues, even while the undesirability of indiscriminate blanket herbicidal spraying - killing many highly desirable non-target species - becomes more and more obvious.

The "end-product" of this technique of rootkilling of unwanted woody plants that had invaded long ago, leaving relatively stable permissible plant-communities, has been essentially accomplished at Aton Forest. This research was begun in 1946. The scientific description of such stable Vegetation types will take increasing precedence in future botanical research reports.

OBSERVATIONS OF THE GENUS GYNOXYS IN ECUADOR (SENECIONEAE: ASTERACEAE).

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A large series of Gynoxys specimens collected in Ecuador have recently been received for study from the Botanical Institute, University of Aarhus, and both recognition of new species and refined concepts of older species have resulted. Three species are considered in the present paper, two newly described and one, G. acostae Cuatr. recognized from many additional specimens. Previous collections have been noted of all three species, collections that have often been misidentified in the past.

Gynoxys acostae Cuatrecasas, Feddes Repert. 55: 129. 1953.

The species has been recognized previously only from the type specimen, Ecuador: Tunguragua: reg. interandina, Sec. Alta de Pasa, 3500 m alt. Oct. 28, 1944. Acosta Solis 8738 (Holotype, F). Various of the specimens recognized below as this species have been determined previously under the names G. fuliginosa (H.B.K.) Cass., G. baccharoides (H.B.K.) Cass., G. buxifolia (H.B.K.) Cass., G. hallii Hieron., and G. cuicohensis Cuatr. It is of interest that Hieronymus (1895) under his description of G. stuebelii, a related species with more cordate leaf bases from Mt. Pichincha in the western range of the Andes, listed as a possible representative of his species a specimen from Mt. Cayambe (Steubel coll. ecuad. n. 114) that is probably the present species. The present species seems to be restricted to the eastern range of the Andes in north-central Ecuador where it seems particularly common along the amazonian side. The specimens seen in this study are as follows: Ecuador: eastern cordillera, 3000-3400 m. May 1930. Rimbach 16919 (US); Napo: Llanganati. Paramo SE of Chosa Aucacocha, between Aucacocha and Pan de Azucar, alt. 3800-3900 m. Øllgaard, Holm-Nielsen, Larsen, Kvist, Jensen & Wium-Anderson 38465 (AAU); Llanganati. North facing slope towards the Río Golpe, just north of Chosa Aucacocha, alt. 3600 m. Øllgaard et al. 38708 (AAU); Llanganati. Ridge between Pan de Azucar and Las Torres de Llanganati, alt. 4050 m. Øllgaard et al. 38580 (AAU); Páramo de Soguillas, near Las

Torres de Llanganati, alt. 3850-4000 m. Øllgaard & Holm-Nielsen 38717 (AAU); Pichincha: Volcán Cayambe, above 4000 m. Little & Paredes 6839 (US); Mt. Cayambe, alt. 13,300-13,833 ft., E. L. Little 6839 (US); Pichincha/Napo: Volcán Cayambe, N slopes, alt. 3750-3850 m. Øllgaard, Brandbyge, Roth & Sperling 34227, 34230 (AAU, US); Tungurahua: Paramo of Minza Chica, elev. 3800 m. Penland & Summers 304 (US).

Gynoxys multibracteifera H. Robinson & J. Cuatrecasas, sp. nov.

Plantae fruticosae 2-3 m altae mediocriter ramosae. Caules subhexagonales inferne teretes distincte striati dense cinereo-farinosi vel minute flavo-lanato-tomentosi. Folia opposita, petiolis 10-10 mm longis subcarnosis distincte striati; laminae coriaceae oblongo-ovatae 4.5-9.5 cm longae et 1.2-3.0 cm latae base abrupte late rotundatae margine integrae anguste reflexae apice breviter acutae supra in nervis primariis anguste distincte pallide lanuginosae aliter glabrae leniter reticulo-exsculptae subtus dense pallide lanuginosae, nervis primariis valde prominentibus recte percurrentibus, nervis secundariis pinnatis basilariter regularibus saepe distaliter dichotomis utrinque 11-17, nervulis non vel vix prominulis. Inflorescentiae in ramis terminales late corymbosae, pedicellis 2-18 mm longis saepe linearibracteiferis. Capitula 12-14 mm alta et 7-9 mm lata; bracteae calyculi et subinvolucri lineares 6-7 mm longae et ca. 0.5 mm latae; bracteae involucri 8 late oblongae ca. 7 mm longae et 2-3 mm latae apice obtusae vel breviter acutae superne tenuiter scariosae ad medio longitudinaliter anguste carinatae extus subsparse fulvo-lanugineo-tomentosae inferne densiores. Flores radii 8 in capitulo; corollae flavae glabrae, tubo ca. 4.5 mm longo, limbo elliptico 7 mm longo et ca. 3 mm lato. Flores disci 9-16 in capitulo; corollae flavae 7-8 mm longae glabrae, tubo 2.5-3.0 mm longo, fauce subabrupte longe campanulata 2.5-3.0 longo; lobis lanceolatis ca. 1.5 mm longis et 0.7 mm latis; filamenta in partibus superioribus ca. 0.5 mm longa; thecae ca. 1.8 mm longae base ad 0.25 mm caudatae; appendices antherarum anguste ovatae ca. 0.75 mm longae et 0.32 mm latae; rami stylorum apice acuti et penicillato- attenuati. Achaenia ca. 3.5-3.7 mm longa 10-costata base leniter angustiora non abrupte constricta; carpopodia annuliformia ca. 0.4 mm lata et 0.07 mm alta, cellulis 4-5-seriatis in parietibus valde incrassatis in marginibus superioribus non prominentibus; setae pappi albi ca. 75 plerumque 6-7 mm longae apice distincte latiores

valdius scabridae. Grana pollinis in diametro ca. 65 µm.

TYPE: ECUADOR: Azuay: Ridge between El Pan and Guachapala; 7500-9800 ft. elev. Shrub 2 m. Leaves leathery; deep green, nitid above; pale pubescent below. Ray and disc flowers yellow. Sept. 4, 1945. W. H. Camp E-5244 (Holotype, US). PARATYPE: ECUADOR: Azuay: Vía Gualaceo-Culebrillas-Limón. Colecciones en páramo, borde del carretero y bosque, suelo humífero, área húmeda. Altitud entre 3261 a 3444 m. Arbusto de 3 m en borde del carretero, envés de las hojas cafés, capítulos amarillos. 2 Nov. 1979. J. Jaramillo & F. Coello 1439 (AAU).

The type of the new species was previously determined as Gynoxys baccharoides H.B.K. to which it seems closely related. The two species and G. reinaldi Cuatr. seem to form a natural group of three species all having linear subinvolucral bracts, scarcely enlarged tips of the pappus setae and broadly scarious apical margins of the involucral bracts. All three species also seem to occur in the area of Azuay according to the citations on recent collections and the collection date given by Humboldt, Bonpland and Kunth (1818) for G. baccharoides. The three species differ from each other by the density of the pubescence on the involucre, none in G. reinaldi, very dense in G. baccharoides and of intermediate density in G. multibracteifera. The new species has the linear subinvolucral bracts much more numerous and longer than those of G. baccharoides. The tomentum is thicker on the undersurfaces of the leaves in G. baccharoides as well as on the involucral bracts, obscuring the secondary veins. Gynoxys multibracteifera is close to the peruvian G. nitida Muschl., but differs by the larger heads, longer peduncles with a greater number of linear bracteoles, and the compact indument on the branchlets and abaxial sides of the leaves. In addition, the type of G. nitida has broad, elliptic ray corollas that are deeply 3-lobed.

Gynoxys regis H. Robinson & J. Cuatrecasas, sp. nov.

Plantae frutescentes vel arborescentes 7-4 m altae mediocriter ramosae. Caules subhexagonales dense flavo-velutini. Folia opposita, petiolis 7-13 mm longis distincte striatis trans nodos anguste contiguis; laminae oblongae in foliis primariis 12-15 cm longae et 4.7-5.0 cm latae in foliis secundariis plerumque 4-6 cm longae et 1.2-2.0 cm latae base abrupte late vel anguste rotundatae margine integrae

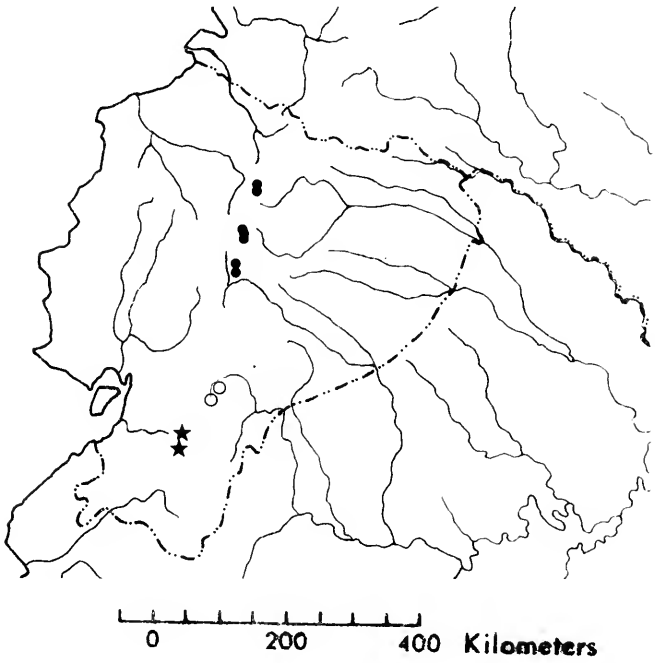
vel in foliis majoribus remote reflexe mucronato-denticulatae apice breviter acutae supra glabra in nervis et nervulis reticulato-exsculptae subtus dense flavide tomentosae, nervis primariis prominentibus valde et recte percurrentibus, nervis secundariis pinnatis fere ad marginem sensim irregulariter flexis vel ramosis utrinque ca. 8-10, nervulis prominulis. Inflorescentiae in ramis terminales pyramidato-thyrsoideae in ramulis interdum breviter racemosae terminaliter corymbosae, pedicellis 1-5 mm longis dense pallide velutinis. Capitula 9-10 mm alta et 5-7 mm lata; bracteae calyculi et subinvolucri minute triangulares ca. 1.5 mm longae et 1 mm latae; bracteae involucri 8 valvatae 5-7 mm longae exteriores 1.0-1.5 mm latae interiores in marginis scariosis ad 2 mm latae apice obtuse vel breviter acutae extus in medio valde prominentes dense pallide velutinae. Flores 7-10 in capitulo disciformi; corollae flavae 7.5-8.0 mm longae glabrae, tubo 3-4 mm longo, fauce abrupte campanulata ca. 2 mm longo, lobis anguste oblongis vel sublinearibus 2-3 mm longis et ca, 0.7 mm latis; filamenta in partibus superioribus ca. 0.6 mm longa; thecae antherarum ca. 2 mm longae base ad 0.4 mm caudatae; appendices antherarum anguste ovatae 0.4-0.6 mm longae et 0.20-0.25 mm latae; rami stylorum apice rotundati truncati papillato-fimbriati ad medio penicillate pilosi. Achaenia ca. 2.7 mm longa 10-costata base leniter angustiora non abrupte constricta; carpopodia breviter cylindrica. 0.45 mm lata et 0.15 mm alta, cellulis ca. 6-seriatis in parietibus valde incrassatis in marginibus superioribus non prominentibus; setae pappi albae ca. 60-95 plerumque ad 6-7 mm longae apice vix latiores, scabris apicalibus leniter densioribus. Grana pollinis in diametro ca. 62 µm.

TYPE: ECUADOR: Azuay: 30 km S of Cumbé on the road to Saraguro at an elevation of 9800 ft. Shrub 2 m tall. Florets yellow. 26 Jan. 1979. R. M. King & F. Almeda 7804 (Holotype, US). PARATYPE: ECUADOR: Loja: Carretero Saraguro-Tenta, colecciones en borde del carretero, bosque secundario, campo abierto, pajonal y ciénegas, suelo con terreno humífero y rojo. Altitud entre 2500 a 2800 m. Arbusto de 4 m en borde del carretero, envés de las hojas café claro, capítulos color amarillo. 16 Sept. 1980. J. Jaramillo 3827 (AAU).

The new species is particularly notable for the heads without ray flowers, the narrow and long corolla lobes, and the tips of the style branches that are rounded to truncate with only a penicillate central projection of hairs. The tip of the style in

Gynoxys is usually acute, but scattered members of the genus such as the new species as G. vargasiana Cabrera and G. (Scrobicaria) ilicifolia, have truncate styles. Most other rayless species in Ecuador tend to have involucral bracts glabrous on the outer surface.

Hieronymus, G. 1895-1896. Plantae Stuebelianae novae. Botanischer Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie. 21: 306-378.



Dots - Gynoxys acostae Cuatr.
Circles - G. multibracteifera n. sp.
Stars - G. regis n. sp.

Gynoxys multibracteifera H. Robinson & J. Cuatrecasas, Holotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

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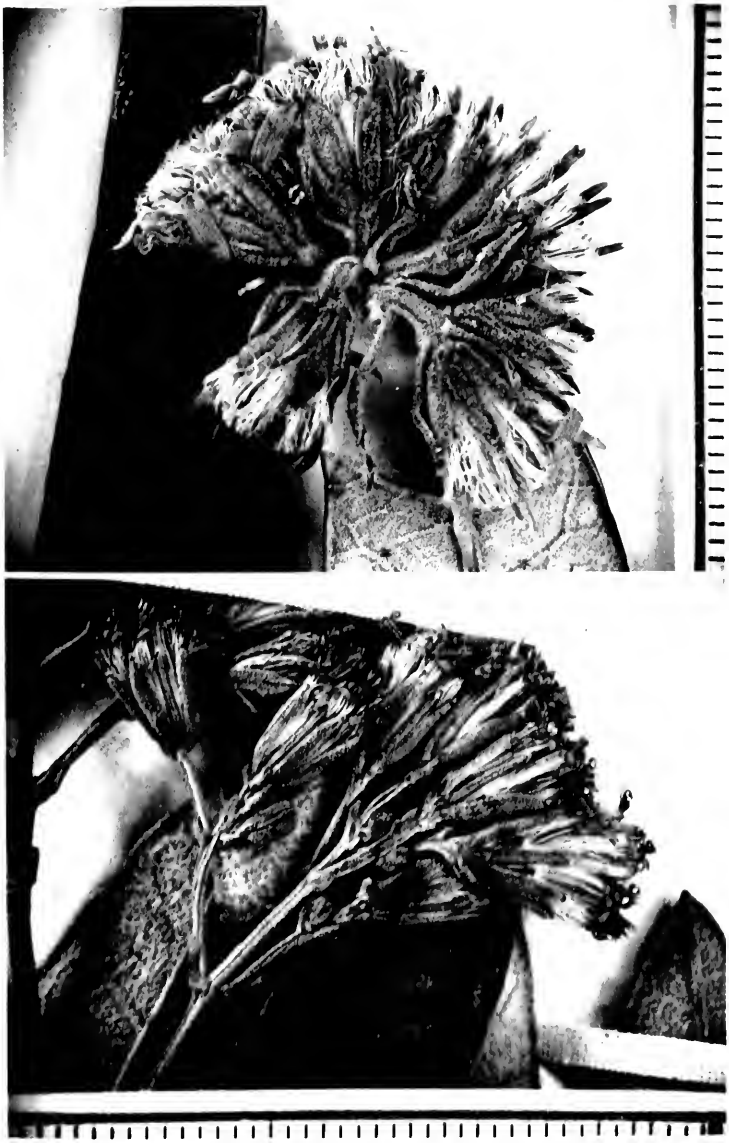
Gynoxys regis H. Robinson & J. Cuatrecasas, Holotype, United States National Herbarium.



Enlargements of heads. Top. Gynoxys multibracteifera. Bottom. G. regis.

BOOK REVIEWS

Alma L. Moldenke

"ARBRES, ARBUSTES, ARBRISSEAUX DU QUÉBEC Comment les Identifier En Toutes Saisons" 8th Edition, by Jean Smith & Louis Parrot, 155 pp. & 52 b/w line draw., Gouvernement du Québec. 1984. Paperbound.

This is a very effective, pocket-sized, readily workable key to the 23 evergreen-needled and 99 deciduous broad-leaved trees and shrubs of the province. Both common names in French and the scientific ones in Latin are given in separate indexes. The clear line drawings at the back are very helpful for the amateur naturalist with a yen to recognize by name the beauties he/she sees while walking through the woods.

"ANNUAL REVIEW OF PHYTOPATHOLOGY Volume 22, 1984" edited by Raymond G. Grogan with George A. Zentmyer & Ellis B. Cowling, x & 487 pp., 18 b/w photo., 17 fig. & 33 tab. Annual Reviews. Inc., Palo Alto, California 94306. 1984. $27.00 U.S.A. & $30.00 foreign.

This continuing fine offering of papers starts with a prefatory one by Dr. Ou relating his experiences in "Exploring Tropical Rice Diseases" and his leadership in the wonderful work of the International Rice Institute. The historical perspectives cover the contributuons of E. C. Stakman, Cynthia Westcott, James Johnson and Mortimer P. Starr. There are 6 papers on different types of pathogens, 1 on compartmentalization as a framework for understanding how trees grow and defend themselves, 5 on the physiology and genetics of host plant and disease interactions, 1 on the breeding of resistance, 3 on epidemiology and influence of the environment, and, lastly, 1 on toxicants and chemical control. As is characteristic of scientific progress reports in the whole series, succint advances are described and subjective prospects are enthusiastically pointed out, but, at the same time, known limitations are always declared.

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ARCHIBACCHARIS INTERMEDIA (BLAKE) TURNER, COMB. NOV.

B. L. Turner

Department of Botany, Univ. of Texas, Austin 78712

Preparation of a treatment of the Asteraceae of Veracruz has convinced me that Archibaccharis hirtella var. intermedia Blake is a valid species related to, but amply distinct from, A. hirtella (DC.) Heer. Jackson (1975) in his revisional study of Archibaccharis knew A. intermedia from only two collections, the type itself and from a Botteri collection, both from Mount Orizaba. The present study is based upon a large group of collections at ENCB, TEX and XAL, ranging from northern Hidalgo state to central Veracruz. Most of these were assembled from Veracruz by the exceptional collector F. Ventura A. working out of ENCB, who must have made Archibaccharis his favorite genus for collection, so numerous and well documented are his specimens (cited, in part, below). For this we owe him many thanks.

I include here an emended description over that rendered by Jackson, along with such other observations that seem appropriate.

Archibaccharis intermedia (Blake) Turner, comb. nov.

Archibaccharis hirtella (DC.) Heer. var. intermedia Blake, J. Wash. Acad. Sci. 24: 434. 1934. TYPE: MEXICO. Veracruz: shaded banks near Orizaba, 25 Jan 1895, Pringle 6108 (holotype US; isotype ENCB!)

Erect to scandent herbs 0.5 m high or clamboring shrubs to 3 m high. Stems terete, striate, densely to moderately sordid puberulent. Leaves ovate to lanceolate-ovate, 2.5-6.5 cm long, 1-2 cm wide, sparsely puberulent above and below along the major veins, otherwise glabrous, the margins remotely dentate to serrulate; petioles well-defined, mostly 1-3 mm long. Heads numerous (50-150) in loose, leafy, terminal corymbose panicles. Pistillate heads 4-5 mm high, 3-4 mm wide; bracts 3-4 seriate, imbricate, linear-lanceolate, glabrous, acute, the margins sparsely ciliate; ray florets filiform, 20-30; corollas 2.5-3.0 mm long, white, puberulous to glabrous, the ligule obsolete; achenes ca. 1.3 mm long, 2-3 nerved, sparsely hispid, the pappus 2-3 mm long. Staminate heads 3-4 mm high, 3-4 mm wide; bracts 2-3 seriate, imbricate, lanceolate-ovate, sparsely puberulent to glabrous, prominently ciliate and often red-tinged; disk florets 10-30; corollas 2-3 mm long, white to reddish-brown; tube 1.0-1.5 mm long, puberulent; limbs 2-3 mm long, glabrous or nearly so, the lobes 1.0-1.5 mm long.

Chromosome number unknown.

DISTRIBUTION AND HABITAT: Montane regions of pine and oak cloud forests from Hidalgo south along the Sierra Madre Orientale to central Veracruz (Mount Orizaba); 1500-2400 m. Flowering Oct.-Feb.

REPRESENTATIVE SPECIMENS: MEXICO. HIDALGO: 3 mi S La Culabra, Hwy. 84, 54 mi N Zimapan, 30 Dec 1970, Dunn et al. 17426 (ENCB); El Estribo carretera Metepec - Tenango de Doria, 2400 m, 3 Dec 1972, Gimate 807 (ENCB); 2 km S Tenango de Doria, 1700 m, 14 Jan 1973, Rzedowski 30241 (ENCB).

PUEBLA: 3 km N Zacapoaxtal, sobre la carretera a Cuetzalan, 1500 m, 4 Feb 1974, Rzedowski 31726 (pistillate plant), 31727 (staminate plant) (ENCB).

VERACRUZ: Mun. Acajete: Plan de Cedeno, 1780 m, 9 Dec 1971, Ventura 4663 (ENCB); Acajete, 1800 m, 6 Dec 1976, Ventura 13712 (ENCB). Mun. Acatlan : Acatlan, 1800 m, 10 Dec 1973 Ventura 9388 (ENCB); Acatlan, 1800 m, 20 Sep 1975, Ventura 11849 (ENCB). Mun. Altotonga: Tasahuapa, 1800 m, 8 Nov 1969, Ventura 17 (ENCB,LL). Mun. Atzalan: Tatzayanala, 1400 m, 10 Jan 1970, Ventura 348 (ENCB); Cerro del Aquila, 800 m, 19 Jan, 1981, Ventura 18113 (ENCB, XAL). Mun. Coscomatepec: El Durazno, 1415 m, 29 Jan 1972, Ventura 4860(ENCB, TEX). Mun. Naolinco: Naolinco, 1500 m, 1 Nov 1973, Ventura 7779 (ENCB). Mun. Yecuatla: Paz de Enriquez, 1550 m, 7 Nov 1970, Ventura 2785 (ENCB).

Jackson (1975) correctly notes that this taxon, which he maintained as a variety of Archibaccharis hirtella , is quite distinct from the latter. Label data indicate that the species may vary in habit from an erect herb (0.5 m, in flower) to a clamboring "vine" up to 3 m high. It is usually described, however, as a perennial herb to 1.5 m high, in which case it has only weakly fractiflex stems. It is readily distinguished from A. hirtella by its small, mostly ovate leaves which are abruptly petiolate, small heads in leafy open capitulescences, the ultimate peducles being mostly 5-12 mm long. In addition, as noted by Jackson, the taxon is completely eglandular, which provides a convenient "key character" for identification purposes.

Archibaccharis hirtella is a widespread species occurring from the state of Mexico along the Sierra Madre Occidentale to Chiapas and hence southward to El Salvador. With the exclusion of A. intermedia it is comprised of 3 varieties: var. hirtella which grades southward into the more pubescent var. taeniotricha Blake and the var. albescens Jackson, which is a poorly known localized taxon from central Oaxaca. The distributional relationships of these several taxa are shown in Figure 1.

LITERATURE CITED

Jackson, J. D. 1975. A revision of the genus Archibaccharis Heering (Compositae - Astereae) Phytologia 32: 81-192.

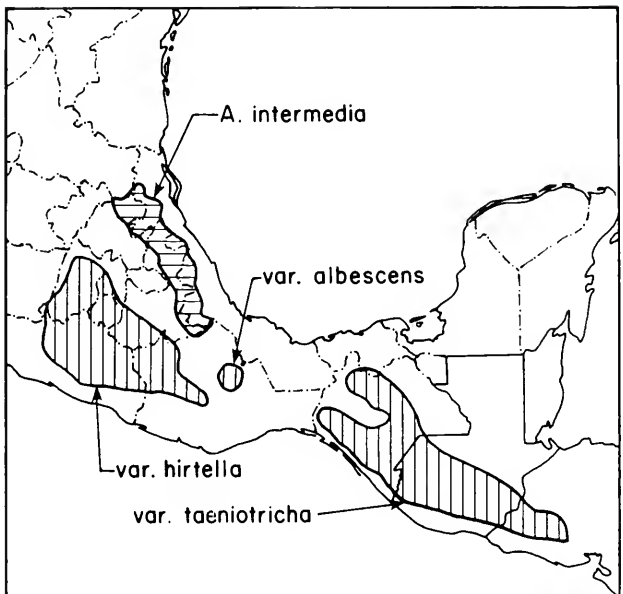

Fig. 1. Distribution of A. intermedia and varieties of A. hirtella.

NOTES ON NEW AND NOTEWORTHY PLANTS. CLXXIX

Harold N. Moldenke

LIPPIA GLAZIOVIANA var. *PUSILLA* Mold., var. nov.

Haec varietas a forma typica speciei statura humiliore foliis parvioribus basaliter subtruncatis recedit.

This variety differs from the typical form of the species in its lower stature and smaller leaves, the latter being only 3--6 mm. long and 3--5 mm. wide, basally subtruncate.

The variety is based on *G. Hatschbach 47540* from campo rupestre in the vicinity of Ibiquare, Bahia, Brazil, collected on January 23, 1984, and deposited in the Lundell Herbarium at the University of Texas. The collector notes that the plant grows from an underground xylopodium and the corollas are rose-color when fresh.

PAEPALANTHUS ERIGERON var. *PUBESCENS* Mold., var. nov.

Haec varietas a forma typica speciei bracteis involucris dorsaliter densissime adpresso-pubescentibus recedit.

This variety differs from the typical form of the species chiefly in the involucral bracts being very densely appressed-pubescent on the outer surface.

The variety is based on *G. Hatschbach & R. Kummrow 47956* from "paredões de arenitos local sombrio" in campo rupestre at Mucugê, Bahia, Brazil. collected on June 16, 1984, and deposited in the Lundell Herbarium at the University of Texas,

STACHYTARPHETA CRASSIFOLIA f. *ALBA* Mold., f. nov.

Haec forma a forma typica speciei corollis albis recedit.

This form differs from the typical form of the species in having white corollas.

The form is based on *G. Hatschbach 47464* from campo rupestre 15 km. south of Mucugê, in the Serra do Sincorá, Bahia, Brazil, collected on January 22, 1984, and deposited in the Lundell Herbarium at the University of Texas. The collector describes the plant as a shrub, 1.5 m. tall.

OXALIDACEAE EXTRA-AUSTROAMERICANAE

V: AVERRHOA L.

Alicia Lourteig

Muséum National d'Histoire Naturelle, Paris

Abstract. The taxonomical study and distribution of the Genus Averrhoa is completed with a palynological research (Contributed by M.-T.Cerceau-Larrival) in the aim of proving, also by the pollen features, its position within the family of the Oxalidaceae as well as establishing the diagnostic characters for the two species.

LINNAEUS creó el género Averrhoa para 3 especies leñosas conocidas desde tiempos muy antiguos en el viejo continente e ilustradas por RUMPHIUS y RHEEDIUS. Dos de ellas son Oxalidáceas y llevan como epítetos los nombres vernaculares por los cuales se las conocía en cultivo. Averrhoa acida L., descripta más tarde por el mismo autore como Cicca disticha L., Mantissa 1: 124. 1767 es una Euphorbiaceae. LINNAEUS filius reconoció la identidad de los dos binomios (Suppl. Pl. 416. 1781) vislumbrando su parentesco con Phyllanthus L. Hoy sabemos que es Phyllanthus acidus (L.) Skeels

Los autores siguientes conservaron este género junto con los otros que actualmente forman la familia de las Oxalidáceas aunque hayan sido incluídos en la familia de las Geraniáceae (Bentham et Hokker, Gen. Pl.) con la cual tienen afinidade. Sólo J. HUTCHINSON , fiel a su concepción separatista de plantas leñosas y herbáceas, dislocó el grupo y creó la familia AVERRHOACEAE Hutchinson, Fam. Flow. Pl. 1959 para este género.

VELDKAMP, 1967 y 1971, expone sus argumentos para reintegrar Averrhoa en Oxalidaceae así como LOURTEIG, 1981 y 1983. El "carácter leñoso" de Hutchinson es insostenible pues Dapania y Sarcotheca del Viejo Mundo son árboles grandes, Biophytum,representado en los dos continentes, comprende en su mayoría, arbustos nanos y numerosas especies de Oxalis poseen tallos leñosos (h, 1-2 m de alto) o de base leñosa.

Distribución geográfica y ecología

Las dos especies viven en todos los continenetes, pero al parecer, cultivadas. El origen no está probado. WEBSTER, J. Arnold Arb.38 :71 - 72 resume la discusión al tratar Phyllanthus acidus y parece favorable a la opinión de TRIMEN, Handb. Fl. Ceylan 1: 200. 1893 y de MERRILL, Botan. of Cook's Voyages p. 301. 1954 quienes afirman que la introducción en India se produjo a partir de Brasil por medio de la navegación portuguesa. No hay más explicaciones. VELDKAMP, 1971, se inclina por un origen indo-malásico con argumentos, a mi parecer, válidos y que comparto.

La literatura prelinneana comenzando con BAUHIN, 1623 y luego RHEEDIUS y RUMPHIUS comporta citaciones sólo para la región indomalaya. Por el contrario, las más antiguas relaciones de viajes de Sudamérica no las mencionan; tampoco figuran en los trabajos de PLUMIER ni en sus manuscritos que he revisado. Las características de estos árboles y sus frutos comestibles no hubieran pasado desapaercibidos. Además KOORDERS, Exkursionf. Java 2: 418-414. 1912 (Cfr. KNUTH, Engler u. Prantl, Pflanzenfamilien 19a : 39. 1931) escribe haber hallado las dos especies silvestres en Java. En Sudamérica, los especímenes que he revisado, proceden de plantas cultivadas. Son especies pantropicales que viven en lugares húmedos, selváticos y en cultivos. Al parecer las plantas americanas no alcanzan la talla maximal observada en el Viejo Mundo.

Movimientos foliares

Han sido objeto de observaciones precisas por BRUCE, Philos. Trans. 356. 1785 y, en especial, por Ch. DARWIN, The movements of Plants 1830 en cuya traducción francesa por G. HECKEL, 1832 Paris, pp. 332 - 337, f. 132-135 y p. 451, f. 180 se estudia el fenómeno de la posición de sueño en Averrhoa Bilimbi L. durante la noche, durante el día, midiendo en grados la separación de los folíolos, verificando la luminosidad, la temperatura, los contactos, etc. estableciendo el paraheliotropismo.

Anatomía

CHAUVEL, Recherches sur la famille des Oxalidacées, Thèse. Pharmacie, 1903, Paris es el estudio clásico detallado de la anatomía de todos los órganos en los géneros de esta familia. HOLL u. JANSSEN, 1911 analizan Averrhoa en p. 9 y G. HEIMSCH, Lilloa 9: 97, 191. 1942 hace un estudio comparativo (al nivel de familias) del xilema. Una síntesis de los conocimientos con algunas observaciones personales se hallan en METCLAFE and CHALK, Anatom. Dicotyl. 1: 299. 1950.

La estructura vascular del tallo y del pecíolo consiste en haces colaterales rodeados externamente de un periciclo casi continuo. Los vasos leñosos presentan perforaciones. CHAUVEL halló cristales de oxalato de Calcio dispuestos en filas longitudinales, uno en cada célula, en A. Bilimbi y cristales prismáticos o grupos cristalinos en la médula, líber y parénquima cortical de A. Carambola. Hay más fibras en A. Bilimbi que en A. Carambola. Los pelos son simples o glandulosos, con pie pluricelular de pocas células y caleza unicelular; en A. Bilimbi pelos con la base hundida en la epidermis. Los estomas están acompañados de 1 o 2 células subsidiarias paralelas a la apertura.

Heterostílea

Existe la trihetersotílea pero la regla es la gran proporción de mesoàtílea, siendo raros los casos de macro- y de microstílea.

Fitoquímica

Como todas las especies de la familia, éstas contienen ácido oxálico en proporción importante, al cual se deben varias de sus propie-

dades que justifican su uso. Todavía no se tienen datos precisos sobre la composición química de los distintos órganos de estas especies aunque desde el punto de vista práctico se han analizado los frutos (HERMANO and SEPULVEDA, Phil. J. Sci. 54. 1934 vitaminas; GUERRERO, Medicinal uses of Philip. Pl., Bull. Bur. Forest. 22(3). 1921) citados por W. H. BROWN, Useful Pl. Philipp. 2. Techn. Bull. Bureau Sci. Manila 10. 1950. HEGNAUER, Chemotaxonomie Pl. 5: 255. 1969 señala la presencia de leucocianidina y leucodelfinidina en las hojas de A. Carambola, hecho que corrobora la idea de que esta familia sería la más primitiva en el Orden de Geraniales.

Palinología

ERDTMAN, Morphol, Pl. Taxonom. 30 2-303. 1952 estudia el polen de A.Bilimbi. Dados los progresos técnicos en la investigación palinológica y con el objeto de reubicar el género y de buscar posibilidades de caracteres específicos, una nueva investigación era necesaria.

Las relaciones con los pólenes de Oxalis, Biophytum, Dapania y Sarcotheca confirman el mantenimiento de Averrhoa en la familia de las Oxalidáceas. Se estudiaron los granos de polen de estambres de los 2 ciclos (largos y cortos) en A. Bilimbi y de uno (sólo fértil el largo) en A. Carambola. Excepcionalmente se halló una antera mal conformada en el ciclo de filamentos cortos, la cual contenía granos de polen estériles, deformados, en masas. Las observaciones fueron efectuadas al microscopio óptico y al de barrido. Existen diferencias al nivel específico.

Usos

Ambas especies presentan las mismas propiedades debidas en gran parte a la abundancia de ácido oxálico: éste hace desaparecer las manchas de hierro y de tinta de las ropas: poseen acción antiscorbútica y febrífuga. Los frutos se utilizan como tales para refrescos, agregándoles un poco de azúcar (especialmente A. Carambola), para preparar dulces, compotas, conservas o en vinagre "pickles" (sobre todo de A. Bilimbi). Los árboles son ornamentales por sus bonitas flores y por los frutos. La madera se utiliza en la fabricación de útiles domésticos. En algunos casos para construcciones (A. Bilimbi es más resistente).

TAXONOMIA

AVERRHOA L.

Linnaeus, Gen. ed. 5. 1754. Savigny in Lamarck, Encyc. Méthod. 1: 619-620. 1785. Lamarck, Illustr. Genres 2: 503, tab. 385. 1793. Poiret in Lamarck, Encyc. Méthod. Suppl. 2: 90. 1810. Candolle, Prodromus 1: 689. 1824.Zuccarini, Denkschr. Akad. Wiss. Muench. ser.1. 9: 141. 1825.Endlicher,Gen. Plant. 1172 - 1173. 1839. Bentham et Hooker, Genera 1: 277. 1866-1867. Edgeworth and Hooker, Fl. Brit. India 1: 439. 1874. Progel in Martius, Fl. Brasil. 12 (2): 511. 1877. Reiche in Engler u. Prantl, Pflanzenfamilien 3 (4): 22. 1897. Small, N. Amer. Fl. 25 (1): 57. 1907. Knuth in Engler, Pflanzenfamilien ed. 2. 19a: 39. 1926; in Engler,

Pflanzenreich 130: 417. 1930 . Lemée, Fl. Guyane Fr. 2: 163. 1952. Backer & Backhuizen, Fl. Java 1: 247. 1963. Scholz in Syllabus 248. 1964. Veldkamp in Fl. Males. ser. 1. 7: 174-175. 1971. Adams, Flow. Pl. Jamaica 376. 1974. Lourteig, Ann. Missouri Bot. Gard. 67 (4): 824-825.1981; in Reitz, Fl. Ilustr. Catarinense 4. 1983.

Carambola Adanson, Fam. Pl. 2: 508. 1763.
Oxynix Noronha, Verh. Batav. Gen. 5: ed. 1, Art. IV. 3. 1790.
Averrhoaceae Hutchinson, Fam. Flow, Pl. ed. 2. 1: 356, f. 212. 1959.

Sépalos 5, imbricados, apenas soldados. Pétalos 5, hipóginos, contortos, libres o poco soldados por encima de la uña. Estambres 10 o un ciclo reducido a estaminodios, poco soldados en la base. Ovario 5-lobado, 5-loculado. Estilos 5, libres. Estigma 2-lobulado. Carpelos pluriovulados (raro 2-ovulados). Ovulos péndulos. Fruto una baya ovoidea u oblonga, 5-lobulada, indehiscente. Semillas 2 a varias por carpelo, albumen carnoso.

Arbolitos o árboles grandes, ramificados. Hojas imparipinadas. Cimas reunidas en racimos y luego en fascículos o pseudo-panículas, axilares o en ramas abortadas, caulifloras. Brácteas caducas. Flores hermafroditas. Flores heterostíleas.

Tipo . Averrhoa Carambola L. (Lectótipo).

Clave de las especies

A. Hojas 3-8-yugas distribuídas en las ramas. Pétalos (h. 9 mm) interiormente con pelos glandulosos diminutos. Estambres fértiles 5. Baya profundamente 5-lobulada. Semillas ariladas..... A. Carambola

B. Hojas 7-20-yugas, reunidas en el ápice de las ramas. Pétalos purpúreos interiormente glabros (10-20 mm). Estambres fértiles 10. Baya oblongo-cilíndrica apenas 5-lobulada o casi lisa. Semillas no ariladas.. A. Bilimbi

Averrhoa Carambola L.

Linnaeus, Sp. Pl. ed. 1. 428. 1753. Cavanilles, Dissert. 7: 373, f. 220. Candolle, l.c.Blume, Bijdrag. 242. 1825. Don, Gen. System. 1: 752. 1831. Wight et Arnott, Prodromus 141. 1834. Blanco, Fl. Filip. 391. 1837. Miquel, Fl. Ind. Batav. 1: 133. 1859.Edgeworth and Hooker, Fl. Brit. India 1: 439. 1874. Progel in l.c. 520 incl. var. angustisepala Prog. Trimen, J. Linn. Soc. 24: 142. 1887. Glaziou, Bull. Soc. Bot. France 52 Mem. 3: 81. 1905. Pulle in Fl. Surinam 237. 1906. Koorders, Exkursionsfl. Java 2: 414. 1912. Merrill, Spec. Blancoana 194.1918. Ridley, Fl. Malas. Pen. 1: 332. 1922. Lecomte, Bois Indochine 127, tab. 39. 1926. Knuth, l.c. 417-418.Jooker in Pulle, Fl. Suriname 3: 53, 54-55.1951. Lemée, l.c. Rivals, Trav. Labor. Forest. Toulouse 1(3):17.1960. Backer & Backhuizen,

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Averrhoa dedicado al célebre filósofo y médico árabe Averrhoes de Córdoba (1149 - 1217) quien tradujo Aristóteles al árabe.

A. Carambola nombre vernacular de la planta en el S de India.Palabra española y portuguesa (= billa).

l.c. Veldkamp, Fl. Thail. 2: 21. 1970; Fl. Mal. l.c. 175-177, fig. 9. Adams, l.c.Bates, Hortus Third 131. 1977. Lourteig, l.c. 1981; l.c. 7-9, fig. 1 A. 1983.

A. acutangula Stokes,Bot. Mat. Med. 2: 543.1812.
A. pentandra Blanco, l.c.392.
Connaropsis philippica Villar in Blanco, l.c. ed. 3. App. 33. 1880.(?)
Sarcotheca philippica (Vill.) Hallier f.,Meded. Rijk. Leiden 1: 2. 1911. Veldkamp, Blumea 15 (2): 542-543. 1967 (dubious species).

Arbol(h. 25 m alto, h. 5 cm diám.) muy ramificado, a veces ramas péndulas; corteza pardo-clara. Ramos pubescentes, pubescencia muy corta, curva, pelos blanquecinos o anaranjados, ascendentes glabrescentes. Hojas distribuídas en el tallo y ramas, 3-8-yugas (h. 50 cm ámbito). Pecíolos (h. 3 - 5 cm) pubescentes, engrosados hacia la base.Raquis rígido, pubescente (h. 20 cm). Peciolillos gruesos (1,5 - 3 mm). Folíolos alternos o subopuestos, discolores, asimétricos, de forma variada, los inferiores menores, ovados (1,5 - 3 x 1 - 2 cm), acuminados o cuspidados; los superiores elípticos (4 - 8,5 x2,5 - 3,5 cm),u ovado-oblongos cuspidados o acuminados, el terminal simétrico, elíptico (5 - 9 x 3 - 4 cm), cuspidado; base redondeada o truncada, asimétrica,nervaduras secundarias 4 - 10 pares; pubescencia cortísima uniforme en el envés;bordes adpreso-ciliados, nervaduras pubescentes en el haz. Cimas pubescentes y glandulosas, reunidas en racimos y éstos en fascículos o pseudopanículas axilares o en ramas abortadas dando caulifloria. Pedúnculos h. 1 cm. Pedicelos 3 - 4 mm, articulados más arriba de la mitad. Brácteas y bractéolas subuladas, agudas, densamente pubescentes (± ½ - 1 mm).

Sépalos oblongos, obovado-oblongos(2,5 - 3,5 x 1 - 2 mm), obtusos algo emarginados, raro subagudos, pocospelos adpresos en la zona central bordes irregulares, hialinos, finamente ciliados. Pétalos linear-espatulados (6,5 - 9 x 1,5 - 3,5 mm) base unguiculada, soldados en la zona media, raro libres, interiormente densamente glandulosos. Estambres con filamentos largos (2- 2,5 mm) fértiles; los con filamentos cortos sin anteras, raro con rudimento de antera y a veces con dos tecas rudimentarias separadas (casos hallados en materiales sudamericanos de Panamá y de Brasil), sobre un filamento corto; los filamentos de los estambres del ciclo corto (± 1,5 mm) son engrosados, más que los largos; todos son ensanchados hacia la base y soldados hasta un quinto de los cortos; anteras orbiculares, conectivo visible. En las flores longistíleas los filamentos mayores llevan glandulitas en la mitad superior.En las flores mesostíleas la diferencia entre los dos ciclos de estambres es muy grande, los cortos son cortísimos. Las flores mesostíleas son las más abundantes, hay longistíleas pero no he visto microstíleas. Pistilos a veces glandulosos (3- 4 mm). Ovario elipsoideo, poco adpreso-pubescente,a veces sólo en el dorso carpelar. Estilos cortos, gruesos, pilosos. Estigmas ensanchados, 2-lobulados, externos. Carpelos 3-5-ovulados.

Fruto ovoideo o elipsoideo, asimétrico, carpelos desiguales, angulosos, sección transversal 5-radiada (8 - 12,5 x 5 -6 cm diám.) base y ápice 5-lobulados, verdoso o amarillento. Semillas ellipsóideas, aplana

das (10 - 12 mm) con pseudoarilo carnoso.

Tipo. Ceylan, leg. Hermann 1672-1677 ex herb. Banks BM. Lectótipo cf. Trimen nº 178.Ibid.,ex herb. Hermann, folio nº 20 (Thes. Zeylan.) Inst. France, cf. Lourteig, p. 26. 1966.

Nombres vernaculares. Carambola el nombre universal (Carambolier para la la planta); asom djorbing, Sumatra; Kombang bua, kaping,Malasia; balingbing amis, blimbing jawa, Java; daligán, Filipinas; ibeid, Nueva Guinea; caramboleiro, Brasil.

Distribución geográfica. Actualmente cultivada en todos los continentes, se la halla en bajas altitudes y hasta algo más de 1000 metros, en selvas primarias y secundarias, lugares de cultivos, cerca de ríos, quebradas, además de los jardines. La bibliografía prueba que en las islas mascareñas esta especie se cultiva desde hace siglos (Willemet, Herbarium Mauritianum p.36. 1796; Bojer, Hortus Mauritianus..... qui croissent à l'Ile Maurice p. 64. 1837;Baker, Flora of Mauritius and the Seychelles, ... p. 37. 1877; Cordemoy, Flore de la Réunion..... p. 63. 1895).

Material estudiado.

S. l. ex herb. Pourret, P.

Asia

Ex herb. Sherard 526 OXF.

CHINA. Leg. Iwan, P. Leg. Millet OXF. Saiheong ?, leg. Krone VI... P. Macao, leg. Callery 203, Voy. Gaudichaud 1836-37 P. Leg. Incarville 189, a.1740 P; 5, P. Fukien, leg. Price 1267, 1912 K. Foochow City,Wovs hihshan, leg. H.H.Chung 2376,30 VIII 1923 K. Hainan. Yaichow, in garden leg. Liang 61906, 4 VII 1933 K,P. Pak Shik Ling, leg. Lei 662, 15 V 1933 K,NY,US. Shan Tong To, leg. Tsang, Wai-Tak 581, 23 VIII 1927 A,K, NA,US. Shapo Shan, leg. ipse 544,21 VIII 1927 K,US. Ngau Ma Woh, leg.ipse 402, 20 B 1928 K, NA, US. Tai Pin, 330 m, leg. Fressitt 1132, VI-VII 1935 BM. Hong-Kong. Leg. J.P.W.Woo & T.K. Woo 363, 29 IX 1972 P.Ibid., leg. H.F.Hance 279 P. Leg. Wright 34, U.S.N.Pacif. Expl. Exp.1853 -56 K,P. Ibid., leg. ipse (17) US. Leg. Harland 508,K. Leg. Hance 279, VII 1853 BM. Leg. Forbes 103,a. 1874 BM. Caste Peak, leg. Shin Ying Hu 6497, 11 I 1969 K,US. Ma OnShan, leg. ipse 6377, 14 XII 1968 US. Tai Po N.T. Lin Tsueng, leg. ipse 7880, 20 IX 1969 K, US. Foung Shui Wood, leg. Hu 12092, 10 I 1972 K. Kwangsi. Suan - tze, leg. Ching 7782, 12 X 1888 US. Leg. ipse 7770, 10 X 1928 US. Kwangsi, leg. Morse 588 y 620, K. Kwangtung. Nanhoi Distr. leg. Chun 7776, 6 XI 1929 K,P. Kwangtung border Shap Man Taai Shan, Na Wai village, leg. Tsang 23931, 11-30 VII 1934 US. Kwong Tung. Prov. Canton vic., leg. Levine 1001, 6 VII 1917 NA,US. Ho - nam Isl., leg. ipse 261, 10 I 1917 US. Ib., leg. ipse 320, 25 I 1917 NA, US. Hainan. Taiwan, leg. Playfair 302, X... K,US. Leg.Henry XI 1889 K.

INDIA. Ex herb. Rottlerianum K. Ex herb. Vaillant, P. Jajhohoi, ex herb. Edgeworh, IV 1835 OXF. Garden Tatihgwet IV 1833 OXF. Leg. Wright 458,US. A. H. Garden, Lahore, leg. Parker 28 VI 1915 US. Exherb.Desvaux P. Hortis trop., leg. Hooker f. et Thomson 18 V 1850 BM,K,OXF,P. Penins. Ind. Orient., leg. Wight 307, 1866-67 K,P. Ib., leg. ipse 458 BM,P. Leg.Son-

nerat, P. Calcutta, leg. Wallich 229, P. Ibc, Bot. Garden, leg. Hara et al. 3079, 8 VII 1960 BM,K. Bangala, Chanderagore, leg. Abu Hosein VIII 1902 P. Pr. urbem Mangalor, leg. Hohenacker 29, 1849 BM,P. Ib., hortis, s. col. 2322 II... P. Moradabad, garden, leg. Thomson 292, OXF. Saharumpore, leg. Jacquemont P. Coromandel, leg. Koenig BM. Ib., leg. Macé P. Bot. Gard. of Calcutta and Serampore, leg. Merrill 11 1934 - 41 P. Leg. Richard H rtulano, P. Hassan Distr., Mysore, Hassan, leg. Saldanha 16163, 3 II 1970 K,P. Agra, leg. V. Negi US. Courtallem.,leg. Wight 180, VII 1835 US. Dehra Dun, leg. Gupta IV 1920 US. Assam. Udelguir,leg. Chaterjee III 1902 BM,P. Chutea Nagpur, Dorunda, 500-2000', leg. Wood IV 1891 K. Mathiban, Gangpur State, Orissa, Sambalpur,leg. Mooney 1601, 2 XI 1940 K. Punjab. Komgra, Bhadwar, 2000 ft., Koelz 4445, 13 V 1933 US Karnal, leg. Drummond 21673, 11 XI 1881 K. Ib., leg. ipse 21709 K. Ganges, Monghyr, Kalranga, leg. Lockwood 23 XII 1877 K. Chittagong,Hill Tracts, Kamalaserie, leg. Gamble 7772, III 1880 K. Madras. Chingapone, near Madras, V 845 K. Guindy, leg. Gamble 20769, VII 1889 K. Cult. Bot. Gard. Ninhar, leg. ipse 11405, IV 1883 K. Madras, leg. Sauter K. Leg. Bourne 24 VIII 1896 K. Ib.,leg. ipse 2824, 6 XI 1897 K. Bengal, W Duais, Jalpaiguri, leg. Gamble 1782 XI 1873 K. Bombay, leg. D. du Bois, 1702 OXF. Puri, leg. Haines 5495, IX 1917 K. Ib.,leg. ipse 5496, VII 1918 K. Dera Duh, leg. Raizada IV 1935 K. Trevadrum, leg.... 255, 10 V 1894 K. Setagarah u Hazaribagh, 2000 ft., St. Stanislaus Gard., leg. Kerr 2578, 3 III 1955 BM. Rangoon, leg. B. Hamilton BM.
CEYLAN. Leg. Hermann, ex herb. Banks n° 178, 1672-1677 BM. Ib., leg. ipse,Inst. France P. Bonnavista Galle, Kundu & Balakrishnan 515, 31 X 1970 US. Peradeniya, Kandy Distr., Roy. Bot. Gard., 480 m, leg. Sassanayake 359, 28 IV 1971 US. Matale Distr., betw. Pallogana and Rananure, 300 m, leg. Jayasuriya 343, 7 X 1971 US. Kudugarmawa, Tismodo Rd. fr. Seafield 1750 ft., leg. Worthington 713 2 I 1940 BM.

BIRMANIA. Pegou, Pointe de l'Elephant, leg. Reynaud X.... P.

TAILANDIA. Doi Pu Ka, Nan., ca. 600 m, leg. A.F.G. Kerr 4945, 27 II 1921 P. Bankok, leg.R. Zimmermann 12, a. 1899 P. Domburi, leg. Surapat 94, 3 III 1959 US. S.l.,leg. Schomburgk 244 y 312, a. 1859 P. Siam. Chiengmai Prov., Wat Lum, 30 mil fr. Bankok, leg. Rock 1534 X 1920 US.

BURMA. Maymyo, Bot. Gard., leg. O.E. White 359, III 1951 US. Bjinma Forest, leg... 46, 27 VIII 1919 OXF.

LAOS.Haut Laos, 6-10 Km de Phong saly, piste de Bun Tai, 1500 m, leg. Poilane 26016, 8 V 1936 P. Chinaimo Rd. Kiu 5, 170 m, leg.... 65, 21 VIII 1955 K.

VIET NAM. Thua Thien, Hue, leg. Eberhardt 2305, 1533, 3285 P. Lieu Chieu 15 m, leg. Poilane 7694, 24 VIII 1923 P. Lang Khoai pr. Quangkim, 300 m. leg. ipse 19933, 10 I 1932 P. Annam. Nord-Annam, Prov. Nghe-An (Vinh), Délégation de Nghia-Hung, leg. F. Fleury 30199, 18 V 1914 P. Km 25 route de Nhatrang a Nuile Hua, leg. Poilane 8375, 24 X 1923 P. Quang Qui, leg. Pirey 25, P. Hue and vic., leg. J. & M.S. Clemens 4117, V-VII 1927 P,US. Cochinchine, leg. Talmy 22 a. 1868 P. Ib., leg.Thorel 8, 1862-1866 K,P.

Ibid., ca. Saigon, leg. L. Pierre 1048, V 1871 P. Tonkin, leg. Balansa 1126, 18 VII 1885 P. Phué Nhac, leg. H. Bon 1804, 31 X 1882 P. Near Hue in gardens, leg. R. W. Squires 403, 2 V 1927 P. Tonkin, Nam Dinh, leg. Mouret 97, VI 1906 P. Ib., leg. Dau 26, P. Ib., TaaiWong Mo Shan and vic., Shui Mei village, NE of Chuk-phai, leg. W. T. Tsang 29280, 23 VI-31 VIII 1939 K,P. Phu Tho, leg. Eberhardt 4362 P.

MALASIA. Malay Peninsula, leg. Griffith 948, 1861-62 P. Kepang Selangor, leg. F. Guard u. Pawanche 17 XI 1927 OXF. Malacca, leg. Gaudichaud 17, II 1837 P. Ibi, leg. Griffith a. 1845 K. Pennang gardens, leg. Curtis 45, IX 1884 K. Pantal vall., leg. Teo & P. 113, 27 VI 1968 K. Lom - bok, Rindjani, leg. Elbert 1516, 30 V 1910 K. Nunong Angsi N.S., road - sides, leg. Guard & Syad 9 XII 1930 OXF.

RYUKYU Islands. Okinawa Isl., Izumi, Nakajin-son, leg. Walker 8387, 24 VI 1966 US. Kunigami, Motobu Península Izumi, Momohara Noen, leg. ipse 7786, 29 X 1957 US.

Oceanía.
FILIPINAS. Luzon, Rizal Prov., S. Francisco, leg. Penix 89, 4 IV 1958 NA. Leg. Commerson 17 Philip., P. Prov. Umingan, Luzon, Pangasinan, leg. Blanco 406, V 1914 K,P,US. Bontoo Prov.,leg. M. Vanoverbergh 2558, XII 1912 P. Gagayan Prov. vic. Peñablanca, Tuguegarac, leg. Adduru 35, 1 V-18 VI 1917 K,P. Samar, Catarman, leg. Rosenbluth, leg. Bureau 12654, 1 IV 1904 NA,P. Carnarines Prov., leg. Curran Bur. 10429, V 1908 NA,P. Prov. Rizal, Luzon, San Mateo, leg. Merrill 106, V 1904 US. Bosoboso, leg. Ahern's 1972 XI-XII 1904 US. Luzon, Prov. of Rizal, leg. Foxworthy 134, I 1906 US. Puguegarao, Cagayan, leg. Merrill 195, 16 VI 1902 US. Bosoboso, leg. ipse 2628, VI 1903 US. Aguilar, leg. Valderrama 33442, XI-XII 1914 US. Prov. of Laguna, Mt. Maquilina, leg. Forest Guard 20920, X 1913 US. Los Baños, leg. Elmer 8135, IV 1906 K. Luzon, Centro, Com. Vidal 1066, XI 1884 K. Ib., leg. Cuming 511, 1841 K. Manila, leg. Bouton a. 1831 P. Ib., leg. Merrill 3463 X- XI 1903 US. Ib., leg. Loher 6782, X 1905 K. Montalbán, leg. ipse 5115, 25 V 1892 K. Prov. Yayabas, Quinayangan, Vidal 675, I 1844 K. Panay Isl., Prov. of Ilvilo, leg. Cammill 117, X 1905 K,US. Island of Negros, Dumaguete (Cuernos Mts.) leg. Elmer 9979, V 1908K,US. Batan Isl., Albay, leg. C. B. Robinson, Bureau 6267, 22 VIII 1908 .
Sulu Archip. Taganak Isl., leg. Hondo & Edaño I - II 1957 K.

BORNEO. North Borneo, leg. Creagh K. Papar, leg. Telado 1924, 2 VII 1922 OXF, K Tampoluri, Kampong Bawang, leg. C. Cuadra 1270, 18 III 1948 K,US. Bangarmassing, leg. Motley,1857-58 K. Distr. Kota Belud, Sarangkul Kelawat, ± 300 ft., leg. Ampurra 10 II 1964 K. Marotai, 20 ft., leg. Maiden 3272, 8 V 1933 K. Serarong, Semporna, leg. Agama 9907, 12. VIII 1938 K. Lahad Datu, Segana, leg. Cuadra A 255, 22 XI 1949 K. Branfort, Near Gov. Hospital, leg. Cuadra 13045, 26 V 1951 K. Ib., Padas Rd., leg. ipse 3030, 20 V 1951 K. Elopura, Mile 2, leg. Kadir A3604, 31 VIII 1951 K.
Sarawak. Tatan, leg. Purseglove 5443, 9 VI 1956 K.

SUMATRA. Adian Rindang, Asahan vic. HoetaTomoean Dolok, leg. Si Boeea

8774, 17 XI - 10 XII 1935 K,P,US. Aer Djoman, Astehan, leg. ipse 8356, 5 VIII 1935 US. Ib.,leg. ipse 8201, VII 1935 US. Asahan, vic. Tomcean Dolok, ca. 1000 m,leg. ipse 10043, 1-20 VIII 1936 US. Asahan, leg. Bartlett and de la Rue 364, 1918 US. Vic. Rantau Parapat, Bila, leg. Si Toroes 2133, 28 III - 10 V 1932 US. Marden, leg. Hooker a. 1841 K.

JAVA. Leg. Zollinger 617, 7 IX 1842 K, P. Voyage Labillardiere, P. Leg. Perrottet a. 1820 P. Entre le Kali Tanabang et le Kedon Kadyi, a Batavia, leg. de la Savinnierre 2061, 13 VI 1879 P. Kaliebota - Kedong Halang, leg. Boerlage 5 X 1888 US. Ex herb. Hirsfield, 1802-18 K.

Islas Pacíficas.
HAWAII. Honolulu,Makiki, Liholiho Street, leg. Bush 389, 1 VI 1976 NA. Ib.,leg. ipse 15 IV 1974 NA. Dr. Brighams Gard., leg. Forbes BM.

Solomon Isl. N. Guadalcanl, headwaters of Tenaru River, 1000 ft., leg. Whitmore & Corner 4400, 1 VI 1964 K. Peon, gardens, leg. Hadley 83, 20 VIII 1955 BM.

TIMOR. Coupang, leg. Jacquinot K,P. Comm. Riedel par Dr. Meyer VI 1884 K.
MARIANAS. Guam. Mr. Lock's property ab. Jona, 100-150 m,leg. Evans 710 3 XI 1965 P,US. Rota. Ab. Tataacho Point, 150-250 m,leg. ipse 2065, 18 V 1966 P. US. Guam, Marche, leg.Ale 256, IV 1888 P. Pagan, leg. Lamoureux 4866 5 VII 1975 US. Guam, Merizo, 1-5 m, leg. Fosberg 25400, 4 VII 1946 US. Guam, leg.Safford & Seale 1115, VI 1900 US. Ib.,leg. Thompson 24, 191? BM. Rota Isl., leg. W.l. Necker 845, 1945 US. Base of Santa Rosa, leg.Rodin 559, 14 I 1945 K,US. Yigo, leg. Whiting E5, 1958 US.Guam, Chalan Pago, leg.Whiting 1, I 1958 US.

CAROLINES. Ponape Island, leg. Takamatsu 794, 8 III 1936 K.

SAMOA. Upolu, Moa Moa plantations, 200 m, leg. Eames, 210, 2 III 1921 P. Upolu, Betw. Salani and Lepa, 10 - 20 m, leg. Christophersen 969, 23 X 1929 K.
Palau Isl. Koror Island, 5-10 m, leg. Fosberg 32090, 14-15 III 1950 US. Ib., Agric. Station, leg. Emmons 48, 2 I 1968 US. Ponape Isl., Agric.Exper. St., leg. Glassman 2407, 2 VII 1949 US. Colonia, 1-50 m, leg. Fosberg26259, 9 VIII 1946 US. Yap,leg. Wong 422, 14 II 1948 US. Palau Isl. Ngatpang, leg.Takamatsu 1293, 27 IV 1936 P,US. Arakabesan Isl., leg. ipse 1243, 5 V 1936 K. Garudo kku, leg. ipse 1360, 7 IV 1936 K.

MARQUESAS. Hiva-oa Isl. Atuona village, leg. M.H.Sachet II 1975 US. Uahuka Isl., Vaipae'e, 1-10 m, leg. Decker 1652, 24 II 1964 P,US.

FIJI. Rewa, Suva, Kimberley Park, leg. Vurihoho 3119, 10 III 1953 K.

Islas de la SOCIEDAD. Huahine Isl. betw. Maeva and Faie, 100 m, leg. D. Baré 106, 10 III 1977 US.Tahiti Isl. Raiatoa, Avera, Temehani, leg. Grant 5236, 29 I 1931 K.

NUEVA CALEDONIA. Paita, leg. McKee 33433, 9 VII 1977 P. Nouméa, leg. ipse 34905, 1 IV 1978 P, US.

Africa
S.l. leg. du Petit Thouards, P.

SENEGAL. Leg. Heudelot 811, P.

GUINEA. Camayenne, leg. Chevalier 25807 y 25808, 7 V 1912 P. Nzrekoro, leg. Baldwin 9713, 11 X 1947 K.

NIGER. Myriah, leg. P. de F. 1875, 10 VI 1966 P. Togo Français, Atakpamé leg. Roberty 1537, 2 V 1936 P. Wiamag (C. Dosso), jardin/terrasse, leg. Boudet 5615, 28 XI 1968 P.

GHANA. Legon, leg. Morton A4666, 30 IX 1961 K.

NIGERIA. Ibadan, Moor Plantation, leg. Keay, 11 III 1948 K. Ib., University, leg. Emwiogbon 24 XI 1965 K, OXF. Prov. Calabar, at the nursery Calabar, leg. Deremola 1 VIII 1964 K. Ibadan, Ikom Gov. Station, leg. Jones & Fonoclue 6 V 1946 OXF.

CAMEROUN. Yaoundé, jardin de l'IRCAM, leg. D. Dang 285, 27 XII 1969 P. Bipinde, leg. Zenker 528, IV 1914 P, US. Victoria, Bot. Gard., leg. Winkler 79, VI 1864 BM, K.

REPUBLICA CENTRO-AFRICANA. Mission St. Joseph, leg. Clair, 22 VI 1969 P. Bossembelé Station, leg. J. Lebrun 3580, 26 V 1967 P.

GABON. Libreville, leg. Jolly 170, IV 1891 P.

ZAIRE. Yangambi, leg. J. Louis 13194, XII 1938 K, P. Eala, cult., leg. Corbisier 1414, 1930 K, OXF, P. Ib., leg. Leemans 121, 1936 K. Ib., Jard. Bot., leg. Vermessen 2219, 14 V 1919 K.
Burundi. Bujumbura, cult., leg. Lewalle 2228, XI 1967 BR, P.

UGANDA. Entebbe, Bot. Gard., 3700 ft., leg. Snowden 1790, X 1930 BM, K.

TANZANIA. Zanzibar, cult., leg. Sacleu 1560, III 1891 P. Kibaha to Soga, 152 m, leg. B.J. & S. Harris 5435, 22 X 1970 K. Mzizima Distr., Bot. Garden Dar-es-Salaam, leg. Ruffo 583, 21 XI 1972 K. Amani, 3000 ft., leg. Greenway 929, 28 X 1928 K. Sigi, plantation, leg. ipse 2958, 7 III 1932 K. Amani cult., leg. Greenway 2938, II 1932 OXF; 9392, 28 X 1928 OXF.

RODESIA. Distr. Umtali, in garden, 3650 ft., leg. N.C. Chase 8579, 11 I 1970 K.

MOZAMBIQUE. Umbehizi, jardim de Ja Sen, leg. Gomes e Souza 3475, 16 XII 1946 COI, K, OXF, P.

SEYCHELLES. Mahé, leg. Perville 222, 12 III 1840 P. Ib., leg. Boivin P. Ib., leg. Schlieben 11703, 6 X 1970 K. Ib., Victoria, Bot. Garden, leg. Jeffrey 608, 3 I 1962 K.

COMORES. Mayotte, Kombani, ca. 20 m, leg. Schlieben 11310, 10 XII 1968 K.

LA REUNION. Bourbon, cult. ex herb. Baillon, P. Leg. Bernier P. Jardin Botanique de Bourbon, leg. Boivin a. 1854 P. Leg. de Montbrison 18... FI.

MAURICIO. Leg. Commerson G, JUSS-P, P. Du jardin de M^r le Juge, leg. ipse, XI 1768 P. Leg. I. Grey a. 1858 P. Garden of Mr. Bowlut, near Pont Fer Phoenix, leg. Y. Delicetl9-IV 1961, MAU. Barkly Gardens, leg. R.E.Vaugham MAU. Leg. Stadran a. 1789 LAM-P. Leg. Néraud G. Ex herb. van Heurck P. Leg. Bojer, K. Ex herb. Shuttleworth av. 1877 BM. Leg. Sieber 205, FI.

América.

ESTADOS UNIDOS. Florida. Coconnut Grove, cult. leg. W.T.Gillis 11007, 18 VII 1971 IJ,NA. Lee Co., Fort Myers, leg. Brumbach 6550, 1 XII 1968 NA. Coral Gables, Jenning's State, leg. R.A.Howard 17053 30 VI 1968 NA. Dade Co., Coconut Grove, Intr. Gard., leg. West, 16-21 VI 1949 NA. Ib., leg. Fennell 1075, 22 XI 1939 NA. Ib., Browns Gard., leg. Popenoe 351, 14 V 1916 NA. Little River, Simpson's Plant., leg. Ricker 4099 11 II 1913 NA.

SALVADOR. Dep. Ca Libertad, Puerta de la Laguna, leg. Standley 23663, 27 IV 1922 US. Ib., leg. F. Chousy 23, 1923 US.

CUBA. Soledad, Cienfuergo, leg. Salvin 3, VI-VIII 1940 NA. Prov. Santa Clara, Soledad, Cienfuego, leg. J.G.Jack 5246, 7 VIII 1927 K,P,US. Ib. leg. ipse 4343 5 XI 1928 K,P. Habana, Santiago de las Vegas, leg. Killip 13522, 7 XII 1930 US.

JAMAICA. Parish Kingston, cult. Grounds of St. Joseph's Hospital, leg. A.v. de Porten, 27 VIII 1949 IJ. Castleton Gardens, leg. Collins 132, VI 1964 US.

SANTO DOMINGO. La Vega, Licey, cult., leg. A. y P. Liogier 5 VII 1975.

PUERTO RICO. Río Piedras, University, 100 ft., leg. E.L.Little 23918, 3 VII 1970 BM,US. Loiza, leg. Dutcher 5754, X 1915, US.

GUADALUPE. Leg. Bena, 1474, 1944-46 P. Leg. ipse 906, 1238 P. Ste. Claire de Goyave, leg. ipse 28 VII 1936 P. Basse Terre, leg. Rodríguez 2872, 25 II 1934 P. Ste. Marie, 50 m, leg. Stehlé 1082, 28 VII 1936 US.

MARTINICA. Leg. Belanger 228, a.1860 P. E de St. Pierre, leg. ipse 565, VIII 1853 P. Leg. ipse 561, V 1854 FI. Jardin Colonial de St. Pierre, leg. Plée a. 1820. Leg. ipse 620, P. Leg. Goudot, P. Ex herb. Baillon a. 1864.

SAN VICENTE. Leg. Guilding a. 1822 K.

PANAMA. Prov. Colón, Achiote, NW side of the canal, leg. Folsom et al. 5793, 7 K 1977 P. Prov. Veraguas, Canazas, leg. Tysson 3617, 26 II 1966 MO. Canal Zone. Barro Colorado, leg. Croat 4558, 9 IV 1968 MO. Ib., leg. ipse 7036, 9 I 1969 MO. Ib., clearing at Laboratory, leg. ipse 4159, 7 XII 1967 MO. Ib., leg. Foster 2190, 20 II 1971 US. Tobago Island, leg. D'Arcy 6799 MO.

TRINIDAD. Leg. Sieber 178, MO, P. Bot. Gard., leg. Broadway 28 IX 1926; ipse 10 VI 1957 OXF.

VENEZUELA. Barinas. NuevaBolivia, Casa Cural, leg. López Palacios 2808, 14 IV 1972 MERF, P.

COLOMBIA. Valle. Granja Experimental Palmira, 1088 m, leg. Duque Jaramillo 4381, 10-15 I 1947 COL. Amazonas. Intendencia Meta, Acacias, 450 m,leg. Uribe 2195, 15 VIII 1951 COL, US. Leticia,ca. 100 m, cult., leg. Plowman 2437 8 II 1969 K.

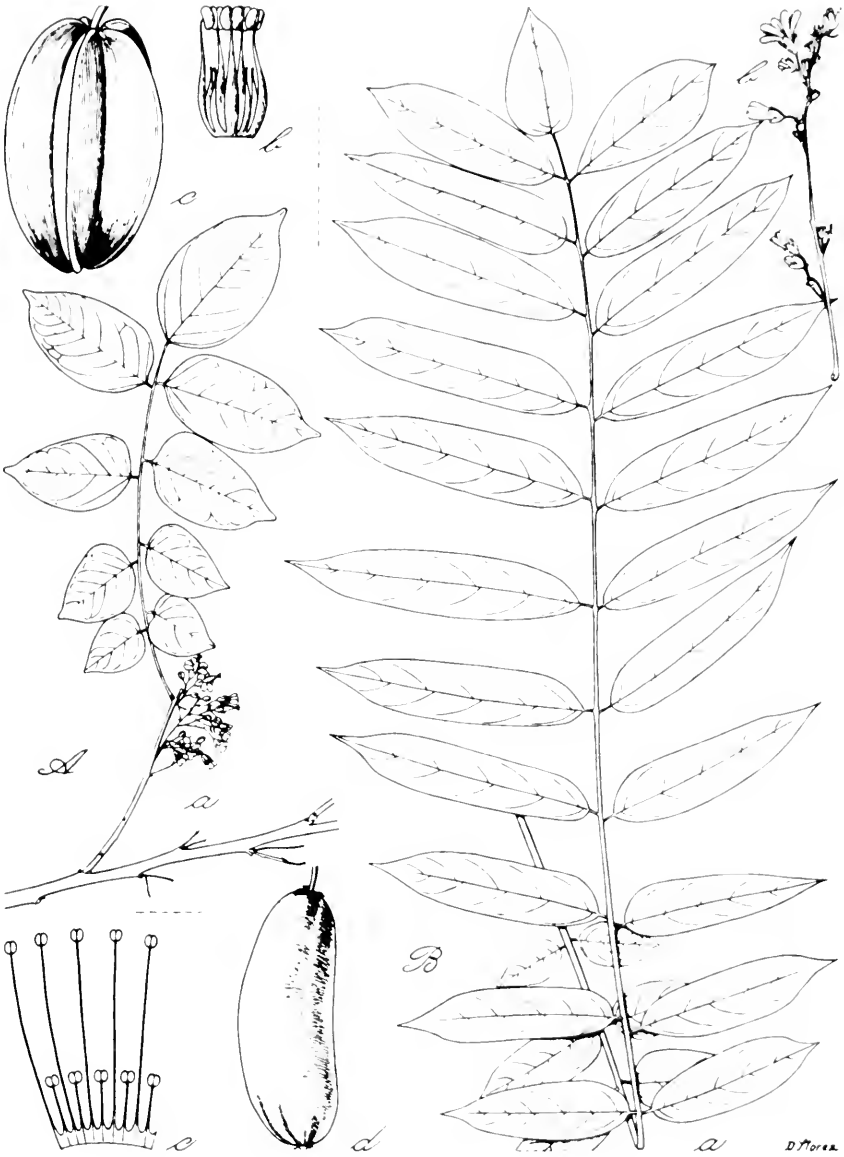
GUAYANA FRANCESA. Cayenne,leg. Martin 129, 265 FI. Ib., K. Leg.Sagot a. 1859 P. Leg. Melinon 264 a. 1842 BM,K,L,P,US. Environs de Kourou, leg. Petitbon 18 VI 1969 P. Leg. Richard P. Cayenne, leg. Lemée P. Cayenne, cult. leg. Poiteau VII 1824 K.

SURINAME. Leg. Hostmann 1000 a. 1843 K,P. Ib., leg. ipse 850 K. Leg.Focke L. Paramaribo, leg. ipse 846, 2 X 1823 U. Ib., leg.Went 562, a.1901 U.

BRASIL.S.l., leg. Claussen P. Ex herb. M, FI. Leg. A.R.Ferreira X 1784 ex herb.Escola Politênica, LISU. Amazonas. In sylvis ad flum. Solimoes pr. Rio Negro, leg. Martius XI L,M. Río Negro, ab. Manaos, 25 m, leg. Killip & Smith 30037, 14 X 1929 P,US. Pará. Bot. Gard. Museu Goeldi,leg. G.F. Baker 60, VI 1904 K,P,MO,US. Rosinhas near Para,leg. Spruce 203, VII 1849 K. Belém, Horto do Museu Goeldi, leg. L. M. Carreira 225,8 X 1981 ; Ib., ipse 226, 8 X 1981 MG, P. Recife. Pernambuco, leg. Tavares, 503, 29 IV 1959 US. Bahia. Mun. Ilheús, Quadra do CEPEC, plant. de Cacau, leg. dos Santos 3228, 5 VI 1978 CEPEC,P. Vic. Bahía, leg. Rose and Russell 19605, a. 1915 US. Minas Gerâes. Viçosa, Rd., to São Miguel, near stream Turba, 710 m,leg.s Mexia 4544, 31 III 1930 BM,MO. Ib.,leg. Irwin 2325, 27 XII 1958 US. Rio de Janeiro. Quinta São Cristovão, leg. Glaziou 9377, 28 XII 1876 K,P,R. Ib., leg.Vauthier 58, a. 1836 FI,K,P. Corcovado,leg. Miers 3971, K,P. Ib.,leg. Nadeaud, P. Paseio Publico, leg. Glaziou 2521, 28 XII 1867 P. São Cristovão, leg. ipse 2521, P.Jardim Bot. Rio, leg. Quillemin 94, XI 1838 P. Jacarepaguá, leg. Strang 547, 12 I 1964 P. Río de Janeiro,leg.... a. 1886 R.Niteroi, leg. Rohan R. Rio de Janeiro, leg. Sampaio 8260, IV 1939 R. Ib.,leg. ipse 8691,XI 1939 R. Sete Pontes, leg. Beaurepaire Rohan 37, 26 I 1878 R. Horto Bota Sebastianopolis, leg. Martius IX M,MO. Quinta Bota Vista, leg. Vidal 10 III 1927 R. Deodora, leg. Rouna 88, VIII 1937 RB. Quinta Bôa Vista, Jardim Zoológico, leg. Emmerich 22 III 1978 P. São Paulo.Mun. Mogi-Guazú, Fazenda Campininha, leg. Ferreira Monteiro 9154, 2 XII 1978 UNICAMP.Paraná. Antonina, leg.Saito 1485, III 1966 P. Mun. Guaratuba, Garuva, leg. Hatschbach 4479, 13 IV 1958 US. Santa Catarina.Florianópolis, Saco Grande, 10 m, leg. Klein et al. 6665, 15 II 1966 HBR,FLOR,P. Itajaí, Cabras 20 m, leg. Reitz 1571, 28 III 1946 HBR,Joinville, Palácio Episcopal,10 m, leg. Reitz e Klein 6304, 23 I 1958 HBR,US.

BOLIVIA. Beni, Ballivián, Espíritu, confluencia del Río Yacuma, 200 m, leg. Beck 5446, 17 IV 1981 P, UMSA.

Fig. 1. A: A. Carambola a, ramo x $\frac{1}{4}$; b, androceo x 6; c, fruto x $\frac{1}{2}$;Emmerich a. 1978,c,Matzenbacher a. 1979. B: A.Bilimbi a, hoja x $\frac{1}{2}$;b,parte de inflorescencia x $\frac{1}{2}$; c,androceo x 3;d, fruto joven x $\frac{1}{2}$.Houllet 948;d, Pabst a. 1979. Storez del.


b
c
A
a
c
d
B
a
D. Mora

Averrhoa Bilimbi L.

Linnaeus, Sp. Pl. 428. 1753. Cavanilles, Dissert. 7: 373, f. 219.1789. Candolle, l.c. Tussac, Fl. Antilles 3: 97 - 99, tab. 29 1824. Don,l.c. 753, f. 121. Rnxburgh, Fl. Ind. ed. Carey 2: 451. 1832. Wight et Arnott l.c. Blanco,l.c. Walners, Nnv. Act. Acad. Nat. Cur. 16 Supp. 1: 321. 1843. Miquel, l.c. Edgeworth and Hooker f., l.c. Progel, in l.c. 1877. Trimen, l.c. Pulle, l.c. Small, l.c. 57. Koorders, l.c. Merrill, l.c.195 Ridley, l.c. 331. Knuth, l.c. 418 incl. f. papuana Knuth.Jonker in Pulle, l.c. 53-54. Backer & Backhuizen, l.c. Veldkamp, l.c. 22.1970; l.c. 177-178. 1971. Adams,l.c. Bates,l.c. Lourteig, l.c. 824 - 825. 1981; l.c. 5 - 7, f. 5 B. 1983.

A. obtusangula Stokes, l.c. 542.

Arbol (h. 15 m alto, 0,30 m diám.)con ramas ascendentes. Hojas reunidas en los ápices de las ramas en pseudnverticilos. Ramos y raquis densamente rojizo-tomentosos. Hojas 7-28-yugas (h. 65 cm largo).Pecíolo pubescente (h. 17 cm), ensanchadn en la base.Peciolillos carnosos, tomentosns. Folíolos homogénens(los inferiores más pequeños 1 - 2 x 1 - 1,5 cm), discolores, oblongos o elípticos asimétricos (2,5 - 15 x 1 - 5 cm), agudos o acuminadns (mucrón ± 2 mm), base rednndeada o subcuneada, pubescencia fina,uniforme en ambas faces, más abundante en el envés y sobre la nervadura media en el haz. Cimas reunidas en racimos o en panículas (h. 20 cm) a menudo cauliflnras, sobre ramas abortadas, péndulas, aún cerca de la base del tronco, 15-20floras, o cimas axilares o flores solitarias; pubescentes y glanduloso-pubescentes. Pedicelos (4 - 20 mm) articulados ca. la mitad, Brácteas subuladas, densamente tomentosas (± 4 mm); bractéolas 1,5 - 2 mm, casi invisibles a causa de la pubescencia deciduas.

Sépalos amarillo-verdosns a purpúreos, ovados a elípticos, asimétricos (5 - 12,5 x 1,5 - 3 mm),agudos, mucronados (unn interno, oblongo obtuso), pelos ± adpresos y glandulnsos exterior e interiormente. Pétalos purpúreos, libres, a veces soldados hasta cerca de la mitad, linear-espatulados, unguiculados(10 - 20 x 2,5 - 4 mm)cortamente ciliados en el ápice y pelns cortísimos glandulosos exteriormente, caducos. Estambres 10, fértiles, casi libres, glabros, los de filamentos largos ± 10 mm, los cortos ± 4 mm ; anteras suborbiculares, connectivo notable.Pistilos en su gran maynría mesostíleos, un especimen microstíleo (Elmer 15122) y varios macrostíleos (Hallier f. s. nº cfr. Weldkamp; los otros vistos por mí)en las flores mesostíleas 7,5 - 12 mm. Ovarin cilíndrico, 5-lobulado (4-7,5 mm), agudo, prolongándose en los estilos cilíndricos (±? mm) a veces 2-lobulados o truncados, densísimamente adpreso-piloso, con pelos amarillentos, rígidos, ascendentes. Estigmas poco conspicuos, laminares n subulados, angostos; carpelos (1-3)-4-7-ovulados.

Baya oblonga (h. 10 x 5 cmdiám.), 5-lobulada a casi lisa, sección subcircular o pentágona, base redondeada, ápice 5-lobulado, asimétrico. Carpelos 4-7-seminados. Semillas exariladas, suborbiculares a cordadas. Tipo.Ceylan, leg. Hermann 1672-1677 ex herb. Banks BM. Lectótipo cf. Trimen nº 177. Ibid., ex herb. Hermann,folio nº 80(Thes.Zelan.) Inst. France,cf. Lourteig, p. 29. 1966.

Bilimbi es nombre Indio dado a esta planta y a su fruto.

Nombres vernaculares. El nombre más difundido es Bilimbi, de origen indio, pero ha recibido muchos otros nombres locales especialmente en el continente indo-malayo(cfr. Veldkamp, 1971). En Filipinas iba, en Nueva Guinea miri-miri. En América del Sur biribiri, mimbre carambolier (Cuba) tiriguro (Costa Rica) y limão de canela (Brasil).

Distribución geográfica. Solamente conocida en nuestro días como planta cultivada. En Java,Koorders la halló al estado silvestre (cfr. Knuth in Engler u. Prantl,l.c.). Es menos difundida que A. Carambola,especialmente en América.Su ecología es la misma que la de la otra especie. Citada por Baker, Flora of Mauritius and the Seychelles..... p. 37. 1877; Cordemoy,l.c.; Rivals, l.c. para La Reunión, precedidospor Bojer, l.c. en 1837.

Material estudiado.
S.d. ex herb. JUSS-P. ex herb. Hasskarl 7732 L.

Asia.
Exherb. Vaillant P. Ex herb. Pourret P. Ex herb. Sherard 525 OXF. TAILANDIA. Bangkok vill., leg. Groff 131, 12 VI 1920 NA. Yaigon, leg. ipse 252, 12 VI 1920 K. Chieng-moi, 1000 ft., leg. Khoon Winitt 346, 14 VIII 1915 K. Pattani, Banang Station, leg. Kerr 7886, 23 VII 1923 BM, K.Bangkok, leg. Marcau 1974, 14 II 1926 BM. Ib., garden,leg. Kerr, 4 VII 1920 BM. Burma. Longyakyet, 2000 ft., leg.Lace 6044, 20 XI 1912 K.

INDIA. Leg. Richard Hortulano,P. Leg. Wight 306,1866-67 K,P. Goa, s.d.P. Pondichery, leg. Commerson 42, 43, JUSS-P. Hort. Calcutta, leg. Prain , 22 VI 1900 K. Trevandrum Bot. Gard. 831, BM. East Indies,St. Georges, leg. Ed. Buldley, a. 1712 OXF. Madras, Guindy, leg. Gamble 20768 VI 1889 K. Ib., leg. Shuter, K. Ib., leg. Bourne 2824, 20 XI 1897 K. Maldive Island. Malé Islet, leg. Fosberg 36907, 12 IV 1956 US.

CEYLAN. Ex herb. Hermann, folio 80, Institut de France.

MALASIA. Singapore, leg. Anderson 84, X 1861 P. Ib., leg. Kehding 502, IX 1880 P.Ib., leg. Carrick 1484, 15 VI 1966 K. Kelantan, leg. V.D.W., 15 III 1911 K. Passar Road, Pudu Kuala Kumpur, leg. Jaamat 8 VI 1927 OXF

FILIPINAS. Antipolo, Rizal Prov., Luzon,leg. Blanco 255, I 1914 BM,K,P, US. Luzon, Prov. Union, Bauang, leg. Elmer 5700, II 1904 K,P,US. Luzon, Prov. Sorsogon, Irosin Mt. Bulusan, leg. ipse 15122, XI 1915 BM,K,P,US. Luzon, Subprov. Bontoc, leg. Vanoverbergh 3771 VII 1913 P.Luzon, Tayabar, leg. Merrill 2434, IV 1903 K,US. Luzon, Prov. Batan,Lamao Riv.,Mt. Mariveles, leg. Borden 2737, III 1905 K,US.Luzon, Prov. Camarines Sur, Nueva Cáceres, leg. H.Hallier,24 VI 1903 K. Mindanao, Prov. Aguzan, Cabadatan, Mt. Urdaneta, leg. Elmer 13999, X 1912 K,P,US. Mindano, Prov. Zamboanga, Sax Riv., leg. R.S.Williams 2428, 4 III 1905 K,US. Amboina, leg. Robinson 219, VII - XI 1913 BM,K,P,US. Isl. Masbate, leg. Merrill 2616,V 1907 BM,K,US. Isla Panay, La Paz,Prov.of Iloilo, leg. Cammill 118, X 1903 BM,K,US.Balabak, leg. Vidal 2244, III 1886 K. Basilan Isl., leg. W.J.Hutchinson 3445, 9 XII 1905 K.Isla Leyte, Palo, leg. Elmer 7089, I 1906 K.

SUMATRA. East Coast, Kisaran, Asahan, leg. Yates 2088, BM,P. Leg.Forbes 2570, 1880 BM.

CELEBES. Südost-Celebes, Menghoka, 100 m, leg. Elbert 3232, 31 IX 1909 K.

BORNEO. North Borneo,Selangan Isl., leg. Keith 9237, 24 VIII 1938 K.

JAVA. Leg. Commerson, P. Tjikada, leg.Zollinger 973, 29 XII 1842 BM,K,P.

TIMOR. Leg. Ridely, P. Leg. Brown, IV 1803 BM.

NUEVA GUINEA. Kaiser Wilhelmsland, leg. Hollrung 709,a. 1887 P. Bivah Hollandia, leg. K. Gjellemp 114, 5 V 1910 K. Rossell Isl., Jinju, leg. Brass 28544,24 X 1956 K, US. Deutsch-Neuguinea, Sepik, leg. Ledermann 7562 K. Kaiser Wilhemsland, leg. ipse 6760,K.

HAWAII. Honolulu, Pauoa Rd., Pauoa Vall., leg. Beroh 381, 24 V 1976 NA. Lyon Arboretum, Middle Lown, Rauka, leg. Nagata 401, 5. VI. 1968 NA.

MARIANAS. Guam. Lujuna, home of A. Taitano, 180 m, leg. Evans 1578, 16 II 1966 P,US. 1 Km S of Barricada, 65 m, leg.Fosberg 35288, 25 XII 1953 US. Rota Isl., Sonsong village, 5-10 m,leg. Evans 2279, 27 V 1966 US.

CHRISTMAS. Hospital Garden, 40',leg. Pearson 95, 11 III 1964 K.

CAROLINE . Palau Island. Angour, 13 m, leg. Canfield 240, 19 X 1977 US. Koror Isl. 5-10 m, leg. Fosberg 32067, 14-15 III 1950 US. Aulupse'el Isl., Dü ebachel beach, 2 m, leg. ipse 47439, 23 VIII 1965 US. Arakebesan Isl., leg. Blackburn 221, 6 II 1968 US. Arakebesan, old japanese base, 1-20 m, leg. Fosberg 25659, 18-21 VII 1946 US.

Africa.
S.d.,leg. du Petit Thouars, P. Leg. Sonnerat, LAM-P.

COTE D'IVOIRE. Adiopoumé, ca. 17 Km W Abidjan, cult.leg. de Wilde 3440, 21 II 1962 K,P, WAG.

CAMEROUN. Douala - Tiko, Manga, près Missllele, leg. Letouzey 14596, 16 IV 1976 P. Cult. Bipindi, leg. Zaubroy 490, II 1913 P. Ib., leg. Zenker 490, XII 1913 US.

ZAIRE. Jardin botanique d'Eala, leg. Chevalier 28001, 15-18 VIII 1912 P.

TANZANIA. Amani, Sigi, plantation, 1200 ft., leg. Greenway 6095, 16 XII 1940 K.

SEYCHELLES. Cousin Isl., Inland, leg. Fosberg 52112, 24 I 1970 US. Grande Anse River Vall., leg. S.A.Robertson 2462, 20 VIII 1977 P.

COMORES. Anjuan, leg. Schlieben 11166, 22 X 1968 K.

MAURICIO. Leg. Commerson, G, LAM-P,P. Leg. Bory, ex herb. Ventenat,G. In horto Regio, leg. Sieber, II 286, a. 1826 L,G,P. Leg. Sieber 204,FI, G. Port Louis, leg. Duljicet, 21 XI 1961 MAU. Leg.Stadman a. 1789 LAM-P. Diego García. Chagos Archipelago, Atoll, East Point, leg. P.R.Stoddart 887, 27 VII 1967 K,P,US. Diego García Atoll, Pt. Marianne, leg. A.M.Hutson 22, 17 IV 1971 K,US. Ib., leg. C. Rhyne 771, 25 VII 1967 US. East

Pt. village, leg. ipse 672, 17 VII 1967 US.

America.

ESTADOS UNIDOS. Florida. Miami, Pl. Introduction Gard., leg. Popenoe 229, 12 IV 1916 NA. Ib.,leg. Ricker 4642, 13-15 III 1916 NA. Dade Co., Miami, leg.West 8 IV 1953 NA. Ib.,leg. Popenoe 348, 14 V 1916 NA.

GUATEMALA. Leg. Friedrichsthal, K.

SALVADOR. S. Salvador, Finca Altamira, 2800 ft., leg. P. Allen & R.Armour 7254, 22 II 1959 US. Dep. La Libertad, Huerta de la Laguna, leg. Standley 23676, 27 IV. 1922 US. La Unión, leg. Hancock a. 1882-83 K.

NICARAGUA. Chinandega, leg. Baker 2285, 3 I 1903 K, L,US.

COSTA RICA. Nicoya, leg. Tonduz 13798, I 1900 K,P,US.

ANTILLES. S.l., ex herb. Baillon, P.

CUBA. Leg. de la Sagra, P.

JAMAICA. Leg. Hooker, 1845 P. Westmoreland, Bluefields, leg. Lewis 4 III 1948 IJ. Parish St. Mary, Vic. Hampstead, 750-1000 ft., leg. Proctor 8704, 15 V 1954 IJ. Bath Gard., leg. A. Prior,1 IV 1850 K.

HAITI. Port au Prince, cult.,leg. Ekman 7141, 31 X 1926 IJ. Dep. de l' Antibonite, vic. Gros Morne, 235 m, leg.E.L.Leonard 9936, 18 II 1926 US. Plaine Cul-de-Sac, Port-au-Prince, leg. Ekman 7141, 31 X 1926 US.

SANTO DOMINGO. Leg. Tussac FI. Santo Domingo, cult., leg. A. y P. Liogier 2 IV 1976 .

GUADALUPE. Basse Terre, leg. Thiebaut 505, 18 II 1876 P.

MARTINIQUE. Saint Maru, leg. Bordas 12, 25 VI 1897 P. Leg. Belanger 836, 1860 P. Leg. Plée 669, 669a, a. 1820 P. Leg. Rivoire a. 1839 P.

St.VINCENT. Leg. Guilding a. 1822 K.

PANAMA. Canal Zone. Summit Plant Introd. Gard., leg. Steyermark,6,7,17 I 1935 MO.

TRINIDAD. St. Augustin Govern. Nursery, leg.Nevling 278, 28 VI 1966 NA. Leg. Sieber 289, a. 1826 BM,MO,P. Leg. Fendler 240, a. 1877-80 K.

VENEZUELA. Est. Aragua. Maracay, cult., leg. F. Yépez 885, 30 XI 1953 M.

GUAYANA FRANCESA.Mau, leg. Sagot 87, V 1855 BM,P. Ib., a. 1856 P. Karouany, leg.ipse a. 1858 P. Ib.,leg. ipse 87, a. 1859 P. Cayenne, cult.,leg Poiteau IV 1824 K.

SURINAME. Leg. Schweinitz, NY. Leg. Weigelt, a. 1827 L,MO. Cult., coll. indig. 1910 U. Tullekn, leg. Pulle 84, 1904 L. In horto, leg. Splitgerber 373, XII 1837 L. Paramaribo, leg.Went 352, X 1901 U. Ib.,leg. Focke 623, VII 1842 U.

BRASIL. Amazonas. Manáus, Serrari Roberto Pereira,E Aeroporto Manáus,

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NOTES

Se han descrito formas y variedades,basadas especialmente en los caracteres del fruto (morfológicos y de sabor), derivadas de ciertos cultivares, que no se justifican botánicamente.

Para la tipificación he seguido TRIMEN, l.c.

Las bibliografías citadas (en el género y las especies) son el resultado de una selección; existen muchas otras publicaciones, algunas ilustradas, de orden en su mayor parte local. (V. VELDKAMP, 1971 para la concerniente a Malaya).

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PALYNOLOGIE

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Un travail récent de L.M.M.CARREIRA et O.M.BARTH SCHATZMAYER(1982) donne quelques informations en microscopie photonique et en microscopie électronique à balayage concernant la morphologie pollinique du Genre Averrhoa L., à partir de plantes cultivées "Parque do Museo Paraense Emilio Goelci Belém, Para".

A la demande de A. LOURTEIG, spécialiste de ce groupe, la présente note a pour but de préciser les caractères palynologiques qui pourraient servir de caractères diagnostiques d'une part pour le genre Averrhoa L. (qui sera comparé aux genres Biophytum, Diapana, Oxalis et Sarcotheca) et d'autre part pour les deux espèces, A. Bilimbi L. et A. Carambola L.

Matériel et méthodes

Le matériel provient de l'Herbier du Laboratoire de Phanérogamie du Muséum National d'Histoire Naturelle.

Ont été observés: 1 échantillon de A. Bilimbi à fleurs à étamines à filets longs et à étamines à filets courts; 2 montages différents ont été effectués à partir de la même fleur: 28930 G A: étamines à filets longs, 28930 G B: étamines à filets courts, Pará, Belém, Horto do Museo Emilio Goeldi, Brasil, leg. L.M.M.Carreira 221, 15 IX 1981 P.

1 échantillon de A. Carambola à fleurs à étamines à filets longs; 1 montage: à partir de l'échantillon leg. Carreira 226, préparation 28929 G.

1 échantillon de A. Carambola à fleurs à étamines à filets courts à partir de l'échantillon leg. Carreira 225, préparation 28928 G. Les spécimens proviennent de Pará Belém, Horto do Museo Emilio Goeldi, Brasil, 8 X 1981.

Les techniques utilisées sont celles employées couramment au Laboratoire et déjà décrites dans des publications antérieures (CERCEAU & coll., 1970; CERCEAU-LARRIVAL, 1971; CERCEAU-LARRIVAL & ROLAND-MEYDACKER, 1976). La terminologie employée est delle qui a été retenue au Colloque de l'Association des Palynologues de langue Française et de la Société Botanique de France (CERCEAU-LARRIVAL & coll., 1975; HIDEUX & FERGUSON, 1975).

Ce travail a été réalisé grâce à la collaboration technique de A.M. VERHILLE et L. DEROUET.

Résultats

Genre Averrhoa. Pollen isopolaire, à symétrie d'ordre 3, tricolporé, équiaxe à légèrement longiaxe, à forme subcirculaire à ovale en coupe optique méridienne.

P (axe polaire) = 22 à 31 um. E (diamètre équatorial) = 21 à 30 um. P/E = 1 à 1,2. Ectoapertures: 3 sillons longs, toujours bien élargis au niveau des endoapertures, pouvant avoir des bords épaissis. Endoapertu-

res: grandes, ovales à ovales-carrées, mal définies.
Exine: surface tectale perforée, à perforée-réticulée, à réticulée,avec présence d'éléments sculpturaux dans les perforations ou les mailles du réticule. Epaisseur : 1,5 à 3 um. Structure: Ectexine : tectum complet, à ± complet, à partiel; possibilité de présence d'éléments supretectaux (orbicules de sporopollénine?); columelles, plutôt courtes; sole supportant des éléments sculpturaux à l'intérieur des perforations ou des mailles du réticule. Endexine: mince par rapport à l'ensemble columelles-tectum, à face interne non homogène, pouvant même disparaître.
Vue polaire : subcirculaire légèrement trilobée.

Espèce Averrhoa Bilimbi

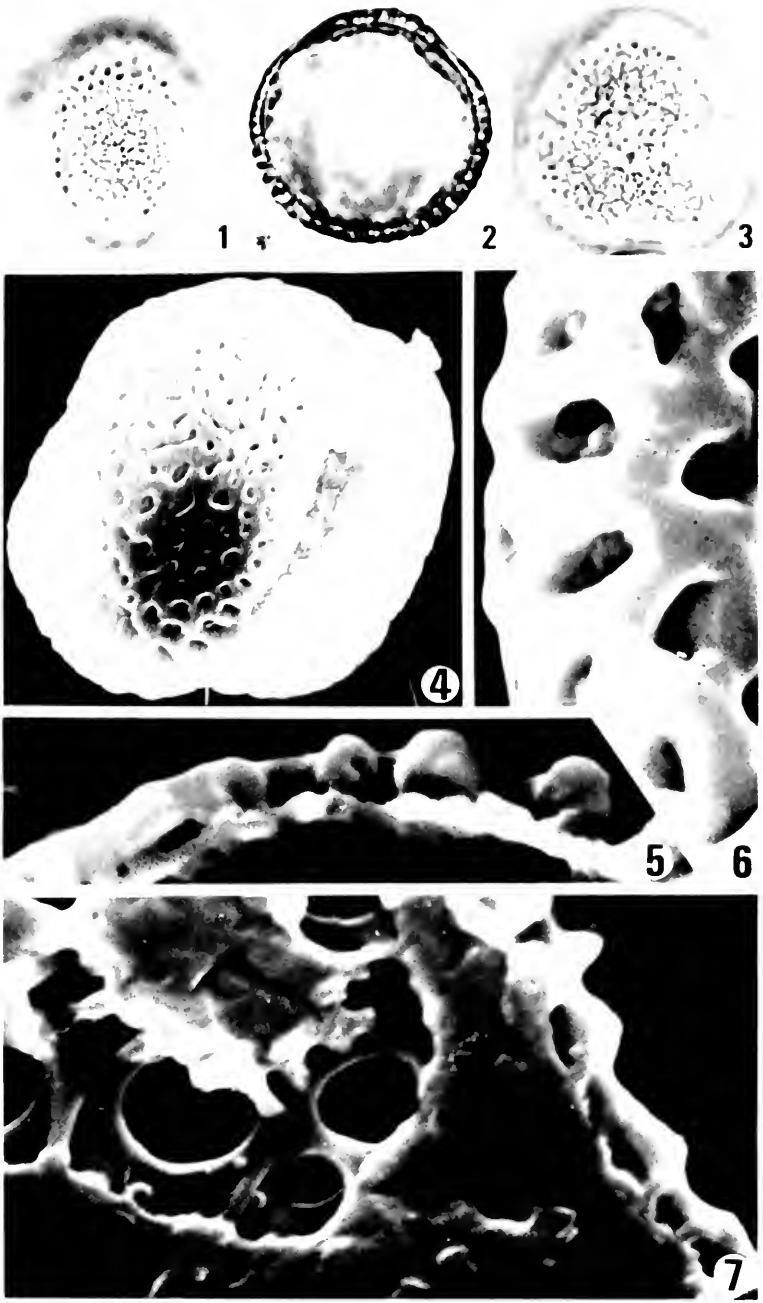
Deux cycles d'étamines (filets longs et filets courts), sur la même fleur.

Préparation 28930 G (A) : étamines à filets longs . Beaux pollens avec cependant quelques formes collapsées.

Pollen isopolaire, à symétrie d'ordre 3, équiaxe, à forme subcirculaires en coupe optique méridienne. P = 30 um. E = 30 um. P/E = 1.
Ectoapertures: 3 sillons allongés, elliptiques, s'ouvrant largement sur toute la longueur. Endoapertures ; 3 mal définies.
Exine:Surface tectale réticulée avec plusieurs éléments sculpturaux à l'intérieur des mailles. Epaisseur : 2,5 à 3 um. Structure: Ectexine :tectum partiel épais, devenant plus compact vers les bords du sillon; columelles courtes;sole supportant les éléments sculpturaux à l'intérieur des mailles. Endexine: très mince par rapport à l'ensemble columelles-tectum. Est-elle discontinue? Ou bien sa fragilité la fait-elle se fragmenter?
Vue polaire: subcirculaire, très légèrement trilobée.

Planche I. M.Ph. : fig. 1 à 3 ; M.E.B. : fig. 4 à 6.

Fig. 1. Vue méridienne montrant une zone interpaerturale bien réticulée x 1000.
Fig. 2. Pollen subcirculaire en coup optique méridienne x 1000.
Fig. 3. Vue polaire subcirculaire , légèrement trilobée x 1000.
Fig. 4. Pollen montrant une zone polaire féduite, des ectoapertures très longues et bien élargies en zone équatoriale x 2600.
Fig. 5. Détail de la surface tectale réticulée avec un ou plusieurs éléments sculpturaux à l'intérieur des mailles du réticule x 10000.
Fig. 6. Cassure due aux ultrassons montrant un tectum partiel épais, des columelles courtes et trapues, et un ensemble sole-endexine très mince x 10000.
Fig. 7. Surface interne d'un pollen montrant que l'endexine et la sole, ne forment peut-être pas un ensemble continu, ou tout au moins forment un ensemble très mince et fragile x 10000.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Préparation 28930 G (B) : étamines à filets courts . Quelques beaux pollens en mélange avec des formes collapsées, aplaties, parfois très déformées.

Pollen isopolaires, à symétrie d'ordre 3, tricolporé à forme subcirculaire en coupe optique méridienne, P = 22 à 25 um. E = 21 à 25 um. P/E ≠ 1.

Ectoapertures : 3 sillons allongés, elliptiques, s'ouvrant largement sur toute la longueur.

Endoapertures: 3 mal définies.

Exine: surface tectale réticulée, devenant réticulée-perforée dans les zones polaires, et en bordure des ectoapertures à un ou plusieurs éléments sculpturaux à l'intérieur des mailles. Epaisseur : 2 um.

Structure:Ectexine : tectum partiel épais, devenant plus compact vers les bords des sillons; columelles courtes; sole supportant les élements sculpturaux à l'intérieur des mailles. Endexine : très mince par rapport à l'ensemble columelles- tectum.

Vue polaire : subcirculaire, légèrement trilobée.

Planche II. M.Ph. : fig. 1à 3. M.E.B. : fig. 4 à 6 .

Fig. 1 à 3. Pollen subcirculaire en vue polaire et coupe optique équatoriales x 1000.

Fig. 4. Détail de la surface tectale réticulée avec un ou plusieurs éléments sculpturaux à l'intérieur des mailles du réticule x 11000.

Fig. 5. Pollen en vue polaire basculée, montrant les ectoapertures longues et larges, une surface tectale réticulée x 3000.

Fig. 6. Pollen montrant une zone interaperturale réticulée, et 2 zones aperturales, celle de gauche avec l'endoaperture visible x 3000.

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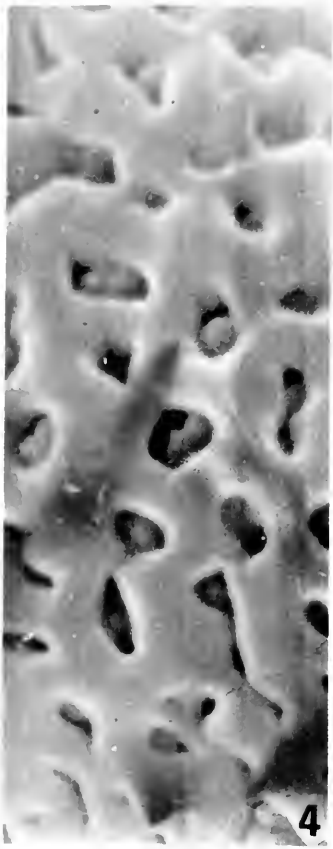

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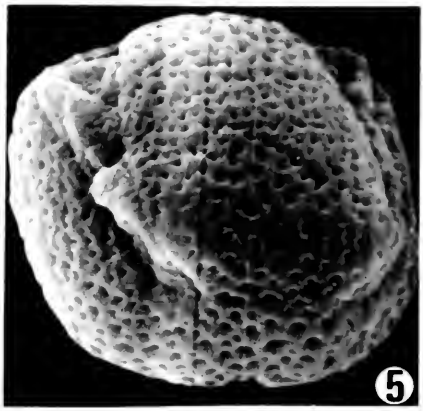

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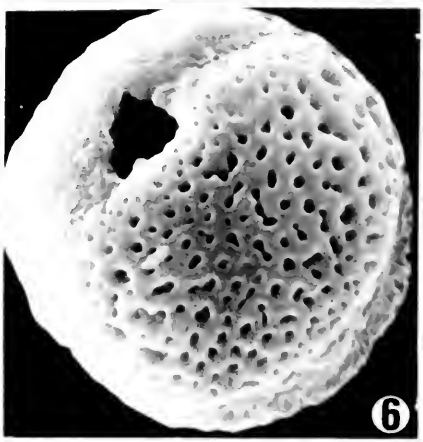

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Espèce Averrhoa Carambola

Deux types d'étamines (filets longs et filets courts) sur deux échantillons différents.

Préparation 28929 G : échantillon à fleurs à étamines à filets longs . Beaucoup d'amas de pollens, aplatis, abimés, enrobés (les fleurs n'étaient pas ouvertes; les pollens ne sont peut-être pas adultes ?).

Pollen isopolaire, à symétrie d'ordre 3, tricolporé, équiaxe à légèrement longiaxe, à forme subcirculaire en coupe optique méridienne. Grande variation de taille: P = 23 à 31 - 32 um . E = 23 à 30 um. P/E ≠ 1 . Quelques formes à 25 x 25 um.

Ectoapertures: 3 sillons longs, elliptiques, assez élargies, surtout au niveau des endoapertures.

Endoapertures : ovales, mal définies.

Exine : surface tectale perforée à perforée-réticulée, les perforarions sont remplies d'éléments extexinaux (1 seul), et peuvent devenir assez grandes (mailles). Epaisseur = 2 um. Structure : extexine : tectum ± complet, muni de perforations qui peuvent devenir importantes (mailles) avec à l'intérieur un élément ectexinal; surface tectale, recouverte d'éléments sporopolléniques (orbicules ?) ce qui serait en faveur de la non maturité des grains; columelles courtes et espacées, sole non différenciable en M.E.B. de l'endexine sous-jacente.Endexine : mince par rapport à l'ensemble sole-columelle-tectum, à face interne non homogène.

Vue polaire: subcirculaire, légèrement trilobée.

Planche III . M. Ph. : fig. 1 à 6. M.E.B. : fig. 7 à 10.

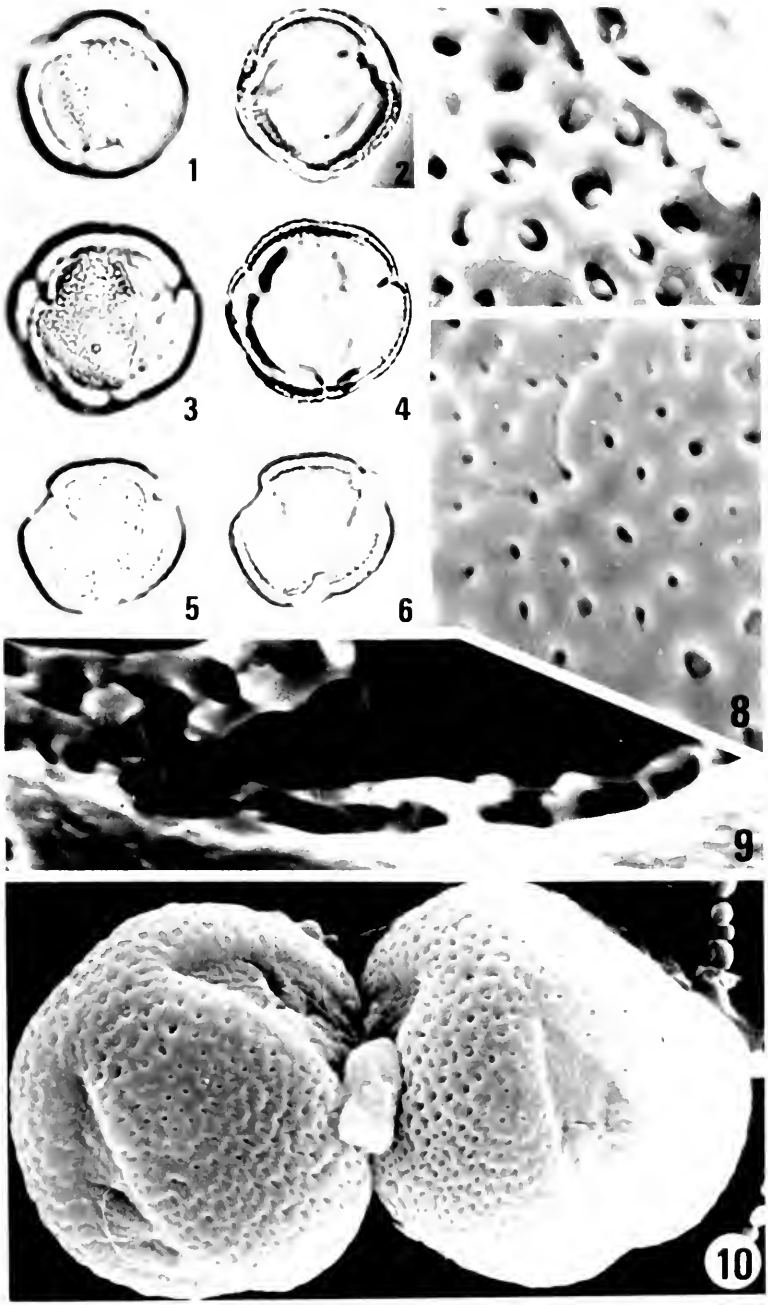
Fig. 1 à 6 . Pollens subcirculaires avec différentes vues et coupes optiques successives, montrant une certaine dufférence de tailles, le pollen photographié en 5 et 6 étant plus petit x 1000.

Fig. 7. Détail de surface tectale perforée-réticulée, dans ure zone équatoriale interaperturale, avec un élément sculptural dans chaque perforation ou maille x 10000.

Fig. 8. Détail de surface tectale dans ure zone polaire, plus dense, perforée avec les éléments sculpturaux cependant visibles dans certaines perforations x 10000.

Fig. 9. Cassure due aux ultrasons montrant le tectum, les columelles trapues, et l'ensemble sole-endexine très mince x 10000.

Fig. 10. Vue d'ensemble de 2 pollens montrant la surface tectale perforée à perforée-réticulée, devenant plus compacte en bordure des zones aperturales qui sont fortement élargies à l'équateur x 3000.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Préparation 28928 G : échantillon à fleurs à étamines à filets courts.

Beaucoup de grains sont en amas. Il semble qu'il y ait une difficulté à leur dissociation, ce que tendrait à prouver que l'on se trouve en présence de pollens stériles.

Pollen isopolaire, à symétrie d'ordre 3, tricolporé, équiaxe à légèrement longiaxe, à forme subcirculaire à ovale en coupe optique méridienne. P = 24 um . E = 20 - 21 um . P/E = 1,2.

Ectoapertures : 3 sillons longs, elliptiques, s'élargissant au niveau des endoapertures avec un bord plus épaissi.

Endoapertures :grandes, ovales-carrées.

Exine : surface tectale perforée à compacte vers les bords du sillon. Epaisseur : 1,5 à 2 um . Structure:ectexine : tectum complet, muni de perforations, assez mince; columelles, assez grandes, larges et espacées; sole, non différenciable en M.E.B. de l'endexine sous-jacente. Endexine : assez mince par rapport à l'ensemble sole-columelles-tectum, à face interne granuleuse, ± absente.

Vue polaire : subcirculaire, légèrement trilobée.

Planche IV. M.Ph. : fig. 1 à 3 . M.E.B. : fig. 4 à 6.

Fig. 1 et 2. Vue en coupe optique d'un grain isolé de forme subcirculaire à ovale c 1000

Fig. 3. Amas de pollens typiques de l'échantillon examiné x 1000.

Fig. 4. Pollens agglomérés et peut-être encore réunis par des tractus de sporopollénine, ce qui serait en faveur de leur état juvénile x 1300.

Fig. 5. Pollen avec une ectoaperture de face, sensiblement collapsée, à surface tectale perforée, devenant plus compacte en bordure des sillons x 3000.

Fig. 6. Pollen en vue polaire basculée montrant des ectoapertures longues et larges, et une surface tectale perforée x 3000.

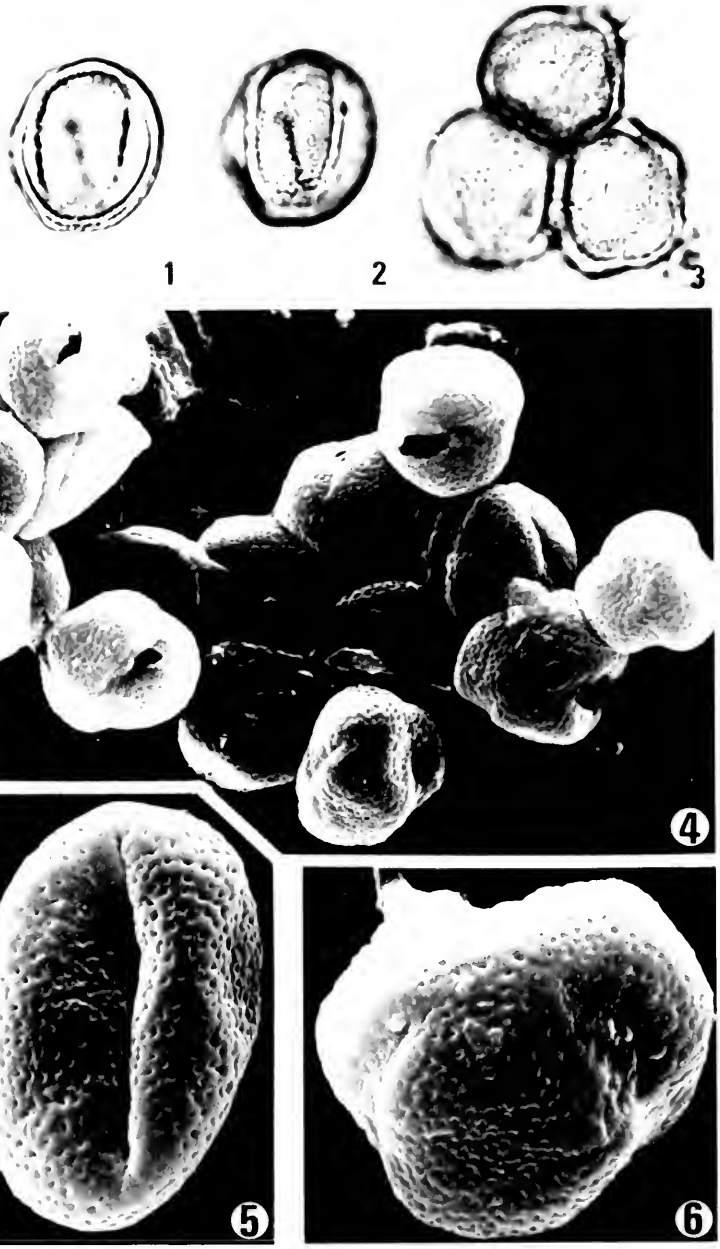
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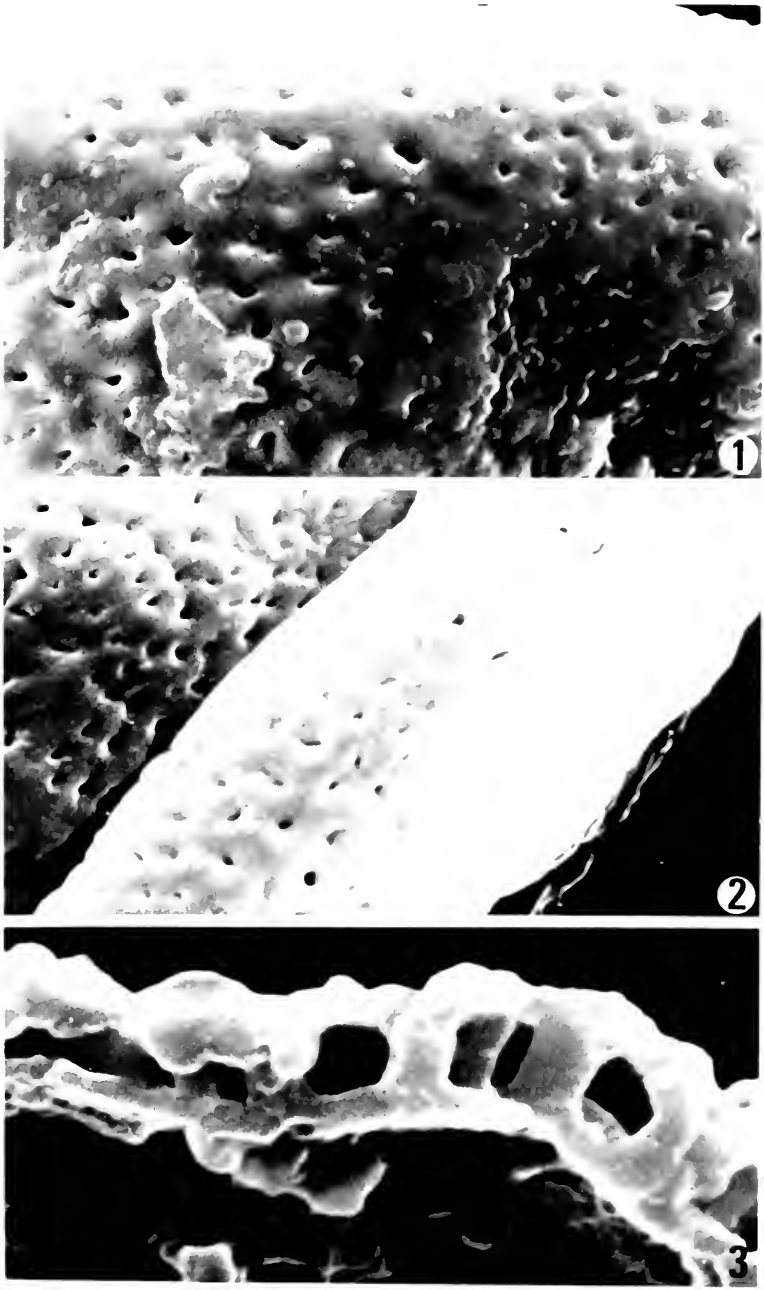
Planche V. (comme la Planche IV, correspond aussi à A. Carambola, à filets courts).
M. L. B. fig. 1 à 3.

Fig. 1. Détail de la zone polaire montrant une surface tectale perforée à compacte en bordure des ectoapertures (en bas, à droite) x 10000.

Fig. 2. Détail d'une zone équatoriale aux niveaux apertural et interapertural, montrant une surface tectale perforée x 10000.

Fig. 3. Cassure due aux ultrasons montrant un tectum assez mince, des columelles assez allongées larges et espacées, et un ensemble sole-endexine assez mince par rapport aux columelles x 20000.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Commentaires Taxonomiques

Il faut remarquer une taille plus élevée du pollen dans les étamines à filets longs aussi bien chez A. Bilimbi que chez A. Carambola : dans ce dernier cas, les pollens de petite taille observés ont des caractéristiques de jeunes pollens, ce qui laisserait supposer la non maturité de certaines étamines à filets longs.

Chez A. Bilimbi, mise à part la différence de taille, les pollens provenant des deux cycles d'étamines de la même fleur présentent les mêmes caractéristiques : surface tectale réticulée, sole suportant des éléments sculpturaux, sillons elliptiques s'ouvrant largement.

Chez A. Carambola, en plus de la taille, les pollens des fleurs à filets longs se distinguent des pollens des fleurs à filets courts par une surface tectale plus aérée (réticulée à perforée avec des éléments sculptureux dans les mailles), que la surface tectale des pollens des fisure à filets courts qui est assez compacte, perforée.

Tectum partiel réticulé

A. Bilimbi : filets longs 30 x 30 um; filets courts 22 à 25 x 21 à 25 um.

Tectum partiel réticulé à complet perforé

A.Carambola : filets longs 23 à 32,5 x 23 à 30 um.

Tectum complet perforé

A. Carambola : filets courts 24 x 21 um.

Conclusion

Cette approche palynologique montre qu'il est possible de distinguer, par la surface tectale, les deux espèces A. Bilimbi et A. Carambola (et particulièrement l'échantillon à filets courts). En cela, nous rejoignons les observations faites chez les Ombellifères qui nous ont amenés à proposer des définitions palynologiques de l'espèce (GUYOT et col., 1980), où les caractères de la surface tectale sont très importants).

On pourrait même penser, suivant les observations de A. LOURTEIG (1983), que l'échantillon à filets courts de A. Carambola à anthères rudimentaires possède des pollens avortés. Des cas similaires de stérilité mâle ont été décrits chez Eryngium campestre L. (CAILLEUX et col., 1983), Petunia hybrida Hort. ex Vilm. (ROLAND-HEYDACKER, CERCEAU-LARRIVAL, 1982), Vicia Faba L. (CERCEAU-LARRIVAL et col., 1982).

Quant au genre Averrhoa, il se caractérise par un pollen de forme subcirculaires à légèrement ovale, de petite taille (23 um), à taille moyenne (31 um), à sillons elliptiques, longs et larges, à endoapertures grandes, mal définies, à surface tectale perforée, à perforée-réticulée, avec des éléments sculpturaux dans les perforations et dans les

mailles du réticule.

Une étude palynologique qui fera l'objet d'une publication ultérieure, permet l'établissement de caractères diagnostiques pour chacun des genres:

Biophytum (pollen de forme subrhombnidale, de taille plus importante, 32 à 48 um, à surface tectale réticulée avec ou sans éléments sculpturaux).

Dapania (petit pollen de 20 um,de forme ovale, à surface tectale largement réticulée avec quelques éléments dans les mailles).

Oxalis (1) (pollen de forme subcirculaire à ovale avec une taille réduite chez certaines espèces, 20 um, pouvant atteindre 30 à 40 um chez d'autres espèces à surface tectale reticulée,sans éléments sculpturaux dans les mailles).

Sarcotheca (pollen de forme subcirculaire de petite taille, 18 à 24 um à surface tectale perforée à réticulée, sans éléments sculpturaux).

Cette étude permet donc de distinguer ces genres les uns par rapport aux autres, ainsi que par rapport au genre Averrhoa. Mais, elle ne semble pas justifier la séparation du genre Averrhoa de ce groupe. En effet, Averrhoa n'est pas isolé par ses caractéristiques palynologiques qui, bien au contraire, montrent des affinités avec celles observées chez Biophytum, Dapania, Oxalis et Sarcotheca.

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(1)Une espèce présente un type de pollen différent à forme ovale en coupe optique méridienne, de très grande taille (P=53,5 um)avec une surface tectale tout à fait particulière "convolutée-perforée" du type de celle observée chez Platysace, Ombelifère endémique d'Australie (CERCEAU-LARRIVAL, 1980).

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NEOTROPICAL MYRSINACEAE -- XV

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Richardson, Texas 75083-0688

AURICULARDISIA Lundell, Phytologia 49: 341. 1981

AURICULARDISIA EURUBIGINOSA Lundell, sp. nov. -- Arbor, 15 m.; ramuli crassiusculi, adpresse rufo-furfuracei; folia pallida, petiolata, petiolo canaliculato, 5--7 mm. longo, subtus adpresse furfuraceo; lamina chartacea, peradpresse lepidota, anguste oblongo-lanceolata, 8--15 cm. longa, 1.7--4 cm. lata, apice acuminata, basi acuta, revoluta, margine integra; inflorescentia terminalis, paniculata, pyramidalis, ad 18 cm. longa, dense rufo-furfuracea; flores 5-meri, capitellati, subsessiles; pedicelli crassi, subnulli vel ad 2 mm. longi; sepala crassa, ovata, ca. 1.6 mm. longa, asymmetrica, auricula hyalino-ciliata, punctata, apice acuta; ovarium punctatum; fructus subglobosus, ca. 6 mm. diam.

Panama: Prov. Bocas del Toro, Cordillera de Talamanca, 2 to 5 airline km. NW of the peak of Cerro Echandi on the Costa Rican-Panamanian international border, elev. 2600--2850 m., March 1--9, 1984, G. Davidse et al. 25486 (holotype, LL), understory tree 15 m. tall, flower buds whitish, fruit green to red to black.

The leaves dry pale brownish. The petiole is reddish-furfuraceous but the blade is lepidote with small appressed scales. Noteworthy are the small heads of flowers, essentially sessile, with coriaceous obscurely punctate ovate acute sepals which are auriculate.

AURICULARDISIA QUADRATUS Lundell, sp. nov. -- Arbor, 4 m.; ramuli crassiusculi, adpresse lepidoti; folia petiolata, petiolo 1--1.5 cm. longo, canaliculato, subtus dense lepidoto; lamina membranacea, elliptica, 11--15 cm. longa, 5--7.5 cm. lata, apice subabrupte subacuminata, basi acutiuscula, integra, nigropunctata, supra glabra, subtus minute lepidota, utrinque reticulata; inflorescentia terminalis, squarrosa, multiramosa, multiflora, minute rufo-lepidota, trichoma substipitata; flores 5-meri, subcorymbosi, pedicelli 3--5 mm. longi; sepala asymmetrica, auriculata, hyalina, ovato-lanceolata, ca. 2.2 mm. longa, acuta, cioliolata, dense nigropunctata; petala oblongo-lanceolata, ca. 6 mm. longa, basi connata, apice asymmetrica, acuta, hyalina, nigropunctata; stamina ca. 4 mm. longa; filamenta ca. 1 mm. longa; antherae crassae, elliptico-lanceolatae, ca. 3 mm. longae, apiculatae; ovarium ovoideum, apice truncatum, minute nigropunctatum, glabrum, stylo punctato, petala aequante.

Costa Rica: Prov. Puntarenas, foothills of the Cordillera de Talamanca, around Tres Colinas, elev. 1800--1850 m., March 20, 1984, Gerrit Davidse et al. 25645 (holotype, LL), tree 4 m. tall, petals pink, anthers yellow, fruit red to black (ripe).

The large inflorescence has strongly zigzag branches which form squares, whence the name.

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

ICACOREA BEKOMIENSIS Lundell, sp. nov. -- Arbor, 6 m.; ramuli graciles, novelli minute et peradpresse lepidoti; folia petiolata, petiolo 5--7 mm. longo, anguste marginato, parce lepidoto; lamina subcoriacea, elliptica vel obovata, 3--6.5 cm. longa, 1.5--3.2 cm. lata, apice obtusa, basi acuta, subtus parce lepidota, integra, utrinque minute reticulato-venosa; inflorescentia terminalis, paniculata, ad 7 cm. longa et lata, parce et minute lepidota, glabrata; flores 5-meri, umbellato-corymbosi; pedicelli ca. 6 mm. longi, parce lepidoti; sepala parva, late ovata, 1.2--1.4 mm. longa, minute et dense nigropunctata, margine anguste hyalina; corolla ca. 6.5 mm. longa; petala oblonga, basi connata, lineari-venosa, parce nigropunctata; stamina 5 mm. longa; filamenta ca. 2.5 mm. longa; antherae crassae, lanceolato-oblongae, ca. 3 mm. longae, apice birimosae; ovarium glabrum, stylo ca. 6.5 mm. longo; ovula, 14, 18, parva, pluriseriata.

Costa Rica: Puntarenas-Limon border, Cordillera de Talamanca, Cerro Bekom, 11 airline km. SSW of the peak of Cerro Kamuk, elev. 2600--2750 m., Mar. 21, 1984, Gerrit Davidse 25710 (holotype, LL), understudy tree 6 m. tall, petals dark pink on the back, whitish-pink on the front, filaments white, anthers yellow.

I. bekomiensis and I. latisepala are very closely related, differing in the much smaller sepals of I. bekomiensis as well as its thicker oblongish anthers and fewer ovules. I. bekomiensis dries blackish, and its mostly elliptic leaves are rather obscurely reticulate veined on both surfaces and sparsely lepidote beneath.

ICACOREA BREVIPES Lundell, sp. nov. -- Arbor, 5 m.; ramuli graciles, novelli peradpresse minute lepidoti; folia supra glabra, subtus minute peradpresse lepidota, petiolata, petiolo 3--6 mm. longo, anguste marginato; lamina chartacea, lanceolata, 3.5--7.5 cm. longa, 1.7--3 cm. lata, apice breviter acuminata, acumine obtusiuscula, margine integra, utrinque minute nigropunctata et reticulata; inflorescentia terminalis, paniculata, ad 9 cm. longa et lata, basi adpresse lepidota; flores 5-meri, corymbosi; pedicelli fructiferi 1.5--3 mm. longi; calyx basi crassus, minute nigropunctatus; sepala ovata, hyalina, ca. 1 mm. longa, minute punctata; fructus subglobosus, nigropunctatus; stylo ca. 3 mm. longo.

Costa Rica: Prov. Puntarenas, foothills of the Cordillera de Talamanca, around Tres Colinas, elev. 1800--1850 m., Mar. 20, 1984, Gerrit Davidse et al. 25680 (holotype, LL), treelet 5 m. tall, fruit green with reddish tint.

The branchlets and petioles dry blackish. Reticulation of the leaf blades is rather obscure but most prominent beneath where the punctation is also densest. The open inflorescences are blackish, slender-branched, and glabrous above the short lepidote peduncle. Notable are the very short pedicels which are enlarged at the base of the calyx. Sepals are small, thin, and conspicuously punctate with minute glands.

Probably related to I. bekomiensis Lundell.

ICACOREA DENTICULATA Lundell, sp. nov. -- Arbor, ad 3 m. alta; ramuli graciles, novelli peradpresse lepidoti; folia glabra, petiolata, petiolo 5--8 mm. longo, canaliculato, late hyalino-marginato; lamina chartacea, lanceolata, 7.5--13 cm. longa, 2.5--4.8 cm. lata, apice acuminata, basi acutiuscula, margine denticulata, subtus reticulata, utrinque nigropunctata; inflorescentia terminalis, paniculata, 5--10 cm. longa, parce lepidota; flores 5-meri, subcorymbosi vel umbellato-corymbosi; pedicelli graciles, 5--7 mm. longi; sepala lanceolato-elliptica, ca. 1.5 mm. longa, acuta vel subacuminata, hyalina, dense et minute rubro-punctata, corolla ca. 4.6 mm. longa; petala lanceolata, basi connata, parce punctata, apice asymmetrica, acuta; stamina ca. 3.5 mm. longa; filamenta ca. 1.5 mm. longa; antherae lineari-lanceolatae; placenta globosa; ovula 11 vel 12, pluriseriata; fructus subglobosus, 5--6 mm. diam.

Costa Rica: Cordillera de Tilaran, Flora de Monteverde, Comunidad, en bosque perturbado, alt. 1400--1500 m., Nov. 28, 1976, V. J. Dryer 1010 (holotype), arbol, 3 m., flores rosado-claras. Two other collections from the same area, Dryer 873A (F) and 1246 (F), are referable to this species.

I. denticulata resembles I. dentata DC. of Cuba, but the latter does not have leaves reticulate beneath and prominently black punctate with rather small black glands, characteristics of I. denticulata. The new taxon appears to be related to I. longicaudata (Lundell) Lundell of Costa Rica, a species with mostly small lateral inflorescences. It differs also in punctation.

The conspicuous hyaline margins of the petioles of I. denticulata are distinctive. Also, its anthers are dehiscent by two small flaring apical pores. Its petals are sparsely punctate, as contrasted with the dense small reddish glands of the thin acute or acuminate sepals.

ICACOREA GUANACASTENSIS Lundell, sp. nov. -- Arbor, 10 m.; rami crassi; ramuli graciles, novelli peradpresse et minute lepidoti; folia novella basi lepidota, glabrata, petiolata, petiolo 3--5 mm. longo, anguste marginato; lamina integra, subcoriacea, oblanceolata, 5--9.5 cm. longa, 2--4 cm. lata, apice

subabrupte breviter acuminata, basi acuta; inflorescentia terminalis, paniculata, basi minute lepidota, ad 8 cm. longa, densiflora; flores 5-meri, corymbosi; pedicelli 3--5 mm. longi; sepala parva, ovata, 1.3--1.5 mm. longa, minute punctata, apice glandula aurantiaca, acutiuscula; corolla ca. 6 mm. longa; petala anguste oblongo-lanceolata, apice asymmetrica, parce lineato-punctata; stamina ca. 5 mm. longa; filamenta ca. 2 mm. longa; antherae anguste linearı-lanceolatae, 3--3.5 mm. longae, apice attenuatae; ovarium ovoideum, minute punctatum; ovula 15--17, pluriseriata.

Costa Rica: Prov. Guanacaste, Parque Nacional Rincon de la Vieja, the SE slopes of Volcan Santa Maria, evergreen montane forest, elev. 900--1200 m., Jan. 27--28, 1983, G. Davidse et al. 23307 (holotype, LL), tree 10 m. tall, petals white, pedicels pink.

I. guanacastensis is closely related to Icacorea Whitei (Lundell) Lundell, a species with anthers thick, shorter, not tapering to apex, and drying blackish. The longer anthers of I. guanacastensis are pallid, very slender, and dehiscent by two small flaring apical pores. Petals of the latter have very slender and fewer lineate glands and apically are mostly epunctate, the glands being very small and few when present.

In this species complex differences in the anthers appear to have significance.

ICACOREA GUINEALENSIS Lundell, sp. nov. -- Arbor, 10 m.; ramuli graciles, glabrati; folia glabra, petiolata, petiolo marginato, 1--1.3 cm. longo; lamina chartacea, anguste oblongo-oblanceolata, 10--21 cm. longa, 3.5--5.5 cm. lata, apice sub-abrupte breviter acuminata, basi obtusiuscula, marginata, subtus subtiliter venosa, supra foviolata, integra; inflorescentia terminalis, paniculata, pyramidalis, ad 15 cm. longa, basi per-adpresse et minute lepidota; flores 5-meri, corymbosi; pedicelli fructiferi graciles, apice clavati, 8--9 mm. longi; sepala lanceolato-elliptica, 2.5--3 mm. longa, punctata, margine hyalina; fructus subglobosus, punctatus.

Costa Rica: Prov. Puntarenas, foothills of the Cordillera de Talamanca, vicinity of Helechales, along the Rio Guineal, elev. 1100--1200 m., March 29, 1984, Gerrit Davidse & G. Herrera Ch. 26215 (holotype, LL), tree 10 m. tall, along river bank, berries black.

In fruit, the plant is essentially glabrous. Although the pedicels of fruits are slender, they are enlarged below the calyx. The rather large sepals are thin with the glands inconspicuous. The oblong-oblanceolate leaf shape is distinctive, with the apex short acuminate and the base decurrent and marginate on the petiole.

Probably related to Icacorea polydactyla (Lundell) Lundell and Icacorea polyantha (Lundell) Lundell, both from Costa Rica.

ICACOREA LATISEPALA Lundell, sp. nov. -- Arbor, 7 m.; ramuli graciles, novelli peradpresse lepidoti; folia parva, supra glabra, subtus parce et minute lepidota, petiolata, petiolo 5--7 mm. longo, canaliculato; lamina coriacea, integra, obovato-elliptica vel oblanceolata, 4.5--7.5 cm. longa, 2--3.5 cm. lata, apice obtusa, basi acuta; inflorescentia terminalis, paniculata, dense et multiflora, ad 8 cm. longa et lata, glabrata; flores 5-meri, corymbosi; pedicelli 5--7 mm. longi; sepala crassa, ovata, 2--2.3 mm. lata et longa, apice obtusa vel rotundata, dense et minute aurantiaco-punctata vel nigropunctata, margine anguste hyalina; corolla ca. 7.5 mm. longa; petala anguste lanceolata, basi connata, apice asymmetrica, lineari-venosa et punctata; stamina ca. 5 mm. longa; filamenta ca. 2.5 mm. longa; antherae lanceolatae, ca. 3 mm. longae, apice birimosae; ovarium ovoideum, apice subtruncatum, stylo ca. 8 mm. longo; ovula parva, ca. 28, pluriseriata.

Panama: Prov. Bocas del Toro, Cordillera de Talamanca, 8 airline km. NW of the peak of Cerro Echandi on the Costa Rican-Panamanian international border, elev. 2800--2900 m., Mar. 4 & 9, 1984, G. Davidse et al. 25279 (holotype, LL), common understory tree 7 m. tall, petals pink without, pinkish-white within, filaments and style white, anthers bright yellow.

The numerous small ovules, the large flowers with filaments subequaling anthers, the linear-veined petals with scattered mostly rounded glands, the broadly ovate thick sepals densely punctate with minute mostly orange glands, and the glabrous inflorescences drying blackish are among the features distinguishing this taxon.

ICACOREA TRIANGULA Lundell, sp. nov. -- Arbor, 5 m.; ramuli graciles et crassiusculi, novelli lepidoti; folia subtus lepidota, glabrata, petiolata, petiolo 3--5 mm. longo, anguste marginato; lamina subcoriacea, parvipunctata, elliptica, 3.5--7.5 cm. longa, 2.5--4 cm. lata, apice subabrupte breviter acuminata, basi acutiuscula, supra glabra, margine integra; inflorescentia terminalis, paniculata, pyramidalis, multiflora, ad 11 cm. longa, novella parce lepidota, basi dense minute lepidota; flores 5-meri, corymbosi; pedicelli 3--6 mm. longi; sepala late ovata, 1.8--2 mm. longa, margine minute ciliolata, late hyalina, in medio crasso-triangula, minute punctata, glandula apice aurantiaca, basi nigropunctata; corolla 6.5--7 mm. longa; petala elliptico-lanceolata, basi connata, parce punctata, apice asymmetrica; stamina ca. 6 mm. longa; filamenta ca. 2 mm. longa; antherae lanceolatae, 4--4.5 mm. longae, apice birimosae; ovarium ovoideum, glabrum, stylo ca. 6 mm. longo, punctato; placenta subglobosa, ovula parva, 27, 29, pluriseriata.

Costa Rica: San Jose, Patarra, Cerro El Espino (Alto Mata de Caña-Azahar), elev. 1600--1800 m., Nov. 13, 1983, G. Herrera y I. A. Chacon 1579 (holotype, LL), arbolito de 5 m. de alto, caliz rojiso, corola blanco rosado, estambres amarillos, frutos lilas.

Icacorea triangula resembles Icacorea rigidifolia (Lundell) Lundell from the Province of Cocle, Panama. I. triangula differs notably in its larger flowers, especially the larger ovate sepals which have a well defined triangular glandular area medially and a wide hyaline margin. The sharply triangular area of the sepals is unique, whence the specific name.

MYRSINE L., Linn. Syst. ed. I (1735); Gen. ed. I. 54 (1737)

MYRSINE NIGRESCENS Lundell, sp. nov. -- Arbor, 6 m.; ramuli graciles, glabri, lenticellati; folia petiolata, petiolo 5--7 mm. longo, canaliculato, margine villoso-ciliato; lamina chartacea, oblonga vel oblanceolata, 5--9 cm. longa, 1.5--2.8 cm. lata, apice acuminata, basi attenuata, acuta, revoluta, margine ciliata, glabrata, nigropunctata, utrinque reticulata, integra; flores 5-meri, fasciculati; pedicelli fructiferi crassi, 1--2 mm. longi; calyx crassus, rugosus; sepala crassa, ovata, ca. 1 mm. longa, ciliolata; fructus punctatus.

Panama: Prov. Bocas del Toro, Cordillera de Talamanca, headwaters of the Rio Culubre, 6 airline km. NW of the peak of Cerro Echandi on the Costa Rican-Panamanian international border, elev. 2450--2600 m., March 2--3, 1984, G. Davidse et al. 25239 (holotype, LL), slender tree 6 m. tall, fruit green.

This is a well-marked species, with leaves much paler beneath and blackened above. Its stems and petioles blacken when dried. The margin of the petioles and the basal third of the leaf blades are ciliate with conspicuous villous-like hairs, the leaf is otherwise glabrous at maturity except along the midvein. Both surfaces of the leaf, especially beneath, are reticulate-veined and black punctate with small scattered glands. The fruits are fasciculate on old wood on small elevated black bracteate nodules. The lenticellate stems are conspicuous with large lenticels.

MYRSINE VERAE-CRUCIS Lundell, sp. nov. -- Arbor, 5 m.; ramuli crassiusculi, glabri; folia glabra, subsessilia vel petiolata, petiolo ad 8 mm. longo, rugoso, marginato; lamina parva, coriacea, obovata, 2.5--7.5 cm. longa, 1.5--3.5 cm. lata, apice late obtusa vel rotundata, basi acuta, marginata, revoluta, integra, minute punctata; flores 5-meri, fasciculati, glabri; pedicelli fructiferi crassi, 0.5--1 mm. longi; sepala crassa, elliptica vel ovato-elliptica, ca. 1 mm. longa, acutiuscula, minute punctata; fructus subglobosus, ca. 4 mm. diam., rugosus.

Mexico: Veracruz, Mun. Alvarado, en el km. 22 de la carretera Veracruz-Alvarado, alt. 20 m., May 21, 1977, Juan Ismael Calzada 3200 (holotype, F; isotype, XAL), arbol, 5 m., fruto verde.

Growing at sea level, Myrsine verae-crucis is related to Myrsine mexicana (Lundell) Lundell, a montane species of which the

type collection was made by Eizi Matuda in Chiapas, on Pico de Loro near Escuintla. They differ in leaf shape, length of fruiting pedicels, and in shape of sepals. Both taxa have flowers fasciculate on short, crowded, bracteate, lateral spurs. In M. verae-crucis the young tender leaves are ciliolate with reddish hairs.

A NEW SPECIES OF EUONYMUS (CELASTRACEAE) FROM MEXICO

Cyrus Longworth Lundell

EUONYMUS PLATYPHYLLUS Lundell, sp. nov. -- Arbor, 6 m.; ramuli graciles, quadrangulares, glabri; folia petiolata, petiolo 3.5--5 mm. longo, canaliculato; lamina chartacea, glabra, late elliptica, 6.5--12 cm. longa, 4.2--7 cm. lata, apice subabrupte breviter-acuminata basi subrotundata et acutiuscula, utrinque reticulata, crenulata, pallide viridia; cymae 1--3-florae, terminales; pedunculi teretes; pedicelli fructiferi teretes, ca. 4 mm. longi, crassi; sepala 1.3--2 mm. lata; capsula tuberculata.

Mexico: Veracruz, Estacion Biologica de los Tuxtlas, selva alta perennifolia, Sept. 8, 1971, Juan Ismael Calzada 494 (holotype, XAL; xerox, LL), arbol 6 m., escasa.

This species with broadly elliptic leaves, finely reticulate on both surfaces, and with small few-flowered terminal cymes less than 1 cm. long, is known only from a specimen with immature tuberculate capsules.

ADDITIONAL NOTES ON THE GENUS *LIPPIA*. XIX

Harold N. Moldenke

LIPPIA ALBA (Mill.) N. E. Br.

Additional bibliography: Mold., Phytologia 56: 359--364. 1984.

Additional citations: CULTIVATED: Puerto Rico: *Sintenis 786b* (W--1322919); *J. A. Stevenson 5229* (W--1475356). MOUNTED ILLUSTRATIONS: D. S. & H. B. Correll, Fl. Bahama Arch. 1235, fig. 531. 1982 (Ld); Alain in Leon & Alain, Fl. Cuba, imp. 2, 2: 288, fig. 124. 1974 (Ld); Troncoso in Burkart, Fl. Ilust. Entre Rios 274, fig. 129. 1979 (Ld); López-Palacios, Fl. Venez. Verb. [420], fig. 98. 1977 (Ld).

LIPPIA ALBA var. *CARTERAE* Mold.

Additional bibliography: Mold., Phytologia 48: 157--158. 1981.

Additional citations: MEXICO: Baja California: *Carter & Ferris 3864* (Me--116644--isotype, W--2539499--isotype).

LIPPIA ALBA var. *GLOBIFLORA* (L'Hér.) Mold.

Additional bibliography: D. Dietr., Syn. Pl. 3: 596, 597, & 610. 1843; Walp., Repert. Bot. Syst. 4: 53--54 & 69. 1845; F. Muell., Sec. Syst. Census Austral. Pl. 1: 171. 1889; Millsp., Field Columb. Mus. Publ. Bot. 1: 317. 1896; F. M. Bailey, Compreh. Cat. Queensl. Pl. 382. 1913; Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. 13: [Verb. Util. Mat. Méd.] [31] & 42--44. 1921; Angely, S. Amer. Bot. Bibl. 2: 678. 1980; Mold., Phytologia 48: 158. 1981; Reis & Lipp, New Pl. Sources Drugs 252. 1982; Mold., Phytologia 56: 363. 1984.

Recent collectors describe this plant as a small, sparsely branched, very fragrant shrub, 1--1.6 m. tall, or shrubby forb, and have found it growing in the clay and mud soil of riverine forests, in cutover woodland and scrub with open patches of grass in sandy soil,, in pastures, and on riverbanks, at 300 m. altitude, in flower in October and November. Steinbach, in Bolivia, refers to it as "scarce"; Casas & Molero, in Paraguay, encountered it "al borde de la pista en matorral ralo". The vernacular name, "salva", is reported.

The corollas are said to have been "rose" on *Ferreira 158*, "purple" on *Prance & al. 26091* and *Schaller 271*, "purplish" on *Schaller 247*, and "mauve, yellow in the throat" on *Renvoize 3283 & 3656*.

Reis & Lipp (1982) report that in Peru a tea is made from the leaves and used to counteract the effects of purgatives, in Brazil (Rio Grande do Sul) it is cultivated for medicinal use but is found only rarely in an indigenous state there, and in Bolivia it is employed "tomadas en infusion por los nativos para purificar la sangre y como bebida estimulante."

Additional citations: BRAZIL: Mato Grosso: *Prance, Schaller, & Crawshaw 26091* (N); *Schaller 247* (N), *271* (N). BOLIVIA: Cochabamba: *R. F. Steinbach 413* (Mi). PARAGUAY: *Casas & Molero FC.3607* (N). ARGENTINA: Chaco: *Renvoize 3656*(W--2894525). Misiones: *Renvoize 3283* (W--2894526). CULTIVATED: Brazil: *Ferreira 158* (Ld).

LIPPIA ALBA f. *INTERMEDIA* Mold., Phytologia 50: 469. 1982.

Bibliography: Mold., Phytologia 50: 469 (1982), 52: 114--119 (1982), 54: 233, 236, & 240 (1983), and 56: 361 & 363. 1984.

Recent collectors refer to this plant as an herb, subshrub, or perennial aromatic shrub, 0.8--2 m. tall, a "shrub or climber to 1 m." (according to Balslev & Dea), or a "shrubby 1 m. vine with a 1--2 cm. basal stem diameter, at first ascending, then arching over to the ground, from a basal rootstock" (according to Traverse). Other collectors refer to the branches as scandent, 1 m. long, and the foliage as membranous and lemon-scented. They have found the plant growing in sandy-clay soil, in low ground, and shady spots as an understory shrub, at 15--1350 m. altitude, in flower in January, March to September, and November, and in fruit in January, March, and May to September. Daly and his associates found it, in Bolivia, "in a dry forest near the river in a large flat valley regenerating after the 1979 floods which killed all but a few of the large trees". Jimenez refers to it as abundant on riverbanks in the Dominican Republic, while Fryxell, in Tamaulipas. Mexico, describes it as "rare in thorn scrub and disturbed ground around lakesides with grazed areas". Hill reports it as escaped from cultivation in Amazonas, Brazil.

Teppner 81/453 was grown from the seeds of his *81/226* collected at Pasco, Peru and herein cited as representing the typical form of the species -- it is accompanied by a color slide. *Coulter 113/364* is a mixture with the typical form.

The corollas are described as having been "rose" on *Héringer & al. 497*, *Jiménez 2685*, and *Liogier & Liogier 27660*, "rose with a yellow center" on *Jacquemin 1506*, "pale-lavender" on *Plowman & Carvalho 12788*, "lavender" on *Fryxell 3717* and *Leonard & Leonard 12442*, "lavender with a yellow center" on *Traverse 1169*, "pale-lilac" on *Cuatrecasas 27288*, "lilac" on *Daly & al. 2227* and *Lita 303*, "lilac with a yellow center" on *Hill & al. 12899*, "pink" on *Leonard & Leonard 15470*, "pink-purple" on *Leonard & Leonard 15470*, "purple" on *Standley 39605*, and "pale-purple with a yellow center on *Prance & al. 16311*.

Vernacular names reported for the form are "calenturapanga", "cedrera", "erva cidreira", "erva-cidreira" [=medicinal calamante], "hierba luisa", "hoja de calentura", "juanalama", and "orégano".

The plant contains, chiefly in its leaves, an essential oil which, in Brazil, is regarded as medicinal and taken as a tea with sugar; in Martinique it is employed as a pectoral. In Costa Rica, according to Standley, it is used to treat stomach-ache, while in Haiti the Leonards report its use as a medicinal tea by the natives and its cultivation "for hotel use". In Ecuador Balslev & Dea report its use in the treatment of fevers and grippe, "se hierve una rama y esta bebida se toma". Daly and his associates describe the bracts as "white".

Material of this form has been cited by me in previous papers (before the recognition of this form) as typical *Lippia alba* (Mill.) N. E. Br. and has been so identified in many herbaria. It has also been misidentified in herbaria as *Lippia geminata* H.B.K., *Lantana involucrata* L., *Lantana trifolia* L., *Lantana* sp., *Melissa* sp., and even as *Compositae*.

Additional & emended citations: TEXAS: Cameron Co.: *J. M. Coulter*

113/364 in part (W--81918). Hidalgo Co.: *Traverse 1169* (W--2339895). MEXICO: Puebla: *Reko 4236* (W--988723). San Luis Potosí: *Purpus 5289* (W--463850). Tamaulipas: *Fryxell 3717* (Ld); *Edw. Palmer 102* (W--463038); *Pringle 1960* (W--81846). GUATEMALA: Alta Verapaz: *Pittier 290* (W--472952); *Tllrckheim II.2241* (W--1322915). Sololá: *Shannon 134* (W--1322922). NICARAGUA: Province undetermined: *C. Wright s.n.* (W--81848). COSTA RICA: Puntarenas: *Tonduz 1606* [Pittier & Durand 2869] (Ld--photo of type, W--1322916--type). HISPANIOLA: Dominican Republic: *J. J. Jiménez 2685* (W--2113176); *Liogier & Liogier 27590* (N), *27660* (N). Haiti: *Leonard & Leonard 14431* (W--1452855). HISPANIOLAN OFFSHORE ISLANDS: Tortue: *Leonard & Leonard 12442* (W--1451200). WINDWARD ISLANDS: Martinique: *Duss 4552* (N), *4765* (N, N). COLOMBIA: Amazonas: *Cuatrecasas 27288* (W--2515055). VENEZUELA: Apure: *Davidse & González 13779* (N). FRENCH GUIANA: *Jacquemin 1506* (Cy). ECUADOR: Napo: *Balslev & Dea 2813* (N). PERU: Loreto: *Prance P.26634* (W--2950921). BRAZIL: Amazônas: *Hill & al. 12899* (Ld); *Prance, Maas, Woolcott, Monteiro, & Ramos 16311* (Ac, N, W--2699654). Rio de Janeiro: *Lira 303* [Rocha 252; Herb. FEEMA 18164] (N). BOLIVIA: Santa Cruz: *Daly, Hopkins, Forero, Beck, Hernandez, Phipps, & Wolf 2227* (Ld). CULTIVATED: Austria: *Teppner 81/453* (Ld). Brazil: *Héringer, Filgueiras, Mendonça, & Pereira 7548* (W--2958141); *Héringer, Figueiras, Mendonça, Pereira, Salles, Silva, & Paula 497* (N); *Plowman & Carvalho 12788* (F--1916408, N). Costa Rica: *P. C. Standley 39605* (W--1228716). Haiti: *Leonard & Leonard s.n.* (W--1451028). Tortue: *Leonard & Leonard 15470* (N, W--1453734).

LIPPIA ALBA f. *MACROPHYLLA* Mold., Phytologia 50: 469. 1982.

Bibliography: Mold., Phytologia 50: 469 (1982) and 52: 118 & 119. 1982.

Collectors have encountered this plant at altitudes of 400--450 m., in both flower and fruit in January. On the island of Tortue it is known as "melisse". In Haiti, according to the Leonards, it is cultivated and used for making tea; in a hotel there they found it combined with orange to make "bon pom tea".

Material of this form has been misidentified and distributed in herbaria as *Lantana* sp. and *Verbena* sp.

Citations: HISPANIOLA: Haiti: *E. C. Leonard 9399* (W--1300533). HISPANIOLAN OFFSHORE ISLANDS: Tortue: *Leonard & Leonard 11507* (W--1450442). PARAGUAY: *Malme 902* (W--1124355). CULTIVATED: Haiti: *Ekman H.8282* (Ld--photo of type, W--1413001--type); *Leonard & Leonard 12324* (W--1451105).

LIPPIA ALBA f. *SCABRA* Mold., Phytologia 50: 469. 1982.

Bibliography: Mold., Phytologia 50: 469 (1982) and 56: 115. 1982.

Collectors have described this plant as having a strong mint odor, growing from long, rooting suckers, along streamsides. They have found it in flower in March and December and in fruit in December. Mexia described the corollas as "lilac" in color when fresh and reports the Mexican vernacular name, "alfombrillo".

Material of this form has been distributed in herbaria as *Lippia geminata* H.B.K., *Lippia geminata* var. *microphylla* Griseb., and *Lantana involucrata* L.

Citations: MEXICO: Colima: *Edw. Palmer 1303* (Ld--photo of type, W--208858--type). Jalisco: *Mexia 1929* (W--1317921); *E. W. Nelson 6520* (W--399111).

LIPPIA ALNIFOLIA Schau.

Additional & emended bibliography: Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 152. 1895; Mold., Phytologia 48: 158. 1981.

LIPPIA AMERICANA L.

Additional & emended bibliography: Walp., Repert. Bot. Syst. 6: 688. 1847; Bocq., Adansonia, ser. 1, 3: [Rev. Verbenac.] 244. 1863; Savage, Cat. Linn. Herb. Lond. 109. 1945; Mold., Phytologia 48: 158--159 (1981), 54: 233 & 235 (1983), 55: 115 (1984), and 56: 363. 1984.

Recent collectors describe this plant as a much-branched shrub, 2.5--3 m. tall, the stems 4--5 cm. in diameter at the base, the bark light, and the branches elongated and drooping. They have encountered it at 80--900 m. altitude, in flower in May and both in flower and fruit in February. The corollas are described as having been "yellow" on *García-Barriga 21119* and "greenish-white" on *Escobar 1332*. The vernacular name, "velita", has been reported.

Material of this taxon has been misidentified and distributed in some herbaria as *Lippia geminata* H.B.K.

Additional citations: PANAMA: Los Santos: *Ostenfeld 30* (W--120889). COLOMBIA: Atlántico: *Dugand 6188* (W--2457462). Boyacá: *García-Barriga 21119* (W--2957931). Magdalena: *Haught 6726* (W--2046309). ECUADOR: El Oro: *Escobar 1332* (Au). MOUNTED ILLUSTRATIONS: Poir. in Lam., Tabl. Encycl. Meth. Bot. 3: pl. 539. 1819 (Ld); Troncoso, Darwiniana 18: 333, fig. 9. 1974 (Ld).

LIPPIA AMERICANA f. *HYPTOIDES* (Benth.) Mold.

Additional bibliography: Walp., Repert. Bot. Syst. 6: 688. 1847; Mold., Phytologia 48: 159 (1981) and 54: 235. 1983.

Llatas encountered this plant at 30 m. altitude, in flower in October, and describes the corollas as "yellowish-green".

Additional citations: PERU: Lambayeque: *Llatas Q. 842* (Ld). MOUNTED CLIPPINGS: Benth., Pl. Hartw. 122. 1842 (W).

LIPPIA AMERICANA f. *PILOSA* Mold.

Additional bibliography: Mold., Phytologia 48: 159. 1981.

Recent collectors describe this plant as a shrub, 1.5--2 m. tall, the stems tetragonal, the leaves aromatic, and the bracts green. The corollas are described as having been "white" on all 4 of the collections cited below. The plant has been found growing in deciduous and much disturbed dry forests, at altitudes of 50--100 m., in both flower and fruit in October and November.

The vernacular name, "canallita de venado" has been reported for this plant.

Additional citations: PANAMA: Herrera: *P. H. Allen 1094* (W--1794964); *Hamel 5292* (E--2889960). VENEZUELA: Zulia: *Bunting 8256*

(Ld); *Bunting, Galué, Nucette, & Huber 11854* (Ld); *Nucette 83* (Ld). MOUNTED ILLUSTRATIONS: López-Palacios, Fl. Venez. Verb. [426], fig. 99. 1977 (Ld).

LIPPIA ANTAICA Loes. & Mold.

Additional bibliography: Mold., Phytologia 48: 159. 1981.

Additional citations: PERU: Cuzco: *Weberbauer 5918* (W--1495381--isotype).

LIPPIA ARECHAVALETAE Mold.

Additional bibliography: Angely, S. Amer. Bot. Bibl. 2: 670. 1980; Mold., Phytologia 48: 160 (1981) and 50: 250. 1982.

Recent collectors have found this plant growing in dry rough grassland and matorral, in flower in February and November. The corollas are described as having been "yellow" on both collections cited below.

The Paraguay record for this species, based on *Fiebrig 6493*, given by me in a previous installment of these notes is erroneous. The Fiebrig collection actually is *L. tegulifera* Briq.

Additional citations: BRAZIL: Rio Grande do Sul: *Pedersen 12575* (N). ARGENTINA: Corrientes: *Krapovickas & Cristóbal 14848* (Ws). MOUNTED ILLUSTRATIONS: Troncoso in Burkart, Fl. Ilustr. Entre Rios 5: 279, fig. 132. 1979 (Ld).

LIPPIA ARECHAVALETAE var. *MICROPHYLLA* Mold.

Additional bibliography: Angely, S. Amer. Bot. Bibl. 2: 670. 1980; Mold., Phytologia 48: 160. 1981.

LIPPIA ASPERRIMA Cham.

Additional bibliography: Angely, S. Amer. Bot. Bibl. 2: 666. 1980; Mold., Phytologia 48: 160--161, 268, & 269 (1981) and 50: 249 & 269. 1982.

Recent collectors describe this plant as a perennial herb, to 30 cm. tall, with erect wiry stems and the flowers borne in dense heads. They have found it growing in gravel and mud of cleared riverbanks in standing water, at 15--700 m. altitude, in flower in October and November. The corollas are said to have been "yellow" on *Renvoize 2883* and *Venturi 7359* and "orange-yellow" on *Renvoize 3371*.

Additional citations: ARGENTINA: Chaco: *Jörgensen 2631* (W--1055233). Corrientes: *Krapovickas, Cristóbal, & Schinini 26496* (Ws). Entre Ríos: *Renvoize 2883* (N, W--2894510). Tucumán: *Renvoize 3371* (N, W--2894516); *Venturi 7359* (W--1440923). MOUNTED ILLUSTRATIONS: Troncoso in Burkart, Fl. Ilustr. Entre Rios 5: 276, fig. 130, 1--x. 1979 (Ld).

LIPPIA ASPERRIMA f. *ANGUSTIFOLIA* Mold.

Additional bibliography: Mold., Phytologia 48: 160--161 (1981) and 50: 249 & 269. 1982.

Recent collectors have encountered this plant in "black earth" soil in hilly medium-dry grasslands, in flower in March and October. The corollas are said to have been "orange-yellow" when fresh on the Schinini collection cited below.

Material of this taxon has been misidentified and distributed in some herbaria, and even cited by me in a previous installment of these notes, as typical *L. asperrima* Cham., as well as *L. tristis* Briq. and *L. turnerifolia* var. *angusta* Kuntze.

Additional & emended citations: PARAGUAY: *Schinini 4307* (Ld). ARGENTINA: Corrientes: *Pedersen 6108* (W--2410684), *9650* (N).

LIPPIA ASPERRIMA var. *LONGIPEDUNCULATA* Mold.

Additional bibliography: Mold., Phytologia 48: 161 & 269. 1981.

The corollas are described as having been "yellow" on the collection cited below.

Additional citations: PARAGUAY: *Casas & Molero FC.3660* (E--2978883).

LIPPIA BAHIENSIS Mold.

Additional bibliography: Mold., Phytologia 48: 161. 1981.

Recent collectors describe this plant as a branched subshrub, 50 cm. tall, and have encountered it in sandy soil of campo rupestre, at 2900 feet altitude, in anthesis in January and May. The corollas are said to have been "rose" in color on the Hatschbach collection and "lilac" on the one of King & Bishop.

Additional citations: BRAZIL: Bahia: *Harley 15027* (W--2791563--isotype); *Hatschbach 46446* (Ld); *King & Bishop 8605* (W--2922468).

LIPPIA BALANSAE Briq.

Additional bibliography: Mold., Phytologia 48: 161. 1981.

Recent collectors describe this plant as a fragrant shrub or subshrub, 1--2 m. tall, branched, and have found it growing in riverine forests and along railroad tracks on campo sujo, at 300--310 m. altitude, in flower in December and February. The corollas are described as having been "lilac" in color when fresh on *Casas & Molero FC.5896*, "lilac, with the interior of the tube yellow" on *Hatschbach 43670*, and "white, rose, & yellow" on *Casas & Schinini 7434*.

Additional citations: BRAZIL: Mato Grosso: *Hatschbach 46141* (Ld). PARAGUAY: *Casas & Molero FC.5733* (N), *FC.5896* (N); *Casas & Schinini 7434* (N); *Hatschbach 43670* (W--2932032); *Schinini 22932* (Ld). MOUNTED ILLUSTRATIONS: Troncoso, Darwiniana 12: 269, pl. 2. 1961 (Ld).

LIPPIA BAUMII Gürke

Additional bibliography: Mold., Phytologia 48: 161. 1981.

The *Phillips 3235*, distributed as *Lippia baumii*, actually is *Lantana mearnsii* var. *congolensis* Mold.

LIPPIA BOLIVIANA Rusby

Additional bibliography: Mold., Phytologia 48: 162. 1981.

Additional citations: BOLIVIA: Cochabamba: *M. Bang 979* (W--62140--isotype).

LIPPIA BOLIVIANA var. *ANGUSTA* Mold.

Additional bibliography: Mold., Phytologia 48: 162. 1981.

Additional citations: BOLIVIA: Cochabamba: *R. F. Steinbach 191* (Ws--

isotype).

LIPPIA BRACTEOSA (Mart. & Gal.) Mold.

Additional synonymy: *Lippia nutan* Rob. & Greenm. ex Mold., Phytologia 54: 243 in syn. 1983.

Additional bibliography: Mold., Phytologia 48: 163 (1981) and 54: 243. 1983.

Recent collectors describe this plant as a shrub, 2 m. tall, and have found it growing in open brushy and dry mountainous woods, on creek banks, in tropical deciduous forests with *Hauya*, *Euphorbia*, *Diospyros*, *Cedrella*, *Trichilia*, and *Heliocarpus*, on dry flats with *Sabal* and tropical deciduous forest and *Byrsonima-Curatella* savannas, and on steep slopes with *Quercus*, *Juniperus*, *Bursera*, *Ipomoea*, and *Heliocarpus*, at 800--1600 m. altitude, in both flower and fruit in March, October, and December. The corollas are said to have been "yellow" when fresh on *Breedlove 42119* and *Breedlove & McClintock 23735*.

It is worth noting that the leaves are all especially narrow on *Purpus 146*, while on *Miranda 4937* the heads are somewhat larger than is usual in this species.

Material of *Lippia bracteosa* has been misidentified and distributed in some herbaria as *Lantana* sp. On the other hand, the *Webster Breckon 16201* and *Webster, Miller, & Miller 11443*, distributed as *Lippia bracteosa*, actually are *L. graveolens* H.B.K., while *Rzedowski 17649* is *L. inopinata* Mold., *Conzatti 3202*, *Magallanes 310*, and *Reko 3579* are *L. mcvaughi* Mold., *Matuda 28483* is *Lantana glandulosissima* Hayek, and *Langman 2134* is *Lantana velutina* Mart. & Gal.

Additional citations: MEXICO: Chiapas: *Breedlove 23049* (Me--230372), *42119* (Me--246443); *Breedlove & McClintock 23735* (Me--221013); *Breedlove & Thorne 30534* (Me--224575); *Goldman 893* (W--470694); *Miranda 4937* (Me--71048). Oaxaca: *Breedlove 35923* (Me--293035); *Conzatti 4248* (W--1082289); *Liebmann 11268* (W--1315072); *Nelson 1637* (W--250210); *Pringle 6175* (W--1418115); *Purpus 146* (W--1265526), *380* (W--1265664); *Rose & Rose 11368* (W--454158); *Seler & Seler 4842* (W--1206021). Puebla: *Purpus 2570* (W--840563). MOUNTED DESCRIPTIONS: Mart. & Gal., Bull. Acad. Roy. Brux., ser. 1, 11 (2): 326. 1844 (W).

LIPPIA BRADEI Mold.

Additional bibliography: Mold., Phytologia 48: 163. 1981.

The *Hatschbach & Guimarães 42383*, cited by me in a previous paper and distributed to herbaria as *L. bradei*, actually represents *L. insignis* Mold. instead.

LIPPIA BROMLEYANA Mold.

Additional bibliography: Mold., Phytologia 48: 163. 1981; Silva & Mori, Cent. Pesq. Cacau Bol. Tecn. 89: 9 & 64. 1981; Mold., Phytologia 50: 214--215, 247, & 249. 1982.

Collectors describe this plant as a shrub from "often less than 1" to 4 m. tall or a sprawling subshrub, the stems (when erect) spindly, leaves coriaceous to slightly fleshy, aromatic, bright-green and undulate above, mostly flat and generally rather pale-green

beneath, the bracts spreading, pale-green with a pinkish tinge, and the flower-buds pink. They have found the plant growing in areas of campo rupestre and caatinga, on dunes, and among rocks in sandy areas by rivers, at 900 m. altitude, in flower in February and May. The corollas are described as having been "rose" on *Carvalho & Plowman 1543*, "violet" on *Mori, Boom, & Carvalho 14044*, and "with a pale-lilac almost white limb and darker pinkish-purple tube, the throat yellow" on *Harley 22835*.

Additional citations: BRAZIL: Bahia: *Carvalho & Plowman 1543* (Ld); *Harley, Bromley, Carvalho, Nunes, Hage, & Santos in Harley 22835* (W--2962835); *Mori, Boom, & Carvalho 14044* (Ld, N).

LIPPIA BROMLEYANA var. *HATSCHBACHII* Mold., Phytologia 50: 214--215. 1982.

Bibliography: Mold., Phytologia 50: 214--215, 247, & 249. 1982.

Material of this variety has been misidentified and distributed in some herbaria as *Lantana radula* Sw.

Citations: BRAZIL: Bahia: *Hatschbach & Kasper 41663* (Ld--type).

LIPPIA CALLICARPAEFOLIA H.B.K.

Additional & emended bibliography: D. Dietr., Syn. Pl. 3: 599. 1843; Walp., Repert. Bot. Syst. 6: 688. 1847; Bocq., Adansonia, ser. 1, 3 [Rev. Verbenac.]: 244. 1863; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 152. 1895; Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. Paris 13: [Verb. Util. Mat. Méd.] 2. 1921; Mold., Phytologia 48: 163--164 (1981), 50: 241 (1982), and 52: 117 & 118. 1982.

Recent collectors describe this species as a shrub, 0.5--2.5 m. tall, a suffrutescent herb, or even as a tree, 8 m. tall, with a resinous odor, the old stems to 2 inches in diameter, and the bracts "pale" or pink to rose-pink or purplish-violet. They have found it growing in oak or oak-pine forests, in volcanic rubble fields, on dry rolling hills, at the edge of woods, in acahual, on wet slopes, in open or low spiny deciduous woods, on dry slopes, and in low open matorral, at 500--2500 m. altitude, in both flower and fruit from November to January.

The corollas are described as having been "yellow" on *Folsom & al. 7147*, "orange" on *Hinton 1456* and *Stuessy & Roberts 3697*, and "rose-pink" on *Miller & al. 469* [this probably is a mis-observation of the floral bracts, not the corollas]. The vernacular names, "secaleche" and "tabaquillo", are recorded.

Stuessy & Roberts, in Mexico, refer to the species as "common" and Maurice uses the same term to describe it in Panama. The Sarukhan collection, cited below, is placed here tentatively -- it is only a fragment (which may actually be *L. myriocephala* Schlecht. & Cham.) and is a mixture with some other species.

Material of *L. callicarpaefolia* has been misidentified and distributed in some herbaria as *L. umbellata* Cav. On the other hand, the *Tonduz 4429*, distributed as being *L. callicarpaefolia*, actually is *L. costaricensis* Mold., while *Reko 3579* is *L. mcvaughi* Mold., *Rovirosa 636* is *L. myriocephala* Schlecht. & Cham., *Purpus 421* is *L. myriocephala* var. *hypoleia* (Briq.) Mold., *Maurice 693* is *L. oxyphyllaria* (Donn. Sm.) Standl., *Pringle 1733* and *Purpus 508* are *L.*

pringlei Brig., *Pittier 1855* is *L. substrigosa* Turcz., *Purpus 8206* is *L. torresii* Standl., *Matuda 37524* and *Paray 1349* are *L. umbellata* Cav., and *Rosas R. 114* seems not to be verbenaceous.

Citations: MEXICO: Chiapas: *Matuda & al. 30274* (W--2364349). Guerrero: *Croat 45566* (Ld), *45570* (E--2889926); *Hinton 11156* (Me--64802, W--1822344), *11302* (W--1822352), *11633* (W--1822360); *Miller, Neill, & Neill 469* (Ld); *Miranda 24* (Me--73568); *Seler & Seler 4252* (W--1206014). México: *Hinton & al. 27513* (Me--108891), *27853* (Me--108897), *30274* (Me--63876, Me--64703), *32091* (Me--64808, Me--109550), *37374* (Me--92098); *Rzedowski 21829* (Me--94385, Mi); *Stuessy & Roberts 3697* (Ws). Michoacán: *Hinton 12945* (W--1305631). Morelos: *Gándara s.n.* [Cuernavaca] (Me--56592); *Gold 25880* (Me--78679); *Lyonnet 1163* (Me--241031, Me--241032), *2917* (Me--286245, Me--286246); *Pringle 6201* (W--287805), *11084* (W--460468); *Seler & Seler 376* (W--1322893). Puebla: *Sarukhán, Soto, & Martínez 913* in part (Me--145950). HONDURAS: Copán: *Blake 7405* (W--1014390). PANAMA: Chiriquí: *Folsom, Dressler, & Dressler 7147* (Ld); *Maurice 693* (W--1844123). MOUNTED ILLUSTRATIONS & CLIPPINGS: O'Gorman, Mex. Flow. Trees [71]. 1961 (Ld); Loes., Feddes Repert. Spec. Nov. 9: 365. 1911 (W); Pringle, Garden Forest 9: 102 & 105, fig. 11. 1896 (W).

LIPPIA CANDICANS Hayek

Additional bibliography: Mold., Phytologia 48: 164. 1981.

BRAZIL: Minas Gerais: *Irwin, Santos, Souza, & Fonsêca 23294* (W--2863454).

LIPPIA CARDIOSTEGIA Benth.

Additional bibliography: Walp., Ann. Bot. Syst. 1: 543. 1849; F. C. Seymour, Phytol. Mem. 1: 244. 1980; Mold., Phytologia 48: 164 (1981), 50: 241, 242, & 469 (1982), 52: 116 & 117 (1982), 54: 231 (1983), and 56: 363. 1984.

Recent collectors describe this plant as an "herb", bush, or weak, narrow shrub, 1--3 m. tall, or even small tree, 4--6 m. tall, strong-scented, the leaves with a rough texture, aromatic when fresh, and the bracts green. They have found it growing in cutover pine-oak forests, scrub woods on limestone, mixed montane forests, disturbed dry forests, dry tropical forests, dry brushy and rocky slopes, in rocky matorral, clearings, rocky fields, and pastures with remnants of semi-evergreen forests, in hedges and "mesic shut-ins between limestone ridges", along irrigation canals, on steep rocky slopes with *Quercus* and *Cnidoscolus*, on grassy ridges with *Pinus* and *Quercus*, on brushy banks, on dry slopes with *Ficus, Hauya, Heliocarpus, Ipomoea, Quercus*, and *Juniperus*, slopes with scrubby growth of *Solanum, Ficus, Randia, Byrsonima*, and *Verbesina*, and slopes with *Quercus, Cnidoscolus, Guazuma, Diospyros, Luehea*, and *Plumeria*, at altitudes of 8--1700 m., in both flower and fruit from June to February. Molina refers to it as "common" in Guatemala and Honduras; Stevens & Montiel found it "common" in Nicaragua.

The corollas are described as having been "white on *Breedlove 20304* & *40082*, *Molina 22477*, *Moreno 1232*, *1553*, *1731*, *2076*, *2107*, *2311*, *2380*, *2436*, *2726*, *3061*, & *3085*, *Moreno & Guzmán 629*, and *Webster & Lynch 17517*, "white & yellow" on *Breedlove 39024*, "white or

cream" on *Molina R. & Molina 26819*, "whitish" on *Guzmán & al. 577*, "greenish-yellow" on *Pittier 1941*, "yellow-green" on *Williams & al. 41123*, "greenish" on *Standley 41349*, "pale-green" on *Guzmán & al. 245*, "pale greenish-yellow" on *Standley 23262*, "yellow" on *Breedlove 40633* and *Grijalva 692*, "white with a yellow eye" on *Stevens & Montiel 1794*, and "cafe y verde" on *Sandino 341*.

The vernacular names "oreganillo", "orégano montés", and "salvia" have been reported for the species.

It should be noted that the leaves on *Heyde 236*, *Heyde & Lux 4385*, *J. D. Smith 1937*, *Tonduz 13631*, and *Tllrckheim 8731* are remarkably small, while those on *Baker 660*, *Holway 617*, *Kovar 1090*, *Molina R. 3661*, and *Shimek & Smith 8* are especially large.

Material of *Lippia cardiostegia* has been misidentified and distributed in many herbaria as *Lippia asperifolia* Rich., *L. controversa* Mold., *L. myriocephala* Schlecht. & Cham., *L. umbellata* Cav., *Lantana involucrata* L., and *Lantana* sp.

On the other hand, the *Standley 14183*, distributed as *Lippia cardiostegia*, actually is *L. controversa* Mold., while *Moreno 1900*, *2204*, *2430*, & *2809* are *L. curtisiana* Mold. and *Matuda 30159* is *Lantana achyranthifolia* Desf.

Additional citations: MEXICO: Campeche: *Webster & Lynch 17517* (Me--255543). Chiapas: *Breedlove 20304* (Me--228972, Mi), *23339* (Me--203082, Mi), *39024* (Me--247691), *39723* (Me--247275), *40082* (Me--246434), *40633* (Me--283645); *Breedlove & Thorne 21308* (Me--199260); *Matuda 743* (Me--86182); *Miranda 5565* (Me--71046), *5731* (Me--71053). State undetermined: *Liebmann 11228* [Mt. Masaya] (W--1315051). GUATEMALA: Amatitlan: *Holway 617* (W--862958); *J. D. Smith 1937* (W--1322823); *Tllrckheim 8731* (W--576780, W--1322943). Chiquimula: *Molina R. & Molina 26819* (Mi). Escuintla: *P. C. Standley 60217* (W--1807020). Huehuetenango: *Williams, Molina R., & Williams 41123* (Mi). Jutiapa: *Harmon & Dwyer 3329* (E--2889934). Santa Rosa: *Heyde & Lux 4385* (W--354971, W--1322993). Province undetermined: *Heyde 236* (W--246091). HONDURAS: Choluteca: *Molina R. & Molina 24585* (W--2925220). Ocotepeque: *Molina R. 22477* (Ws). Santa Bárbara: *Molina R. 3661* (W--2024678). EL SALVADOR: Ahuachapán: *Padilla 5* (W--1150987), *10* (W--1150992); *P. C. Standley 19860* (W--1135732), *19958* (W--1135825), *20222* (W--1136074). La Libertad: *Case, Dunn, Trott, Dziekanowski, Thurm, & Hess 159* (N); *Stork & Horton 8646* (W--1809218). La Unión: *P. C. Standley 20803* (W--1136630). San Martín: *Calderón 1899* (W--1206489). San Salvador: *Calderón 14* (W--1151034); *P. C. Standley 19395* (W--1135314), *22677* (W--1138413), *23262* (W--1138956). Sonsonate: *Pittier 1941* (W--578340); *P. C. Standley 22181* (W--1137931). Province undetermined: *Kovar 1090* (W--2297042); *Schwabe & Kailing s.n.* [17 Sept. 1978] (Me--253285), *s.n.* [19 Sept. 1978] (Me--253316). NICARAGUA: Estelí: *Moreno 1272* (Ld), *1553* (Ld), *2076* (Ld), *2107* (Ld), *2380* (Ld), *3061* (Ld), *3085* (Ld); *Williams & Molina R. 42384* (Mi). Granada: *Araquistain 251* (Ld); *Guzmán, Castro, & Montiel 577* (Ld); *Lévy 241* (P); *Moreno 2726* (Ld). León: *C. F. Baker 660* (W--862758); *Moreno 2311* (Ld), *2436* (Ld); *C. L. Smith 108* (Me--86183 W--312559); *Stevens & Montiel 17901* (Ld). Madriz: *Stevens & Grijalva 16168* (Ld). Managua: *Chaves 55* (W--1206325); *Croat 43694* (Ld); *Garnier 1069* (W--1639431); *Grijalva 692* (Ld); *Guzmán, Castro, & Montiel*

245 (Ld), *264* (Ld), *429* (Ld); *Maxon, Harvey, & Valentine 7446* (W--1181158); *Moreno 1232* (Ld), *1731* (Ld), *1800* (Ld); *Moreno & Guzmán 629* (Ld); *Sandino 341* (Ld). Ometepe Island: *Shimek & Smith 8* (W--2085016); *C. L. Smith s.n.* [1893] (Mi). Province undetermined: *C. Wright s.n.* (W--81850). COSTA RICA: Alajuela: *Holway 372* (W--862582); *A. Smith P.2346* (W--2955868). Cartago: *Ørsted 11223* (W--1269907), *11241* (W--1269911), *11247* (W--1269913); *Pittier 7519* [Herb. Nat. Costarric. 13215] (Ld, W--355588, W--1322994). Guanacaste: *Tonduz 13631* (577796). San José: *Cooper 602* (W--1322991); *Ørsted s.n.* [Anne e St. Thomas] (W--1959432); *Pittier 13032* (W--358758); *P. C. Standley 41349* (W--1252241); *Tonduz 1460* (W--1322992), *8452* [7111] (W--1322995); *Tonduz & Biolley 7218* (W--1322990).

LIPPIA CARDIOSTEGIA f. *SKUTCHII* Mold., Phytologia 50: 469. 1982.
Bibliography: Mold., Phytologia 50: 469 (1982) and 52: 116. 1982.
Citations: GUATEMALA: Quiche: *Skutch 1747* (Ld--photo of type, W--1644263--type).

LIPPIA CARVIODORA Meikle
Additional bibliography: Mold., Phytologia 48: 164. 1981.
The *Herlocker 59*, distributed as *L. carviodora*, actually is *Lantana petitiana* A. Rich.

LIPPIA CARVIODORA var. *MINOR* Meikle
Additional bibliography: Mold., Phytologia 48: 164. 1981.
Recent collectors describe this plant as a sweet-smelling shrub, 0.5--1.5 m. tall, and report the vernacular names, "gad hamer" and "gad hamar".
Additional citations: SOMALIA: *Kazmi, Elmi, Mahanoud, & Suliman 27* (Mu), *61* (Mu).

LIPPIA CHEVALIERII Mold.
Additional bibliography: Mold., Phytologia 48: 155 & 164. 1981.
Sweeney describes this plant as a tall herb, much branched from the base, and found it growing near streams, at 3000 feet altitude, in both flower and fruit in November. His collection was mistakenly distributed as a member of the *Labiatae*.
Additional citations: REPUBLIC OF GUINEA: *Sweeney 9* (W--2127050).

LIPPIA CHIAPASENSIS Loes.
Additional bibliography: Mold., Phytologia 48: 164--165.(1981), 52: 115 & 116 (1882), and 54: 231. 1983.
Recent collectors describe this species as a weak shrub, 1--3 m. tall, or small tree, the leaves stiff and hairy, and the bracts green. They have encountered it on steep rocky and pine-oak slopes, in open pine-oak forests, thickets and mixed forests, on ledges and cliff faces with *Pinus* and *Quercus*, on the sunny sides of cliffs, on dry slopes with tropical deciduous forest, and on pine-oak-madrono openly forested slopes, at 1000--2400 m. altitude, in anthesis in May and from September to January, in fruit in January and September. Williams and his associates, in Guatemala, refers to it

as "common" and Carlson uses the same term for it in Chiapas.

The corollas are said to have been "yellow"on *Breedlove 40676* & *41225*, *Carlson 2246*, and *Stevens & Montiel 17326*, "yellowish" on *Williams & al. 41202* & *43361*, and "pale-yellow" on *Breedlove 43919*.

Material of *Lippia chiapasensis* has been misidentified and distributed in some herbaria as *L. controversa* Mold. and *L. umbellata* Cav.

Additional citations: MEXICO: Chiapas: *Breedlove 33433* (Me--247606), *40676* (Me--257617), *41225* (Mi); *Breedlove & Dressler 29502* (Me--246316); *Breedlove & Smith 22702* (Me--227330); *Breedlove & Thorne 21323* (Me--198683); *M. C. Carlson 2246* (Me--74568); *Laughlin 475* (Me--104556); *Miranda 5012* (Me--69663); *E. W. Nelson 3482* (W--252567); *F. Ramirez s.n.* [3 Dec. 1951] (Me--76438). Durango: *Breedlove 43919* (Me--292073). Michoacán: *Arsene 5293* (W--1000879). Nayarit: *Croat 45193* (E--2914050). Sinaloa: *H. S. Gentry 7222* (W--1945217). Veracruz: *N. L. H. Krauss 286* (W--2189369). GUATEMALA: Amatitlan: *Morales Ruano 851* (W--1405272). Baja Verapaz: *Williams, Molina R., Williams, & Molina 43361* (Mi). Quiché: *Williams, Molina R., & Williams 41202* (Mi). NICARAGUA: Madriz: *Stevens & Montiel 17326* (Ld).

LIPPIA CHRYSANTHA Greenm.

Additional bibliography: Mold., Phytologia 48: 165 & 184. 1981.

Recent collectors describe this plant as an unarmed shrub, 3--6 feet tall, with erect or ascending branches, and dense axillary inflorescences. They have found it growing in stunted woody vegetation on limestone hillsides, at 3000 feet altitude, in flower in July. The corollas are said to have been "pale-yellow" on the collection of Smith & Corona cited below.

The *Paray 3014* distributed as *Lippia chrysantha*, actually is *L. pringlei* Briq.

Additional citations: MEXICO: Morelos: *Pringle 8679* (W--460035--isotype, W--1322897--isotype); *Smith & Corona Mex.10* (Me--99364).

LIPPIA CIPOËNSIS Mold.

Additional bibliography: Angely, S. Amer. Bot. Bibl. 2: 673. 1980; Mold., Phytologia 48: 165. 1981.

The collection cited below was gathered with the plant in full flower in May and the corollas are said to have been "rose" when fresh.

Additional citations: BRAZIL: Minas Gerais: *Gibbs, Abbott, & Andrade 5238* (N).

LIPPIA COARCTATA Troncoso, Darwiniana 19: 490--493. 1975.

Bibliography: Troncoso, Darwiniana 19: 490--493. 1975; Mold., Phytologia 54: 238. 1983.

The type collection of this taxon was originally distributed as *L. imbricata* Kuntze.

Citations: URUGUAY: *Gallinal, Aragone, Bergalli, Campal, & Rosengurtt PE.5171* (W--1858134--type).

LIPPIA CONTERMINA Briq.

Additional bibliography: Troncoso, Hickenia 1: 231. 1980; Mold., Phytologia 48: 165 (1981) and 51: 162. 1982.

Troncoso (1980) has examined the type of *Lantana ovata* Hayek and concludes that it is conspecific with *Lippia contermina*.

Lippia contermina is described by recent collectors 20 cm. tall, woody at the base, and they have encountered it in dry matorral, in flower in September. The corollas are described as having been "yellow" when fresh on the collection cited below.

Additional citations: PARAGUAY: *Casas & Molero FC.3856* (N).

LIPPIA CONTERMINA var. *HIRSUTA* Mold., Phytologia 51: 162. 1982.

Bibliography: Mold., Phytologia 51: 162. 1982.

Citations: PARAGUAY: *Casas & Molero FC.3660* (N--type).

LIPPIA CONTROVERSA Mold.

Additional bibliography: F. C. Seymour, Phytol. Mem. 1: 244. 1980; Mold., Phytologia 48: 165--166 (1981), 50: 242 & 243 (1982), and 52: 118. 1982.

Recent collectors describe this plant as a small shrub, 1--2.5 m. tall, and have found it growing in partial shade, on dry brushy hillsides, along roadsides, in mesophytic forests, on dry slopes with tropical deciduous forests, and in cafetal in seasonal evergreen forests along small streams, at 20--1100 m. altitude, in flower in April, July, November, and December, and in fruit in April, July, and November. Molina encountered it on "colinas pedrojosas sobre barro colorado". The vernacular name, "frijillo", is recorded for it.

The corollas are described as having been "white" on *Araquistain 251*, *Molina R. 15275*, and *Vincelli 763*, "yellow" on *Breedlove & Thorne 30919*, and *Molina R. 549* & *1456*, and "blue" on *D'Arcy 11288*.

Material of *Lippia controversa* has been misidentified and distributed in some herbaria as *Lippia cardiostegia* Benth., *L. lucens* Standl., *L. oxyphyllaria* (Donn. Sm.) Standl., *L. umbellata* Cav., and *Lantana hispida* H.B.K. On the other hand, the *Breedlove 41225* and *Williams, Molina R., & Williams 41202*, distributed as *Lippia controversa*, actually are *L. chiapasensis* Loes., while *Breedlove & Raven 8381* is *L. curtisiana* Mold.

Additional citations: MEXICO: Chiapas: *Breedlove 20375* (Me--226995); *Breedlove & Thorne 30919* (Me--226860); *Matuda 17260* (Me--85841), GUATEMALA: Santa Rosa: *Heyde & Lux 4387* (W--74220, W--1322894). Sololá: *Molina R. 15275* (Ws). HONDURAS: Morazán: *Molina R. 549* (W--2021538), *1134* (W--2922303), *1456* (W--2022325); *P. C. Standley 14183* (W--2021055). NICARAGUA: Granada: *Araquistain 251* (Ld). Managua: *Vincelli 763* (Ld). Masaya: *Maxon 7653* (W--1181365). COSTA RICA: Guanacaste: *Murger & Ramirez B. 4082* (Ws). PANAMA: Coclé: *D'Arcy 11288* (Ld).

LIPPIA CONTROVERSA var. *BREVIPEDUNCULATA* Mold.

Synonymy: *Lippia controversa* var. *pedunculata* Mold. ex F. C. Sey-

mour, Phytol. Mem. 1: 244. 1980.

Additional bibliography: F. C. Seymour, Phytol. Mem. 1: 244. 1980; Mold., Phytologia 48: 166 (1981) and 50: 242. 1982.

Recent collectors describe this plant as a shrub, 0.5--1.5 m. tall, abundant on grassy hills, at 1100 m. altitude, in anthesis in October. The corollas are said to have been "yellowish" on *Molina R. & Molina 22835.*

Material of this taxon has been misidentified and distributed in some herbaria as *L. lucens* Standl.

Additional citations: HONDURAS: Morazán: *Molina R. & Molina 22835* (Ws). NICARAGUA: Granada: *Atwood A.202* (Ln--266876).

LIPPIA CORYMBOSA Cham.

Additional bibliography: Pio Corrêa, Dicc. Pl. Uteis Bras. 2: 208. 1931; Mold., Phytologia 48: 166. 1981.

Pio Corrêa (1931) records the vernacular name, "cha de pedestre" for this plant. Recent collectors describe it as an herb, 40 cm. tall, the flower-buds "rose" color, and have found it growing in rocky soil of campo rupestre. at 1380 m. altitude, in flower in January.

Additional citations: BRAZIL: Goiás: *Nogueira, Silva, Cardoso Silva, Bianchetti, & Mauri 65* (N).

LIPPIA COSTARICENSIS Mold.

Additional bibliography: Mold., Phytologia 48: 166. 1981.

Recent collectors refer to this plant as a tree, 4--18 m. tall, the bracts scarious and white. They have found it growing in pastures on steep slopes, in thickets in ravines, cutover pastures, clearings, cloud forests, and cafetal margins in premontane rainforests and drier hilltops, at 1300--2333 m. altitude, in flower in July, August, and October, and in fruit in July and August. Wilbur and his associates refer to it as "common" in Costa Rica.

The corollas are said to have been "yellow" on *Knapp 1594* and *Skutch 3297*, "dull-yellow" on *Stevens 13659*, and "pale-yellow" on *Wilbur, Almeda, & Daniel 21956.*

Additional citations: COSTA RICA: Alajuela: *Skutch 3297* (W--1643385). Cartago: *Wilbur, Almeda, & Daniel 21956* (Mi). Heredia: *Lent 2633* (Ne--219311). San José: *Skutch 2292* (W--1642323--isotype); *W. D. Stevens 13659* (Ld); *Tonduz 1262* (W--1322948). PANAMA: Chiriquí: *Kirkbride 143* (N); *Knapp 1594* (Ld); *Stern & Chambers 88* (W--2301307).

LIPPIA CURTISIANA Mold.

Additional bibliography: Mold., Phytologia 48: 166 (1981) and 52: 115. 1982.

Recent collectors describe this plant as a shrub, 1--2 m. tall, and have encountered it in dense woodlands of *Quercus* and *Pinus*, at 300--1700 m. altitude, in flower in January and September. The corollas are said to have been "white" on all the Moreno collections cited below and "yellow" on the Breedlove & Raven collection.

Material of *Lippia curtisiana* has been misidentified and distributed in some herbaria as *L. controversa* Mold. On the other hand,

the *Gold s.n.* [Oct. 22, 1950], distributed as *L. curtisiana*, actually is *L. umbellata* Cav.

Additional citations: MEXICO: Chiapas: *Breedlove & Raven 8381* (Ld). Durango: *Edw. Palmer 479* (W--304248--isotype, W--398813--isotype). NICARAGUA: Estelí: *Moreno 1900* (Ld), *2204* (Ld), *2430* (Ld). Madriz: *Moreno 2809* (Ld).

LIPPIA DOMINGENSIS Mold.

Synonymy: *Phyla domingensis* Molh. ex Mold., Phytologia 52: 128 in syn. 1982.

Additional bibliography: Mold., Phytologia 48: 267 (1981) and 52: 128. 1982.

Recent collectors refer to this plant as a common aromatic shrub, 1 m. tall, at 1000--1320 m. altitude, in both flower and fruit in March.

Material of *Lippia domingensis* has been misidentified and distributed in some herbaria as *Lantana exarata* Urb. & Ekm. and *Lantana reticulata* Pers.

Additional citations: HISPANIOLA: Dominican Republic: *Howard & Howard 8110* (W--2110714--isotype); *J. J. Jiménez 3264* (W--2225610), *4458* (W--2519425); *Votava & Liogier 116* (N).

LIPPIA DUARTEI Mold.

Additional bibliography: Angely, S. Amer. Bot. Bibl. 2: 676. 1980; Mold., Phytologia 48: 167. 1981.

LIPPIA DUMETORUM Herzog

Additional bibliography: Mold., Phytologia 48: 167. 1981.

Gerold describes this plant as a shrub, 2 m. tall, and found it growing in disturbed forests, in both flower and fruit in March.

Additional citations: BOLIVIA: Santa Cruz: *Gerold 380* (Ld); *R. F. Steinbach 333* (Mi).

LIPPIA DURANGENSIS Mold.

Additional bibliography: Mold., Phytologia 48: 167 (1981) and 52: 115. 1982.

Recent collectors have encountered this plant at 1900--2100 m. altitude, in flower in October. Material has been misidentified and distributed in some herbaria as *L. myriocephala* Schlecht. & Cham. and *L. umbellata* Cav.

Additional citations: MEXICO: Chihuahua: *Gentry & Arguelles 18064m* (W--2301888). Durango: *Díaz 854* (Au, Ld); *Edw. Palmer 496* (W--571517); *Pennell 18189* (Me--isotype). Zacatecas: *H. S. Gentry 8516* (W--2022196).

LIPPIA ELEGANS Cham.

Additional bibliography: Mold., Phytologia 48: 167--168 (1981), 54: 236 (1983), and 55: 42--43. 1984.

Recent collectors describe this plant as a shrub or subshrub, 1--2.5 m. tall, and have found it growing in caatinga and in disturbed spots in mata ciliar, in flower in April. The corollas are said to have been "white" on *Carvalho & al. 1858*, *Heringer & al. 6509*, and

Kummrow & Stutts 1785.

Additional citations: BRAZIL: Bahia: *Carvalho, Lauenberger, & Silva 1858* (Ld). Distrito Federal: *Héringer, Filgueiras, Mendonça, & Pereira 6509* (N). Minas Gerais: *Menezes 810* (Ld). São Paulo: *Kummrow & Stutts 1785* (Ld).

LIPPIA ELEGANS var. *MACROPHYLLA* Mold., Phytologia 55: 42--43. 1984.

Bibliography: Mold., Phytologia 55: 42--43. 1984.

Citations: BRAZIL: Distrito Federal: *Pereira & Mendonça 408* (N--type).

LIPPIA ELLIPTICA Schau.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 168. 1981.

LIPPIA ELLIPTICA var. *SILVICOLA* Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 168. 1981.

Additional citations: BRAZIL: Bahia: *Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 16436* (W--2791561--isotype).

LIPPIA EUPATORIUM Schau.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 168 (1981) and 50: 262. 1982.

Héringer and his associates found this plant in "cerrado sobre morro cascalhento" and report the corolla-color as "yellow".

Additional citations: BRAZIL: Distrito Federal: *Héringer, Figueiras, Mendonça, Pereira, Salles, & Silva 4940* (E--2978867).

LIPPIA EUPATORIUM var. *ANGUSTIFOLIA* Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 168 (1981) and 50: 262. 1982.

LIPPIA FELIPPEI Mold.

Additional bibliography: Angely, S. Amer. Bot. Bibl. 2: 676. 1980; Mold., Phytologia 48: 168. 1981.

LIPPIA FERRUGINEA H.B.K.

Additional & emended bibliography: Bocq., Adansonia, ser. 1, 3: [Rev. Verbenac.] 244. 1863; Mold., Phytologia 48: 168. 1981.

Recent collectors describe this plant as an odorous subshrub and have found it in flower in September. The corollas are said to have been "white" on the Sagastegui A. & Cabanillas S. collection cited below. These collectors report the vernacular name, "tulluquero".

Additional citations: PERU: Piura: *Fosberg 27705* (W--2747151); *Sagastegui A. & Cabanillas S. 8601* (Ld).

LIPPIA FLAVIDA Urb.

Additional bibliography: Mold., Phytologia 48: 169. 1981.

Recent collectors refer to this plant as a shrub, 1 m. tall, and have encountered it in dry thickets, at 325--900 m. altitude, in both flower and fruit in January.

The *Ekman H.16082*, distributed as *Lippia flavida*, actually is *Lantana microcarpa* Urb.

Additional citations: HISPANIOLA: Haiti: *Ekman H.1817* (W--1411943); *Leonard 8901* (W--1300233).

LIPPIA FLORIDA Cham.

Additional bibliography: Mold., Phytologia 48: 169. 1981.

Williams & Assis refer to this plant as a shrub, with yellow corollas, and found it growing at 1300 m. altitude, in flower in June. Their collection was previously misidentified as *L. pseudothea* (A. St.-Hil.) Schau.

Additional citations: BRAZIL: Minas Gerais: *Williams & Assis 7160* (B).

LIPPIA FORMOSA T. S. Brandeg.

Additional bibliography: Mold., Phytologia 48: 169. 1981.

Additional citations: MEXICO: Baja California: *T. S. Brandegee s.n.* [Todos Santos, Jan. 19, 1890] (W--47022--isotype), *s.n.* [Pescadero, Nov. 1902] (W--397995); *Carter, Alexander, & Kellogg 2291* (W--2022908); *R. V. Moran 6979* (Me--55026); *Nelson & Goldman 7334* (W--565414); *Wiggins 14536* (Me).

LIPPIA FRAGRANS Turcz.

Additional synonymy: *Lippia fragans* Turcz. ex Botta, Darwiniana 22: 531 sphalm. 1980.

Additional bibliography: Botta, Darwiniana 22: 531. 1980; Mold., Phytologia 48: 169. 1981.

Botta (1980) raises the possibility that this species may belong in the genus *Acantholippia* Grisb.

LIPPIA GARDNERIANA Schau.

Additional bibliography: S. Moore, Trans. Linn. Soc. Lond., ser. 2, 4: 437. 1895; Angely, S. Amer. Bot. Bibl. 2: 666. 1980; Mold., Phytologia 48: 169. 1981.

LIPPIA GENTRYI Standl.

Additional bibliography: Mold., Phytologia 48: 170 (1981) and 50: 14. 1981.

Additional citations: MEXICO: Sonora: *H. S. Gentry 3039* (W--1689753--isotype).

LIPPIA GLANDULOSA Schau.

Additional bibliography: Mold., Phytologia 48: 170 (1981), 50: 247 (1982), and 54: 236. 1983.

Recent collectors describe this plant as a shrub, 0.8--2 m. tall, with pendent branches, and have encountered it on campo ruderal and at the edges of brejo, in flower in October, and both in flower and fruit in June. The corollas as described as having been "whitish" on *Hatschbach 44201* and "cream"-color on *Héringer 17797*.

Additional citations: BRAZIL: Bahia: *Hatschbach 44201* (Ld). Distrito Federal: *Héringer 15855* (N, N); *Héringer, Filgueiras, Mendonca, & Pereira 7426* (W--2941377). Goiás: *Héringer 17797* (N). Min-

as Gerais: *Irwin, Maxwell, & Wasshausen 19579* (W--2630579).

LIPPIA GRACILIS Schau.

Additional bibliography: Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. 13: [Verb. Util. Mat. Med.] 44. 1921; Mold., Phytologia 48: 170--171 (1981) and 54: 236. 1983.

Recent collectors describe this plant as a slender, spindly, brittle-stemmed shrub, 0.5--3 m. tall, the leaves "coriaceous", rugose, somewhat bicolored, agreeably resinous-fragrant, dull mid-green above, paler gray-green beneath, the bracts pale-green. They have found it growing on campos gerais (shrub- and herb-rich grassland with acaulous palms but few trees), at 500--1000 m. altitude, in flower in April, May, and December. The leaves are especially large on *Harley 16390* & *16778*.

The corollas are described as having been "white" on *Carvalho & al. 977*, *Harley 21103*, *Hatschbach 47811*, and *Rosa & Santos 1885*, but "yellow" on *Héringer & al. 532* and "limb cream, throat yellow, tube reddish-purple below" on *Harley 21818*.

Material of *Lippia gracilis* has been misidentified and distributed in some herbaria as *Hyptis suaveolens* Poit.

Additional citations: BRAZIL: Bahia: *Carvalho, Lewis, & Hage 977* (Ld); *Harley, Bromley, Carvalho, Hage, & Brito in Harley 21103* (W--2965517), *21818* (W--2965514); *Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15158* (W--2791582), *16269* (W--2791578), *16390* (W--2791579), *16444* (W--2791590), *16778* (W--2791588); *Mori & Benton 13178* (Ld, N). Distrito Federal: *Héringer, Paula, Mendonça, & Salles 532* (E--2978868). Minas Gerais: *Hatschbach 47811* (Ld). Pará: *Collector undetermined s.n.* (N); *Rosa & Santos 1885* (N). Piauí: *Netto 67* (W--1199619).

LIPPIA GRANDIFOLIA Hochst.

Additional synonymy: *Lippia grandiflora* A. Rich. ex Mold., Phytologia 50: 262 in syn. 1982 [not *L. grandiflora* Mart. & Schau., 1847, nor Mart., 1851]. *Lippia grandifolia* A. Rich. ex Mold., Phytologia 50: 262 in syn. 1982.

Additional bibliography: Mold., Phytologia 48: 171 (1981) and 50: 250 & 262. 1982.

Recent collectors describe this plant as 2.5 m. tall and have found it growing at the edges of gallery forests and on degraded *Combretum* savannas, in open bushland, and on high shrubby grassland, at 1700--2200 m. altitude, in both flower and fruit in May and November. Sometimes they refer to it as a shrub, 0.8--2 m. tall, the stems red, and the foliage somewhat aromatic. The corollas are said to have been "white" on *Magogo 1592*, "whitish" on *Reekmans 8982*, and "creamish with yellow inside" on *Kahurananga & al. 2608*. Magogo reports it "common" in Kenya.

Additional citations: BURUNDI: *Reekmans 5249* in part (Me--222093), *8982* (W--2895635). TANGANYIKA: *Kahurananga, Kibuwa, & Mungai 2608* (Mu). KENYA: *Magogo 1502* (Mu).

LIPPIA GRANDIFOLIA var. *LONGIPEDUNCULATA* Mold.

Additional bibliography: Mold., Phytologia 48: 171. 1981.

Reekmans refers to this plant as 2.5 m. tall and encountered it at the edge of a gallery forest, at 1800 m. altitude; his collection is a mixture with the typical form of the species.

Additional citations: BURUNDI: *Reekmans 5249* in part (Me--222093).

LIPPIA GRATA Schau.

Additional bibliography: Mold., Phytologia 48: 171. 1981.

Hatschbach describes this plant as a shrub, 2 m. tall, with "whitish" corollas, and encountered it in chapada, at 700 m. altitude, in anthesis in May.

Additional citations: Brazil: Bahia: *Hatschbach 46377* (Ld).

LIPPIA GRAVEOLENS H.B.K.

Additional synonymy: *Lantana berlandieri* Schau., in herb.

Additional & emended bibliography: Bocq., Adansonia, ser. 1, 3: [Rév. Verbenac.] 244. 1863; A. Gray, Synop. Fl. N. Am., ed. 1, 2: 338 (1878) and ed. 2, 2: 138. 1886; Baill., Hist. Pl. 11: 94. 1891; Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. 13: [Verb. Util. Mat. Méd.] [31] & 37--38, pl. 3, fig. 7--11. 1921; Puig, Trav. Sect. Scient. Techn. Inst. Franc. Pond. Hors 16: 77 & 132. 1979; J. T. & R. Kartesz, Syn. Checklist Vasc. Fl. 2: 467. 1980; F. C. Seymour, Phytol. Mem. 1: 244. 1980; Mold., Phytologia 48: 157 & 171--172 (1981), 49: 431 (1981), and 50: 13--14. 1981; L. O. Williams, Ceiba 24: 332. 1981; Mold., Phytologia 50: 239, 241, 243, 262, & 269 (1982) and 52: 114--117. 1982; Knobloch, Phytol. Mem. 6: 13, 14, 73, 82, 87, & 99. 1983; Mold., Phytologia 54: 230 (1983) and 56: 361 & 363. 1984; Martin & Hutchins, Spring Wildfls. N. Mex. 188 & 189. 1984.

Additional illustrations: Hubert, Trav. Lab. Mat. Med. Fac. Pharm. 13: [Verb. Util Mat. Med.] [31], pl. 3, fig. 7--11. 1921; Martin & Hutchins, Spring Wildfls. N. Mex. 189. 1984.

Recent collectors describe this plant as a shrub, 1--2 m. tall, often browsed by goats, with aromatic leaves that are light-green above and gray-green beneath and fragrant flowers. They have found it growing in stony places, rock-jumbled canyons, and disturbed areas, on steep rocky granite slopes above beaches, limestone hills, and on heavily eroded hills of loose limey soil covered with *Acacia-Prosopis* grassland, on volcanic rock outcrops, rocky limestone slopes in high desert scrub, in low deciduous forests with *Bursera* and with *Croton* spp., *Colubrina heteroneura*, *Jatropha*, *Bursera*, and *Plumeria*, in scrub on gray metamorphic rock with *Brahea*, *Ipomoea*, and *Bursera*, and on steep slopes with *Quercus*, *Juniperus*, *Bursera*, *Ipomoea*, *Heliocarpus*, as well as among lower sierran vegetation, in mixed woods on wet rocky slopes, and in rocky soil of barrancas. They have encountered it in low, deciduous, spiny woods, in mezquital, in brushland, in matorral alto subinerme, in sandy-loam of valley floors with *Prosopis*, *Acacia*, and large *Platyopuntia*, as well as in low deciduous forests with *Acacia coulteri*, *Ceiba*, and much *Bursera*. It is said to be frequent in canyons, common in rocky valleys, and locally common in shallow gravelly loam on sandstone bluffs.

Collectors report the species scattered in steep-walled, brushy, limestone canyon woods with *Acacia berlandieri*, *A. greggii*, *Helietta*,

Gochnatia, *Vauquelinia*, *Zanthoxylum fagara*, *Colubrina greggii*, *Ptelea*, *Calliandra*, *Fraxinus greggii*, *Bernardia*, and *Agave*, common on limestone slopes with *Larrea*, *Acacia*, *Jatropha*, *Croton*, *Agave lecheguilla*, and *Grusonia*, common in semi-evergreen thorn scrub of *Acacia*, *Agave*, *Bursera*, and *Sabal*, infrequent in limestone canyons with Tamaulipan-like scrub growth of *Quercus*, *Rhus*, *Prunus*, *Cercocarpus*, and *Ceanothus*. and in association with *Karwinskia*, *Poinciana pulcherrima*, *Cosmos*, *Waltheria*, and *Mimosa*.

Butterwick & Strong refer to the species (in Texas) as an infrequent shrub at the margins of cleared areas in gravelly-sandy soil with *Cercidium texanum*, *Aloysia gratissima*, and *Acacia rigidula*. Millspaugh (1896) reports it cultivated at Izamal as a shrub to "30 feet" tall, citing his *nos. 41 & 832*. Williams (1981) refers to it as "Native from Texas and Mexico south to Nicaragua. The leaves are often used to flavor food or medicines. The leaves of this and perhaps other species are sometimes found in markets, most often as home remedies." Martin & Hutchins (1984) tell us that in New Mexico it occurs on dry rocky hills, in canyons and arroyos, and on mesas in the southern portion of the state, from 3000 to 5500 feet altitude.

Recent collectors have encountered *Lippia graveolens* at 65--1800 m. altitude, in anthesis from July to December, in fruit in November. Vernacular names reported include "orégano", "orégano de la tierra", "oregano del monte", "redbush lippia", "salvia", "tarbay", and "yerba buena cerril".

The corollas are said to have been "white" on *Argüelles 899*, *D'Arcy 11766*, *Dwyer 14298*, *Gentry 14286*, *Henrickson & Lee 17441*, *Johnston 2766*, *Lott & al. 1523*, *McKee 11001*, *Medrano 1019*, *Messer 193*, *Smith & Kitchen 4838*, and *Webster & Brecken 16201*, "whitish" on *D'Arcy 11998*, "cream" on *Wendt & Riskind 1700*, "yellowish-white" on *Webster & al. 11443*, and "pale-yellow" on *Hernández M. 3952*.

In Mexico the leaves of this plant are used to relieve coughs and as a condiment in cooking; the plant is also cultivated as an ornamental. The Tucker and Foster collections, cited below, represent material sold in public markets in jars labeled "oregano" distributed by Goya Foods of Brooklyn, New York, originally from Toluca, Mexico; *Palmer 2771* was purchased in a public market at Culiacán. *Crockett 283* is a mixture with *Aloysia gratissima* (Gill. & Hook.) Troncoso.

It should be noted that the leaves on *Salazar s.n.* and *Tharp & York 51-252* are especially large and approach those seen regularly on f. *macrophylla* Mold., while those on *Berlandier 832* and *Gonzalez-Medrano 108 & 9041* are exceptionally small, approaching those seen regularly on f. *microphylla* Mold.

Material of *Lippia graveolens* has been misidentified and distributed in some herbaria as *Lippia alba* (Mill.) N. E. Br., *L. geminata* H.B.K., *L. nutans* Rob. & Greenm., *L. palmeri* S. Wats., *Lantana canescens* H.B.K., and *Lantana involucrata* L. On the other hand, the *Bruff 1408*, distributed as *Lippia graveolens*, actually is *L. alba* (Mill.) N. E. Br., while *Breedlove 28468*, *Gaumer 832*, *Hernandez M. & Cedillo T. 701*, *Hinton 2655 & 13162*, *Levy 250*, *Rowell*, *Webster*, & *Barkley 17M490*, *Stanford*, *Retherford*, & *Northcraft 96*, *Tharp & York*

51-252, and *Vela G. s.n.* are all *L. graveolens* f. *macrophylla* Mold., *Aguirre & Reko 37*, *Berlandier 832*, *Brenes s.n.* [vic. Liberia, 1910] *Cochrane & Cochrane 8506*, *Frye & Frye 2353* in part, *Gentry 6833*, *Heard & Barkley 14547*, *Fernandez & Barkley 14496a*, *Smith, Peterson, & Tejeda 3977*, and *Stanford, Lauber, & Taylor 2226* are *L. graveolens* f. *microphylla* Mold., *Bourgeau 1471 & 2983* are *L. myriocephala* var. *hypoleia* (Briq.) Mold., *Barber 28* is *Lantana camara* f. *parvifolia* Mold., *Medrano & al. 10069* and *Seler & Seler 3916* are *Lantana microcephala* A. Rich., *Sánchez Mejorada 2789* is *Lantana velutina* Mart. & Gal., *Medrano 8355* is *Lantana velutina* f. *flava* Mold., and *Arglelles 106* is *Lantana velutina* f. *violacea* Mold.

Additional citations: TEXAS: Brewster Co.: *Hanson 614* (W--982945), *709* (W--983022); *Warnock 831* (W--1725947). El Paso Co.: *C. Wright 459* (W--81916). Hidalgo Co.: *Correll & Johnston 18041* (Mi); *Lundell & Lundell 9906* (W--1887607); *R. Runyon 1721* (W--1699948). Houston Co.: *Tracy 9158* (W--513854). Maverick Co.: *Pringle 9034* (W--382080). Presidio Co.: *Havard s.n.* [Chinati Mts.] (W--155947). Starr Co.: *Butterwick & Strong 1187* (Au), *1343* (Au); *D. S. Correll 14895* (W--2178857); *Crockett 283* in part (It); *M. C. Johnston 2766* (Me--58974); *R. Runyon 154* (W--1469666); *Tharp 5905* (W--1468811). Val Verde Co.: *G. L. Fisher 280* (W--1119182); *Havard s.n.* [mouth of Pecos R.] (W--155948); *Rose & Fitch 17978* (W--761026). Zapata Co.: *Tharp 3697* (W--1289914). NEW MEXICO: Dona Ana Co.: *Parry, Bigelow, Wright, & Schott 819* (W--81917); *C. Wright 1507* (W--81915). MEXICO: Chiapas: *Breedlove 27656* (Me--225329); *Langman 3796* (W--1976804); *Miranda 5062* (Me--71814). Chihuahua: *LeSueur s.n.* [Mesqui, 8/6/26] (W--2086676). Coahuila: *Capó s.n.* [24-XI-78] (Me--267693); *Henrickson 11840b* (Au); *Henrickson & Lee 17441* (Au); *Hinton 16571* (W--1891480); *I. M. Johnston 7038* (W--1822957); *Lehto, Pinkava, Parfitt, & Reeves L. 21705* (Me--269678); *M. Martínez s.n.* [1925] (W--1268939); *E. W. Nelson 6201* (W--347427); *Edw. Palmer 736* (W--570256), *1024* (W--82073), *1025* (W--1322924), *1026* (W--82070); *Pringle 215* (W--1322917); *Wendt & Riskind 1700* (Au, Me--294106). Durango: *Gentry & Arglelles 18147* (W--2301914); *E. W. Nelson 4694* (W--332749); *Edw. Palmer 539* (W--336467); *Ward 5768* (Mi). Guerrero: *Breedlove 35990* (Me--300722); *Gómez & Vázquez 5* (Me--296070); *Koch & Fryxell 8250* (Ae); *Edw. Palmer 167* (W--259583); *Paray 2148* (Mi); *Pringle 9167* (W--382145); *Webster & Breckon 16201* (Me--241587). Hidalgo: *Gilly & Camp 20* (Me--64803); *Hernández M. 3640* (Me--276485), *3952* (Me--290145); *Medrano, Ortiz, Solis, & Hiriart 9604* (Me--292558); *Salazar s.n.* [Tecozantla, July 24, 1913] (W--1013231). Jalisco: *Lott, Butterwick, & Bullock 1523* (Ld); *Magallanes 479* (Me--249672); *Rose 3031a* (W--866780). México: *Matuda & al. 31723* (Me--64807, Me--109578), *31934* (Me--64806, Me--109594). Michoacán: *Soto Nuñez 301* (Au); *Soto Nuñez & Roman de Soto 965* (Me--283419). Morelos: *Paray 3015* (Me--99876); *Pringle 11083* (W--460467). Nuevo León: *D'Arcy 11766* (E--2904986); *Pringle 1934* (W--82069); *Seler & Seler 1092* (W--1205451); *Villarreal & Valdes Reyna VO.519* (Me--262716). Oaxaca: *Breedlove 35907* (Me--293034); *Cisneros 2571* (Ws); *D'Arcy 11998* (E--2889917); *Dziekanowski, Dunn, & Pennell 3098* (Me--263556); *McKee 11001* (Me--253370); *Messer 193* (Me--149340); *E. W. Nelson 1210* (W--565891); *Pringle 6258* (Au, W--254860); *Smith & Kitchen 4838* (Me--142172); *Sousa, German, & Rico*

8074 (Me--209735); *Wallace, Dunn, & LeDoux 463* (Me--216596). Puebla: *Dwyer 14298* (N); *Hernández M. & Cedillo T. 701* (Me--140883); *Huitrón 14* (Me--210902); *Miranda 1986* (Me--73557), *2949* (Me--66233); *E. W. Nelson 2026* (W--566190); *Sanchez G. s.n.* [22.VIII.1965] (Me--97181); *Webster, Miller, & Miller 11443* (Me--114031). Querétaro: *Argüelles 899* (Me--258045); *Paray 2148* (Me--95432). Sinaloa: *H. S. Gentry 14286* (W--2296660), *14426* (W--2296763); *Gonzalez Ortega 6602* (Me--98669, W--1317454). Tamaulipas: *Crutchfield & Johnston 4986* (Me); *Fryxell 3728* (Ld); *Gonzáles-Medrano 108* (Me--127716), *9041* (Me--296149); *González-Medrano, Castellanos, & Zavaleta 9689* (Me--211968), *9729* (Me--211983); *González-Medrano, Lopez, & Dirzo 4526* (Ld); *Medrano 1019* (Me--127520, Me--172854); *Edw. Palmer 520* (W--572749); *Viereck 823* (W--1687418). Veracruz: *Purpus 1915* (W--840079). Yucatán: *G. F. Gaumer 832* (W--268610); *Souza Novelo 264* (W--2087135). Zacatecas: *Rose 2412* (W--301322); *Taylor & Taylor 6086* (W--2914986). State undetermined: *Berlandier 2252* [Macbride photos 33929] (Ld--photo, W--2216238). BELIZE: *Record s.n.* [Vaca Falls Distr. 1926] (W--1266413). NICARAGUA: Province undetermined: *Chaves 297* (W--1406224). CULTIVATED: Costa Rica: *P. C. Standley 37383* (W--1227924). Delaware: *Tucker s.n.* [October 13, 1980] (Ba--386802). El Salvador: *Calderón 1177* (W--1152149). Mexico: *Edw. Palmer 2771* (W--867329); *Soto Nuñez 965* (Me--280108). New Jersey: *Tucker 1* (Ba). Wisconsin: *G. F. Foster s.n.* [Sept. 11, 1983] (Ba--389677). MOUNTED CLIPPINGS: Mart. & Gal., Bull. Acad. Roy. Brux. 11 (2): 327. 1844 (W).

LIPPIA GRAVEOLENS f. *LOESENERIANA* Mold., Phytologia 52: 130--131. 1982.

Bibliography: Mold., Phytologia 52: 115 & 130--131. 1982.

Collectors have encountered this plant at 5000 feet altitude, in both flower and fruit in August. Material has been misidentified and distributed in some herbaria as *L. berlandieri* Schau.

Citations: MEXICO: Chiapas: *Seler & Seler 3043* (E--photo of type, Ld--clastotype, W--1205596--type). San Luis Potosí: *G. L. Fisher 3718* (W--1725427).

LIPPIA GRAVEOLENS f. *MACROPHYLLA* Mold., Phytologia 49: 431. 1981.

Bibliography: Mold., Phytologia 49: 431 (1981), 50: 239, 241, & 269 (1982), 52: 115 (1982), and 56: 361. 1984.

Collectors refer to this plant as a shrub, 0.8--3 m. tall. quite fragrant when bruised. They have found it growing abundantly in low spiny vegetation, on slopes with *Pinus*, *Quercus*, and *Acacia*, along riversides, in brushland along railroad cuts, and in granitic soil on cliffs of sandstone and soft granite, at 1000--1340 m. altitude, in flower in April, June to August, October, and November, and in fruit in November. The vernacular name, "orégano", is reported for it.

The corollas are said to have been "white" on *Breedlove 28468* and *Dwyer 14301* and "yellow" on *Stanford & al. 96*.

Material of this form has been distributed widely in herbaria as typical *L. graveolens* H.B.K., *L. berlandieri* Schau., *L. geminata* H.B.K., or *Lantana velutina* Mart. & Gal.

Citations: TEXAS: Hidalgo Co.:*Tharp & York 51-252* (Au--121180,

Bl--87441, Me--123524, St). MEXICO: Chiapas: *Breedlove 28468* (Me--228568). Coahuila: *Stanford, Retherford, & Northcraft 96* (Ca--713862, Du--291288, G, N, Se--70494, Tu--120241). México: *Hinton 2655* (A, N, N, N). Michoacán: *Hinton 13162* (G--isotype, Ld--type, Mi--isotype, N--isotype, N--isotype, S--isotype). Oaxaca: *Rowell, Webster, & Barkley 17M490* (Au--170142, Me--175734, Mi, N). Puebla: *Dwyer 14301* (Ld); *Hernández M. & Cedillo T. 701* (Me--140882, Me--157971, Mi). Querétaro: *Vela G. s.n.* (Me--183508). Yucatán: *Gaumer 832* (Br, Ca--446227, Du--207671, F--36635, G, Gg--160699, Mi, N, Ws). NICARAGUA: Granada: *Levy 250* (Bo, Cb, Cp, Cp, Ld--photo, N--photo).

LIPPIA GRAVEOLENS f. *MICROPHYLLA* Mold., Phytologia 50: 13--14. 1981.

Bibliography: Mold., Phytologia 50: 13--14 (1981), 50: 243 & 269 (1982), 52: 116 & 117 (1982), and 54: 230. 1983.

Recent collectors refer to this plant as a very aromatic small shrub or subshrub, 0.8--2 m. tall, twiggy, straggly, and brittle, several-stemmed at the base, soon branching, with fragrant mint-like flowers. They have encountered it in dry country, with *Yucca*, and in arid scrub, in dry creek beds, on *Larrea* slopes, along small runoff channels on lower bajada slopes, in desert shrub grassland and dry rocky terrain, on rocky hills, in dense shrub grassland on limestone slopes, on extremely dry hillsides and limey-clay hilltops, on slopes with oaks, grasses, and *Dodonaea*, in primary thorn-scrub-cactus cover with evidence of former oak forest at higher elevations and with frequently calcareous rock outcrops, on low arid rocky hills with grazed desert to open crassicaulis matorral dominated by *Cephalocereus hoppenstedtii* and spiny mimosoid legumes with *Yucca perniculosa*, *Beaucarnea gracilis*, *Achtinocheita filicina*, *Juliana adstringens*, *Jatropha neopauciflora*, *Malpighia galeottiana*, and *Echinopteris lappula*, on very rocky spiny-shrub-covered limestone talus slopes with *Fouquieria*, *Agave lecheguilla*, *A. asperrima*, *Viguiera stenoloba*, *Acacia crassifolia*, *A. berlandieri*, *Mimosa* spp., etc., among *Agave lecheguilla*, *Euphorbia antisyphilitica*, *Acacia crassifolia*, and *Tiquilia greggii*, in litosol, and growing in association with *Juniperus*, *Croton*, *Acalypha*, *Karwinskia*, *Solanum*, *Savvia*, and *Bursera*, at 700--3100 m. altitude, in flower in April and from June to November, in fruit from June to November. Webster and his associates refer to it as fairly common in Puebla, Marín reports it very abundant in Coahuila, and Molina found it frequent in Honduras.

The plant is used medicinally in Mexico and the vernacular name, "oregano", is applied to it. The corollas are described as having been "white" on *Frye & Frye 2353*, *Gentry & al. 20221*, *Molina R. 13202*, *Smith & al. 3977*, and *Webster & al. 17211*, "cream-white" on *Stanford & al. 2226*, "white with a small yellow eye" on *Cochrane & Cochrane 8506*, and "white and gold" on *Messer 142*.

The Cochrane collection serves as voucher for cytological material taken from the plant. The Pittier collection, cited below, from Costa Rica, bears striking resemblance to the northern South American *Lippia schomburgkiana* Schau.

Material of *Lippia graveolens* f. *microphylla* has been identified and distributed in some herbaria as typical *L. graveolens* H.B.K., *L. berlandieri* Schau., *L. schomburgkiana* Schau., and *Cordia* sp. On the

other hand, the *Ferris 5927* distributed as *Lippia berlandieri*, actually represents *L. alba* (Mill.) N. E. Br.

Citations: MEXICO: Baja California: *Nelson & Goldman 7220* (W--565306). Chihuahua: *Gentry & Engard 23085* (Me--158845, Mi). Coahuila: *Aguirre & Reko 37* (N); *M. E. Jones 361* (W--238003); *Marín s.n.* [17.I.1961] (Me--105722); *Edw. Palmer 362* (W--336358); *Rodriguez G. 662* (Au); *Shreve 8420* (W--1790624), *8731* (W--1790694); *Wynd & Mueller 87* (W--1639567). Durango: *H. S. Gentry 6833* (Ak--22803, G, Mi, N); *Hendrickson 2* (Me--246104); *Iltis & Lasseigne 124* (Ld); *Pittier 489* (W--570883). Hidalgo: *González-Medrano & al. 8355* (Me--199051); *Matuda 29564* (Me--64804, Me--108906); *Salazar s.n.* [July 24, 1913] (Ld, W--1013194, W--1013237). Jalisco: *Rzedowski 17557* (Me--91943). Nuevo León: *Fernandez & Barkley 14496* (Au, N, W--2134258); *G. L. Fisher 332* (W--1207934); *Frye & Frye 2353* in part (It, N, Pl--111102, Se--65594); *Heard & Barkley 14547* (Au, N); *Orcutt 1285* (W--1207818). Oaxaca: *Clarke, Gittens, Haid, & Lathrop s.n.* [26 August 1967] (Au); *Conzatti 4960* (W--1696337); *Messer 142* (Me--149341); *E. W. Nelson 1977* (W--566175); *Seler & Seler 1391* (W--1205469). Puebla: *Cochrane & Cochrane 8506* (Au, Ld); *Gentry, Barclay, & Argüelles 20221* (W--2451102); *Liebmann 11255* (W--1315067); *Miranda 1399* (Me--73560); *Rose & Hay 5930* (W--395720); *Rose, Painter, & Rose 10174* (W--453675); *Smith, Peterson, & Tejeda 3977* (G--isotype, Me--118985--type, N--isotype, W--2397994--isotype); *Webster, Lynch, & Breckon 17211* (Me--252999). Querétaro: *Altamirano 1595* (W--570665). San Luis Potosí: *Edw. Palmer 711½* (W--82071, W--82072). Sinaloa: *Brandegee s.n.* [Nov. 1, 1904] (W--873685). Tamaulipas: *Gonzalez-Medrano, Castellanos, & Zavaleta 9792* (Me--205033); *González-Medrano, Lopez, & Dirzo 4526* (Me--192142) *González-Medrano, Guevara, & Zavaleta 8527* (Me--199056); *González-Medrano, Zavaleta, & Guevara 8499* (Me--230308); *Perkins & Hall 3322* (It); *Stanford, Lauber, & Taylor 2226* (Du--366137, N, Se--149146); *Viereck 322* (W--1687181), *505* (W--1687262), *787* (W--16871406). Zacatecas: *Lloyd 97* (W--574063). State undetermined: *Berlandier 832* (G, T, W--771827). HONDURAS: El Paraíso: *Molina R. 13202* (Mi). COSTA RICA: Guanacaste: *Brenes s.n.* [vic. of Liberia, 1910] (N, Si). San José: *Pittier 1681* (W--1322886).

LIPPIA GRISEA Mold.

Additional bibliography: Mold., Phytologia 48: 172 (1981) and 55: 43. 1984.

LIPPIA GRISEA var. *LATIFOLIA* Mold., Phytologia 55: 43. 1984.

Bibliography: Mold., Phytologia 55: 43. 1984.

Citations: BRAZIL: Distrito Federal: *Héringer, Filgueiras, Mendonca, & Pereira 7050* (N--type), *7051* (N).

LIPPIA GRISEBACHIANA Mold.

Additional bibliography: Mold., Phytologia 48: 172. 1981; Retamar, Delfini, Juliani, Guissani, & Piagentini, Essenz. Deriv. Agrum. 51: 91--97. 1983.

Retamar and his associates (1983) found the leaves of this plant to yield 1.7% essential oil on steam distillation with the following constituents: α- and β-pinenes, myrcene, limonene, camphene,

1,8-cineole, p-cymene, methyl heptenone, citronellal, piperitone, linalol, linalyl acetate, isobornyl acetate, caryophyllene, pulegone, dihydrocarbons, α-terpineol, isoborneol, geranyl acetate, geraniol, sesquiterpenoids, eugenol, and several unidentified components.

Additional citations: ARGENTINA: La Rioja: *Venturi 7808* (W--1591391). Tucumán: *Rodriguez 346* (W--1802577). MOUNTED ILLUSTRATIONS: Sanzin, Anal. Soc. Cienc. Argent. 88: 103, fig. 5. 1919 (Ld).

LIPPIA HARLEYI Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 173. 1981.

Mori & Boom describe this plant as a shrub, 1.5 m. tall, with purple corollas, and found it growing in wet sandy depressions in pine woods, in flower in May.

Additional citations: BRAZIL: Bahia: *Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 16788* (W--2791562--isotype); *Mori & Boom 14143* (N).

LIPPIA HATSCHBACHII Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 173. 1981.

LIPPIA HEDERAEFOLIA Mart. & Schau.

Additional & emended bibliography: C. Muell. in Walp., Ann. Bot. Syst, 5: 707. 1860; Bocq., Adansonia, ser. 1, 3: [Rév. Verbenac.] 244. 1863; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a); 152. 1895; Mold., Phytologia 48:173. 1981.

LIPPIA HIERACIFOLIA Cham.

Additional bibliography: Mold., Phytologia 48: 173. 1981.

Pedersen encountered this plant on roadcuts, in both flower and fruit in November, describing the corolla color as "yellow".

Additional citations: BRAZIL: Rio Grande do Sul: *Pedersen 12566* (N).

LIPPIA HIRSUTA L. f.

Additional & emended bibliography: Walp., Repert. Bot. Syst. 6: 689. 1847; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 152. 1895; Savage, Cat. Linn. Herb. Lond. 109. 1945; Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 173--174. 1981.

Additional citations: COLOMBIA: Antioquia: *Escallon 4* [Herb. Linnaeus G.801, S. 3] (It--photo of type). MOUNTED CLIPPINGS: Benth., Fl. Hartw. 245. 1846 (W).

LIPPIA HIRSUTA var. *MORITZII* (Turcz.) López-Palacios

Additional bibliography: C. Muell. in Walp., Ann. Bot. Syst. 5: 708. 1860; Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 173--174. 1981.

Recent collectors describe this plant as a shrub or tree, 5--8 m. tall, the trunk 5 cm. in diameter at breast height, and have found it growing at 2000--2300 m. altitude, in flower in February, June, and July. The corollas are said to have been "white" on *Aymard &*

Salcedo 20, Berti, Valverde, & Mendez 982-085, and *López Figueiras & Rodriguez 9081* and "cream-white" on *Bertin & Pena 11-7-78*.

Material of this variety has been misidentified and distributed in some herbaria as *Labiatae*.

Additional citations: COLOMBIA: Norte de Santander: *Schlim 97* (W--1628277). VENEZUELA: Mérida: *Aymard & Salcedo 20* (Ld); *Berti & Peña 11-7-78* (W--2977405); *Berti, Valverde, & Mendez 982-085* (W--2977416); *Breteler 3398* (W--2465643); *Lopez Figueiras & Rodriguez 9081* (W--2932346). Trujillo: *Breteler 4134* (W--2465989). MOUNTED CLIPPINGS & ILLUSTRATIONS: Briq., Ann. Conserv. Bot. Genev. 4: 237. 1900 (W); Lopez-Palacios, Fl. Venez. Verb. [429], fig. 100. 1977 (Ld); Lopez-Palacios, Revist. Fac. Farm. Univ. Andes 15: 58, [fig. 12]. 1975 (Ld).

LIPPIA HIRTA (Cham.) Meisn.

Additional synonymy: "*H. hirta* Meisn." ex D. Dietr., Syn. Pl. 3: 599 sphalm. 1843.

Addidional bibliography: C. Muell. in Walp., Ann. Bot. Syst. 5: 707. 1860; Mold., Phytologia 48: 174 (1981) and 50: 261. 1982.

Additional citations: BRAZIL: Paraná: *Hatschbach 31739* (Ba); *Smith & Klein 14922* (W--2573698). Santa Catarina: *Smith & Klein 10672* (W--2251702).

LIPPIA HISPIDA Good

Additional bibliography: Mold., Phytologia 48: 174 & 176. 1981.

Additional citations: ANGOLA: *Gossweiler 2362* [Mo. Bot. Gard. type photo A.833] (Ba--photo of type. E--1983905--photo of type, Ld--photo of type, W--photo of type).

LIPPIA HOEHNEI Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 174. 1981.

LIPPIA HOEHNEI var. *GOYAZENSIS* Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 174. 1981.

LIPPIA INOPINATA Mold.

Synonymy: *Lippia opiniata* Knobloch, Phytol. Mem. 6: 63 sphalm. 1983.

Additional bibliography: Mold., Phytologia 48: 175. 1981; Knobloch, Phytol. Mem. 6: 63 & 91. 1983.

Recent collectors describe this plant as a rare slender shrub, 2.5 m. tall, with a dense inflorescence, the corollas "yellowish-white", and have encountered it at 125--1700 m. altitude in dry lowland forests. Material has been misidentified and distributed in some herbaria as *Lippia bracteosa* (Mart. & Gal.) Mold.

Additional citations: MEXICO: Jalisco: *Gentry & Gentry 23542* (Me--181679); *Rzedowski 17649* (Me--95614).

LIPPIA INSIGNIS Mold.

Additional bibliography: Mold., Phytologia 48: 175. 1981; Silva & Mori, Cent. Pesq. Cacau Bol. Técn. 89: 9 & 65. 1981.

Recent collectors describe this plant as a spindly shrub, 1--3.5 m. tall, the stems erect, brittle, little-branched, the leaves coriaceous, glossy and rugose mid-green above, gray beneath, or glossy dark-green above and gray-green beneath, the "bracteoles" rather bright-green, tinged purple at the tips, or pale-green and tinged reddish, and have found it in flower in May and June, growing in campo rupestre, open scrubby campos gerais vegetation, or open scrub on exposed sites to scattered low woodland and marsh, among sandstone rock with open sand in the flatter areas, at 980--1000 m. altitude.

The corollas are described as having been "lavender" on *Mori & Boom 14463*, "deep-pink with a yellow-orange throat surrounded by a whitish area" on *Harley 22754*, and "very showy, pink, white at center, with yellow throat" on *Harley 22958*.

Material of *Lippia insignis* has been misidentified and distributed in some herbaria as *L. bradei* Mold.

Additional & emended citations: BRAZIL: Bahia: *Harley, Bromley, Carvalho, Nunes, Hage, & Santos in Harley 22754* (W--2965511), *22958* (W--2965518); *Hatschbach & Guimarães 42383* (Ld); *Mori & Boom 14463* (Ld, N).

LIPPIA INTEGRIFOLIA (Griseb.) Hieron.

Additional bibliography: Mold., Phytologia 48: 175. 1981; Retamar, Delfini, & Iturraspe, Essenz. Deriv. Agrum. 51: 40--43. 1981; Mold., Phytologia 52: 19. 1982; Reis & Lipp, New Pl. Sources Drugs 252. 1982.

Reis & Lipp (1982) refer to this plant as medicinal, citing *Schreiter 1202*. Retamar and his associates (1981) asserts that this plant "differs markedly" from *L. turbinata* Griseb. in chemical composition, the essential oil containing -pinene, limonene, 1,8-cineol, camphor, and sesquiterpenoids in a 1% yield.

Additional citations: ARGENTINA: Salta: *Venturi 6972* (W--1591513), *8072* (W--1443351).

LIPPIA INTEGRIFOLIA var. *BECKII* Mold., Phytologia 52: 19. 1982.

Bibliography: Mold., Phytologia 52: 19. 1982.

Citations: BOLIVIA: Cochabamba: *S. G. Beck 7433* (Ld--type).

LIPPIA INTERMEDIA Cham.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 175. 1981.

The Dusén collection cited below was previously incorrectly identified and cited as *L. pumila* Cham.

Additional & emended citations: BRAZIL: Paraná: *Dusen 16736* (F--photo, Ld--photo, N--photo, S, Si--photo).

LIPPIA INTERMEDIA var. *PARVIFOLIA* Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 175. 1981.

Additional citations: BRAZIL: Paraná: *Hatschbach 32582* (W--2849693--isotype).

LIPPIA JALISCANA Mold.

Additional bibliography: Mold., Phytologia 48: 176 (1981) and 50: 241. 1982.

Recent collectors have found this plant in flower in January and in both flower and fruit in November. Material has been misidentified and distributed in some herbaria as *L. myriocephala* Schlecht. & Cham. and *L. umbellata* Cav.

Additional citations: MEXICO: Jalisco: *Mexia 1636* (W--1317889--isotype). Michoacán: *Bratz M.125* (Me--94182). Sinaloa: *Ortega 5101* (W--1165142).

LIPPIA JAVANICA (Burm. f.) Spreng.

Additional & emended bibliography: Walp., Repert. Bot. Syst. 4: 33, 43--44, 47, 50, & 134. 1845; Koord., Excursionsfl. 3: 133 & 439. 1912; White & Angus, For. Fl. N. Rhodes. 370. 1962; Bennet, Fl. Howrah 309--310. 1976; Mold., Phytologia 48: 174 & 176. 1981; Rooyen, Theron, & Grobbelaar, Journ. S. Afr. Bot. 47: 413. 1981; Blundell, Wild Fls. Kenya 109 & 158, pl. 8, fig. 54. 1982; Guha Bakshi, Fl. Murshidabad Dist. 17. 1984; Mold., Phytologia 56: 362. 1984.

Additional illustrations: Blundell, Wild Fls. Kenya pl. 8, fig. 54 (in color). 1982.

Recent collectors describe this plant as a shrub, 1.5 m. tall, and have found it in flower in February and April. The corollas are said to have been "yellowish-white" on *Giess 15811*; Blundell (1982) describes them as "white or cream", while White & Angus (1962) refer to them as simply "white", calling the plant "A weed, and a pioneer in secondary vegetation", citing *White 1851* & *2784*, *Mart. 476*, *Mich. 183*, and *Tr. 1694* from Zambia.

Material of *Lippia javanica* has been misidentified and distributed in some herbaria as *Lantana* sp. On the other hand, the *Belsky 271*, distributed as *Lippia javanica*, actually is *L. plicata* J. G. Baker, while *Phillips 2009* is *L. whytei* Mold. and *Liebenberg 8722* is *Lantana rugosa* Thunb.

Additional citations: SOUTH AFRICA: Cape Province: *Bayliss BS. 7086* (Ba--371861), *BS.8742* (Ba--381504, Mu); *Collector undetermined s.n.* [Mo. Bot. Gard. photo A.865] (Ld--photo). Transvaal: *Bernardi 8956* (W--2896856), *9074* (W--2896892); *Giess 15811* (Mu); *Liebenberg 8669* (W--3000422). LOCALITY OF COLLECTION UNDETERMINED: *Herb. Linnaeus G.35, S.10a* (It--photo). MOUNTED ILLUSTRATIONS: Brig. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 150. 1895 (Ld).

LIPPIA LACUNOSA Mart. & Schau.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 177. 1981.

Recent collectors describe this plant as a shrub or subshrub, 1--2 m. tall, the leaves thick, rough, and aromatic-odoriferous, and the flowers fragrant. They have encountered it in openings in woods, along roadsides, in campo rupestre, cerrado, and wet brejo, at 1100 m. altitude, in flower in March, May to August, and October, and in fruit in March, August, and October. Héringer reports that the leaves contain an essential oil.

[to be continued]

BOOK REVIEWS

Alma L. Moldenke

"TREES OF CENTRAL TEXAS" by Robert A. Vines, xv & 405 pp., 3 maps, 202 b/w detailed twig draw. & 40 outline draw. of lvs. & fl. parts. University of Texas Press, P. O. 7819, Austin, Texas 78713. 1984, hardcover & paperback editions.

This well prepared field manual follows "Trees of East Texas"(1977) and "Trees of North Texas" (1982). It presents 186 species of native and naturalized trees inhabiting mainly the Edwards Plateau, several being rare and/or unique. They are arranged according to 48 families s.l. The illustrated twigs should help with identification as should the descriptive text which covers field identification, flowers, fruits, leaves, range and remarks about uses, parasites, possible cultivation, and other common names. The early origin of the cultivated and escaping *Vitex agnus-castus* L. is given as China and India, but the species is not native to either country; it is definitely a Mediterranean species. The similar *V. negundo* L. is the native species of India and China.

"CELL BIOLOGY Structure, Biochemistry and Function", Second Edition, by Phillip Sheeler & Donald E. Bianchi, 17 & 670 pp., 206 b/w photo., 178 fig. & 134 tab. John Wiley & Sons, Inc., New York, N. Y. 10158. 1983. $31.95.

Just as the first edition of this work was an excellent full text, this updated edition is also of first calibre for logical explanations, additional excellent diagrams that are often accentuated by the additional use of rust-red lines, and really convincing electron microscope illustrations. "This book was written for sophomore and junior level courses in cell biology, molecular biology and cellular physiology" presupposing introductory biology and chemistry. It would be really worthwhile to use this text in a 2-semester or year course, certainly not steam-shovelling it through a quarter course. It has so much to offer.

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AUSTRAL HEPATICAE, XIX. SOME TAXA NEW TO NEW ZEALAND AND NEW CALEDONIA

Rudolf M. Schuster
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I. INTRODUCTION

A variety of antipodal taxa have been dealt with under the above title by myself, Dr. John E. Engel, or both of us joined in authorship. The present paper continues this tradition. A number of new records and new taxa are proposed so that the names and other documentation will be available for a joint work we proposed to issue on the Hepaticae of New Zealand. All types are to be deposited an the Field Museum of Natural History, Chicago.

II. ANEURACEAE (METZGERIALES)

1. Austral Aneura Species

Because of the simplicity in their organization, the species of Aneura are exceedingly difficult to study. An additional, inherent problem is that herbarium material -- especially when sterile -- is virtually useless for critical examination. Showalter (1926, 1928) has shown that in the protean A. pinguis, supposedly of subcosmopolitan range (cf. Schuster, 1983, p. 607), genetically incompatible races exist and one must almost conclude that such simplified species have undergone at least incipient speciation, with the structural simplification so marked that traditional means of separating species no longer exist. Under such conditions any attempts at taxonomic judgments are surely premature so long as they are based only on herbarium material. I venture to give the following preliminary notes chiefly because, having collected all but one of the taxa in the field, I believe that these entities represent real species. Unfortunately only fragmentary types have been seen, so that application of the several earlier names is, at this point, highly preliminary. A key for orientation follows:

KEY TO SOME AUSTRALASIAN TAXA OF ANEURA

1. Thalli devoid of gemmae. . . . . 2.

2. Oil-bodies few, usually (2-3)4-10(12) per cell, the larger granular, opaque, to 8-15 x 12-20 μ or even larger. Thalli translucent, pure green, not extremely brittle. Epidermal capsule-wall cells with thickenings (as in Riccardia) confined to adaxial walls.

   subg. Lobatiriccardia Mizutani & Hattori. .3.

3. Thalli thin, relatively slight, margins never denticulate. Oil-

bodies (2-5)6-12 per cell. . . . . 4.

4. Thallus margins unistratose and decolorate, hyaline for 2-3(4) cell rows, shallowly crenulate. Oil-bodies (2-3)4-9(10) per cell, very variable, the largest 13-15 x 32-36 or 28 x 33 to 24 x 38 µ. Thalli firmer, larger, to 7.5-8.5 mm wide, but only 9-10 cells high. Calyptra not hairy, with scattered, irregular, multicellular "tubercles."

A. subaquatica Schust., sp. n.

4. Thallus margins neither unistratose nor decolorate. Oil-bodies (3-5)6-12 per cell, at most 8-10 x 12-15 to 15 x 20 µ. Thalli 3-6(7) mm wide but 10-15 cells high.

A. lobata subsp. australis Schust., subsp. n.

3. Thalli wide, to 10 mm wide or more, margins (especially toward apices) denticulate with blunt, 1-celled teeth. Oil-bodies 3-7(8) per cell usually, the larger 14 x 23 to 8-10 x 27 µ.

A. gigantea Schust., sp. n.

2. Oil-bodies numerous [usually (7-12)13-25, or even 40-50 per cell], minute, glistening or obscurely few-segmented, under 4-6 x 6-8 µ, usually much smaller. Thalli opaque, yellow-green, brittle, with smooth margins that may be sharp or blunt. Epidermal capsule-wall cells with longitudinal radial walls with thickenings of both faces. . . . . 5.

5. Shoot calyptra ± clavate, rounded at the summit, hairy, with bristles or trichomes, at least prior to maturity.

A. pinguis (L.) Dum.

5. Shoot calyptra cylindrical, the apex rounded-truncate, with a depressed umbilicus, much as in Liochlaena lanceolata.

A. novaecaledoniae Schust., sp. n.

1. Thalli developing parenchymatous, pluricellular gemmae from stalk cells originating from dorsal epidermal cells.

subg. Austroaneura Schust., subg. n.
[A. kaguensis Hewson]

Aneura subaquatica Schust., sp. n. Species A. lobatae s. lat. similis thallo tenui, marginibus non denticulatis. Distincta ut: marginibus unistratosis hyalinisque per 2-3(4) ordines cellularum, exiliter crenulatis; guttae olei variantes plerumque 4-9 omni in cellula, maximis 24-28 x 33-38 µm; thallo latiore (usque ad 8.5 mm lat.) tenuiore autem, solum 9-10 cellulis alt.

Type. New Zealand, North Island: Lake Rotoiti (RMS 84-2962b).

Aneura lobata subsp. australis Schust., subsp. n. Subspecies cuius thalli crassiores quam in subsp. lobata (10-15 cellulis alt.); sporae maiores (16.5-19 µm); guttae olei numerosiores (plerumque 6-12 omni in cellula); aliter subsp. lobatae similis.

Type. New Zealand, South Island: Fox Glacier (RMS 48358).

This plant is discussed in some detail in Schuster (1964, pp. 214-15), where it is stated the discrepancies may "prove adequate to separate the New Zealand plant as a subspecies."

Aneura gigantea Schust., sp. n. Species a A. lobata et A. subaquatica differens ut thallus latior (10-12 mm vel plus lat.) in margine denticulatus, dentibus unicellularibus.

Type. New Zealand, South Island: Purakanui Falls, Otago (RMS 84-2454).

Aneura novaecaledoniae Schust., sp. n. Species A. pingui similis ut thallus opacus, rigidus, flavovirensque; distincta calyptra surculi levis cylindricaque, apex rotundo-truncatus, et umbilicus depressus.

Type. New Caledonia: Mandjélia, above Puebo, 20°24' S., 600-700 m. (RMS 84-4196).

Growing as a pioneer over rocks and boulders in the bed of a deeply shaded rivulet, forming flat, closely adnate patches. It is distinct from all other Aneura species I have seen in the peculiar, chimney-like shoot calyptrae which are reminiscent of the perianths of Liochlaena lanceolata.

Aneura subg. Austroaneura Schust., subsp. n. Subgenus subg. Aneurae simile magnitudine vigente, thallo solido opacoque et ramificatione sparsa; distinctus a subsp. Aneura et ex omnibus aliis Aneuraceis gemmis stipitatis singulis, parenchymatis, pluricellularibus superficii thalli.

Type. A. kaguensis Hewson.

2. Dendroceropsis Schust. and Hyaloneura Schust., new subgenera of Riccardia.

The intrageneric classification of Riccardia remains chaotic. A clearer comprehension of the genus will come about only after the genus is divided into natural groups, subgenera and sections, so that the numerous species can be given some comprehensible organization. In 1964 I proposed Phycaneura and Anomaneura for isolated austral elements; Hässel (1972), in a major paper on temperate-subantarctic South American taxa, proposed additional subgenera [Arceoneura Häss., Trichothallia Häss., Lophoneura Häss., Spinella (Schiffn. & Gott.)

Hässs.]. The bulk of taxa, however, remain simply assigned to Riccardia, without subgeneric placements. Furthermore, some of the Hässel subgenera will need major emendations, since the Australasian taxa, in several cases, do not fit well into her groups, as currently defined. For the moment, two subgenera, one occurring from Malaysia to New Guinea (subg. Hyaloneura), the other an alpine in New Zealand (Dendroceropsis), need to be segregated.

Riccardia subg. Dendroceropsis Schust., subg. n.

Cellulae thalli epidermales (a sectionibus transversis visae) a cellulis interioribus discriminatae, ut in Spinella et Arceoneura. Subgenus novus a his differens ut (a) cellulae epidermales globosae ad ovoideas ad digitiformes, extremitatibus rotundatis tantummodo discretis, thallo itaque plus minusve mammillato; cellulae thalli ventrales non discriminatas; (b) thallus axem principalem non determinate elongatum 1.8-3 mm lat., habens, axes secondarios (et partim tertiarios) efficiens, qui proiectiones laterales ferunt, et qui lamellati, cellulis hyalinis sine chloroplastis uno in strato iacentibus; (c) dentes marginales, et pinnae ultimatae et margines thalli crispati et/aut sinuosi.

Type [and only] species. R. pseudodendroceros Schust., sp. n. [The above diagnosis represents a descriptio generico-specifica.] Type. Paparoa Range, near Mt. Euclid, 4300-4400 ft, in tussock zone, South I., New Zealand (RMS 84-1503).

Occurring at the bases of snow tussock culms; with the aspect of Dendroceros -- and wholly unlike any Riccardia in appearance. Indeed, initially regarded as a sterile Dendroceros and, as such, much of the material was discarded in the field!

Riccardia subg. Hyaloneura Schust., subg. n.

Subgenus subgeneri Riccardiae simile ut cellulae epidermales a cellulis internis non valde differentiatae quamquam magnitudine multo inferiores. A Riccardia distinctum ut (a) thalli vigentes, 2.5 mm lat. x 3 cm vel plus long., solum, autem, ca. 4 cellulis alti; (b) thallus perspicue applanatus, sectionibus transversis usque ad 20 plo latioribus quam altae; (c) margines thalli per cellulas hyalinas sine chlorophyllo, quae ut limbus differentiales, valde praetexti; hic limbus e cellulis oblique aut perpendiculariter margine elongatis formatus.

Type. R. albo-marginata (Steph.) Schiffn. Also R. argento-limbata Hews. & Grolle here.

Both this subgenus and Dendroceropsis agree in the distinct border of chlorophyll-free cells forming a unistratose margin. In other respects the two groups are very different and the hyaline border has surely been independently evolved. Unfortunately, Dendroceropsis is largely sterile and even though I collected R. argento-limbata in

New Guinea, I was unable to find material with sporophytes. Both subgenera need further study.

I have not seen living plants of Hyaloneura, except in the field, so have no data as to oil-bodies. In Dendroceropsis, however, the gibbous epidermal cells bear, in ca. 25-40% of cases, a solitary oil-body, ca. 7 x 7-9 to 8-9 x 11-13 μ. The much larger hypodermal cells bear 1-2 larger oil-bodies [each 10-11 x 16 to 11-12(14) x 19-22 μ]. The hyaline marginal cells, although devoid of chloroplasts, typically bear oil-bodies.

III. ACROSCYPHUS Kitagawa, Acta Phytotax. Geobot. 35:1, 1984 (Balantiopsidaceae, Jungermanniales)

In 1964 Grolle described as new the genus Neesioscyphus and assigned here, aside from several neotropical taxa, a plant he described as N. phoenicorhizus Grolle, from New Zealand. Although this plant shares with Neesioscyphus the isophyllous gynoecium and the purely ventral-intercalary branching, it differs in the: (a) stem formed of rigid, almost bast-fiber-like cells; (b) large, Isotachis-like, but very shallowly bilobed underleaves; (c) purplish or intensely claret-red rhizoids; (d) lateral leaves not bilobed but irregularly 3-4-toothed; (e) small leaf cells, 13-18 x 20-24 μ, evenly thick-walled; (f) secondary pigments of cell walls, aside from rhizoids, at least in part brownish, never reddish, although stem cortex in part reddish. Grolle expressed his doubts that this plant really fitted into Neesioscyphus, but stated that its proper systematic position could be established only after sporophytes and androecia were found. Study of living material of A. nitidissimus Schust., sp. n., has shown that it possesses (0)1-2 highly glistening, homogeneous oil-bodies per cell and that it (and presumably also the other species I refer to Acroscyphus) thus differs from all other members of the Balantiopsidaceae (incl. Isotachidaceae) in this respect. Even though, provisionally, I retain Acroscyphus in the Balantiopsidaceae, this is based on ignorance rather than on conviction.

The above lines were written in early 1984, and I there assigned 3 of the 4 species in the following key to a new genus "Austroscyphus." When the present MS was about to be sent for publication, Dr. J. J. Engel provided me with a xerox of tne May 1984 paper by Dr. N. Kitagawa, describing Acroscyphus. It is an extraordinary coincidence that the two of us should, independently, conclude that such a taxon exists -- and even adopt, independently, generic epithets of such similarity. My concept, as the above lines indicate, was buttressed by the discovery that the genus had homogeneous oil-bodies; Kitagawa's was based on a much fuller suite of features, for he had available ♂ and ♀ plants with young sporophytes, but not oil-bodies. The two independent studies thus fully corroborate the distinctness of the genus.

The coincidence is even more extraordinary because in Jan. 1984, in Vol. II of the New Manual of Bryology, I published a plate of Ruizanthus Schust., a bitypic genus known only from Venezuela

(Schuster, 1978, p. 240) which seems, clearly, the nearest ally of Acroscyphus. My figures of Ruizanthus (Schuster, 1984, fig. 61, p. 994) evidently were not yet available to Dr. Kitagawa when he published Acroscyphus since his fig. 1:6-7 demonstrates beyond a doubt that Ruizanthus and Acroscyphus are immediately allied. Indeed, one could consider the two genera to be merely subgenera of a single genus, were it not for the differences in the oil-bodies and rhizoid color. In Schuster (1984, p. 998) Ruizanthus is assigned to an autonomous subfamily of Balantiopsidaceae, the Ruizanthoideae Schust., principally on the basis of the short-ovoid capsules with nonspiral valves. I would predict that when mature capsules of Acroscyphus are found, this genus, like Ruizanthus, will prove to have nonspiral capsule valves. On that basis the two are here assigned to the Ruizanthoideae and are separated as follows:

1. Oil-bodies large, granular-botryoidal, 2-3(4) per cell. Antheridia ca. 4-5 per bract, with paraphyses. Rhizoids colorless. Ventral-intercalary stolons frequent. Leaves symmetrically (2)3-4-lobed or -cuspidate at apex. Stem with a differentiated cortex, in 1-2 layers, of small, thick-walled cells contrasted to the larger, leptodermous medullary cells.

Ruizanthus Schust.

1. Oil-bodies homogeneous, small, glistening (0-1)2 per cell. Antheridia 1 per bract, without paraphyses. Rhizoids magenta or claret-red. Ventral-intercalary stolons lacking. Leaves variable: unlobed, lobulate, or 2-4-lobulate at apex. Stem in cross section uniformly formed of thick-walled cells, all similar in diameter.

Acroscyphus Kitagawa

The two genera agree in, i.a. (a) exclusively ventral-intercalary branching; (b) fasciculate rhizoids from bases of the large, bifid underleaves; (c) succubous leaves, with cells firm-walled, often, locally, elongated and sometimes tiered; (d) ♀ bracts erect, mutually involute, identical to bracteole in size and similar in form; (e) antheridial stalk biseriate; (f) gynoecium erect, somewhat swollen below foot of sporophyte but, at best, developing an incipient marsupium; (g) perianth arising gradually (and almost imperceptibly) from a polystratose base [=? Isotachis-type perigynium]; (h) sporophyte with short-ovoid capsule, with erect valves (conjectural for Acroscyphus).

My "genus" Austroscyphus was based primarily on the following new species. It and A. tjiwideiensis agree in the exclusively brownish wall pigments of the gametophyte, aside from rhizoids, and in the broad, unlobed leaves. These two species appear to form a complex distinct at least at the sectional level from the type of Acroscyphus and for them I retain the epithet Austroscyphus. Four taxa belong to Acroscyphus, separable as follows:

1. Leaves wider than long, the apices rounded to rounded-truncate. Aside from rhizoids no reddish pigmentation, the stem cortex brown to brownish. Underleaves, or most of them, divided 0.3-0.45 by a

V-shaped sinus, the disk margins mostly with 1-2 strong teeth on each side, in lower half.

Sectio Austroscyphus Schust., sect. n. . . . . .2.

2. Cuticle smooth; leaves subrotundate to quadrate-rotundate, apex rounded to sinuous, basal margins edentate, with antical bases slightly decurrent. Median cells 12-14(15) x (28)32-40(42) μ, ± rectangulate, longer walls occasionally with an intermediate thickening. [New Zealand].

A. nitidissimus Schust., sp. n.

2. Cuticle finely but closely papillose, the rather soft-textured plants dull; leaves oblate to reniform-oblate, much wider than long, apex broadly rounded to sinuous, the dorsal margins often with 1-2 teeth near base, the postical margins usually with 1-2 (3) teeth; antical leaf base long-decurrent. Median cells with medium to large-sized trigones, not or little elongated, (25)28-37 x 28-38(42) μ, polygonal. [Java].

A. tjiwideiensis (Sde.-Lac.) Schust. & Engel, comb. n.

1. Leaves lingulate to lingulate-falcate, clearly longer than wide, apices mostly (2)3-4-5-toothed or lobulate, occasionally subentire. Secondary pigments, at least of stem, largely or entirely reddish. Cuticle smooth.

Sectio Acroscyphus Kitagawa. . . . . 3.

3. Leaves lobulate to subentire at apex; underleaves 0.12-0.2 bilobed, margins entire or with 1-2 low teeth of each side. ♀ Bracts subrectangulate, entire-margined in lower 0.5; perianth (juvenile) subentire. [New Zealand].

A. phoenicorhizus (Grolle) Schust. & Engel, comb. n.

3. Leaves sharply (2)3-4-lobed or lobulate at apex; underleaves 0.35-0.5 bifid, with mostly 1-3 coarse teeth on each side. ♀ Bracts narrowly ovate, margins with several conspicuous teeth, some of which arise from basal 0.5; perianth laciniate-lobulate at mouth. [New Caledonia].

A. iwatsukii Kitagawa

Acroscyphus sect. Austroscyphus Schust., sect. n.

Sectio a Neesioscypho differens ut (a) rhizoidea colore magentea aut vinaceae; (b) cauliculi rigidi, cellulis et medullae et corticis pachydermatis; (c) folia non bilobata, in culmine integra aut subintegra. A Clasmatocolea differens ut (1) rhizoidea pigmentifera; (2) eamificatio nonnisi ventrali-intercalaris.

Type. Acroscyphus nitidissimus Schust., sp. n.

Acroscyphus nitidissimus Schust., sp. n.

Plantae caespitosae, parce ramosae, omnes rami ventrali-inter-

calares, colore lignei ad brunneos, aspectu valde nitidi et politi. Folia concava anticaliter assurgentia conniventia, rotundo-quadrata, apice rotundato ad repandi-sinuosum, basibus anticalibus paululum decurrentibus, marginibus apicibusque edentatis. Amphigastria subquadrata, 0.35 bifida, sinu forma letterae V, lobis subacutis ad acutos, triangularibus, marginibus lateralibus 1-2-dentes grossos ad basim latos habentibus. Cellulae mediae basalesque 12-14(15) x (28)30-40(42) µm, pachydermatae; guttae olei (0)1-2 in omni cellula; lucentiae, homogeneae, 3-5 x 5-6 µm ad 3.2-3.5 x 3.2-4 µm. Rhizoidea in fasciculis e basibus amphigastriorum, colore vinacea aut magentea.

Type. New Zealand, South Island, Buller: Paparoa Range, NW. of Mt. Euclid, 4300-4500 ft (RMS 84-1423).

In the field this plant was regarded as something unique. The exceedingly shiny and polished-appearing gametophyte, erect in growth, with concave, unlobed and edentate leaves, antically connivent or assurgent, were highly distinctive. The combination of (a) leaf cells, in leaf middle and below, elongated, rectangular, occasionally locally tiered; (b) purely ventral-intercalary branching; (c) bifid and toothed underleaves, suggests a remote affinity to Balantiopsidaceae subf. Isotachidoideae. Yet the cells bear 2 (less often 1 or 0) small, glistening oil-bodies -- and such oil-bodies have not been seen in any other member of the Balantiopsidaceae (incl. Isotachidoideae). As a consequence, a very isolated element is surely at hand: a close affinity to Neesioscyphus seems unlikely to me. The edentate, wide leaves plus the deeply bifid underleaves with a sharp, V-shaped sinus, and 1-2 sharp, coarse lateral teeth of the disk margins, suggest A. tjiwideiensis (Sde.-Lac.) Schust. & Engel, comb. n.V This, however, is very different in the much broader leaves, strongly decurrent antically; in the roughened cuticle; and in the relatively thin-walled cells with distinct trigones.

The equally thick-walled cells, smooth cuticle, and only moderately decurrent antical leaf bases suggest a closer affinity to Acroscyphus phoenicorhizus (Grolle) Schuster & Engel, comb. n. [Basionym: Neesioscyphus phoenicorhizus Grolle, Oesterr. Bot. Zeitschr. III:27, 1964.] That species, however, has more ovate-lanceolate underleaves, divided 0.12-0.2 via a U-shaped notch with rounded base. According to Grolle (l.c.) it grows in flat patches or mats, has lingulate leaves with apices often irregularly 4-5-dentate and the stem cortex is mostly reddish-tinged, which is not the case in A. nitidissimus. Unfortunately, no mention is made of the texture of the plants.

With the recognition of Acroscyphus a number of problems are resolved: (a) the phytogeographically unlikely position of "Clasmatocolea" tjiwideiensis, and equally unlikely phytogeography of Neesioscyphus (New World tropical, except for the subalpine-alpine antipodal, Australasian "N." phoenicorhizus); (b) the anomalous position of "C." tjiwideiensis in Geocalycaceae, a group otherwise not known to produce anthocyanin-type pigments. The unsatisfactory prior taxonomy of this complex is self-evident from the fact that 2 of the 4 known taxa were

placed by Grolle (1960, p. 73; 1964, p. 27) respectively into Clasmatocolea (Geocalycaceae, Geocalycineae) and Neesioscyphus (Balantiopsidaceae, Balantiopsidineae) -- thus exceedingly far apart in the phylogenetic systems of Schuster (1979, 1984).

The 4 taxa of Acroscyphus, with 3 or 4 Gondwanalandic, the fourth on the "wrong" side of Wallace's Line, in Java, roughly parallel the range o: Zoopsis H.f. & T. Strikingly, the purely neotropical range of Neesioscyphus Grolle and Ruizanthus Schust. parallel the range of Zoopsidella Schust. The phytogeographical analogies are instructive and, surely, significant.

IV. CHAETOPHYLLOPSIDACEAE (JUNGERMANNIALES)

The family was described (Schuster, 1961) to include 2 monotypic genera, Chaetophyllopsis Schust. [with C. whiteleggei (Carr. & Pears.) Schust.] and Herzogianthus Schust. [with H. vaginatus (Herz.) Schust.]. The group is highly isolated but related, perhaps remotely, to the Ptilidiaceae. A third species has come to light, as follows:

Herzogianthus sanguineus Schust., sp. n.

Species a H. vagiantus differens ut: (a) ramificatio irregularis, multis ramis primariis folia normalia, non-vaginata, non-connata, succubaque; foliis cauliculi similia, habentibus; ramificatio penitus irregulariter 2(3)-pinnata; (b) folia cauliculi variantia, saepe sine lobo anticali accessorio, lobus dorsalis solum 1-pauca cilia habens, duobus lobis ventralibus plerumque sine ciliis; (c) cilia 100-150 µm long.; (d) amphigastria cauliculi bifida, sine ciliis aut solum 1-2 cilia habentia; (d) plantae colore intense vinaceae, in situ saepe fere nigrae piceae.

Type. New Zealand, South Island, Buller: W. slope of Paparoa Range, NW. of Mt. Euclid, 4300-4400 ft (FMS 84-1427).

The plants grew in low turf and were densely caespitose, thus very different from H. vaginatus as regards growth pattern. The latter, very regularly once-pinnate, with all primary branches usually vaginate-leaved, grows rather closely prostrate or creeping. The intensity of the pigmentation is remarkable: exposed sectors are all almost reddish black, when viewed by reflected light. The color suggests a rather fleshy Lepidolaena. Plants are soft yet brittle, with fleshy stems, and are relatively fragile -- quite unlike H. vaginatus. They are also much less setigerous than the latter: stem leaves are often virtually devoid of cilia, although dorsal lobes commonly bear several setae; ventral lobes are eciliate or bear, at most, 1-2 cilia each.

V. LEJEUNEACEAE

The Lejeuneaceae of Australasia remain exceedingly poorly known. The following represent several new taxa discovered during 1984.

1. New taxa of Cololejeunea (Spr.) Schiffn.:

Cololejeunea inflexifolia Schust., sp. n.

Species C. cucullifoliae (Herz.) Schust. et C. ellipsoideae Schust. similis ut: (a) apices foliorum rotundati ad obtusos, omnes cellulae non-tuberculatae; (b) lobuli numquam polymorphici; (c) folia remota, convexa, aspectu quasi inflata. Species nova ab ambabus speciebus ut: (a) lobuli 2 dentes apicales iuxtapositos praebentes, dentibus suprapositis; (b) apices lobi obtuse triangulares et valde decurvato-inflexi, apice cauliculum versus directo; (c) styli distincti e (3)4-5 cellulis superpositis formati.

Type. New Zealand, South Island, Westland: Lake Mahinapua Forest Reserve, N. of Ross (RMS 84-1133; on twigs of Myrsine nummularia).

Distinct from all Cololejeunea species of Australasia in the (a) strongly inflated lobule (whose antical margin, in situ, is completely hidden); (b) lobule apex, much as in Aphanolejeunea, bearing 2 closely juxtaposed teeth, with the proximal tooth 1-celled and elongated, the distal, 2-celled, with the apical cell usually oriented so that (in ventral aspect) it lies over the proximal 1-celled tooth; (c) styli filiform and 3-4-5-celled; (d) deflexed-inflexed triangular lobe apex so curved under that its apex often overlies and obscures the 2 ventral teeth of the lobule apex.

Cololejeunea fragilis Schust., sp. n.

Species C. cucullifoliae et C. ellipsoideae similis ut: (a) apex lobuli singulum dentem apicalem potius quam 2 iuxtapositos habet; (b) apex loborum non deflexo-inflexus; (c) stylus vestigialis, tantummodo papilla. Species nova ex ambabus speciebus distincta ut: (a) habens non modo illum dentem apicalem unicellularem sed etiam dentem proximalem tricellularem qui paululum a distali iacit; (b) lobi convexi obovoidei, solum ca. 0.25 maiores quam lobuli.

Type. New Zealand, South Island: Waterfall Track, W. of Lewis Pass, Lewis Pass Reserve; on leaf of Pseudowintera colorata (RMS 84-1699d; trace only, on Hoyer's Fluid slide). Growing with Ephemeropsis trentepohlioides, Austrolejeunea olgae, A. hispida, and Cololejeunea laevigata.

Unfortunately known only from a trace, mixed with the aforementioned taxa. This tiny species, with the remote-leaved shoots only 340-360 μ wide, is barely 0.2 the size of C. pulchella. Perhaps remotely allied to C. minutissima and C. cucullifolia, but clearly different in: (a) the obovate lobes, widest distad of their middle; (b) distal lobular tooth 1-celled, proximal, 3-celled vs. a 2-celled distal tooth and low proximal angulation in the last 2 species.

Cololejeunea pulchella (Mitt.) Schust. var. stylifera Schust., var. n.

Varietas C. pulchellae typicae et C. laevigatae (Mitt.) Schust. similis foliis non-inflatis, nitidis ± umbricatis, et lobulis 2-3 ad 3-4 dentes habentibus; ab ambabus differns ut: (a) styli ex 1-2 ad 6-7 cellulas cauliculi elongatas + papilla mucosa distali formati;

(b) folia super axem valde elevata; (c) lobulus 3(4) dentes habens, dente maxime distali 2-3 cellulis a carina seiuncto; (d) perianthium aegre compressum.

Type. New Zealand, North Island: Lake Rotoiti, Nelson Lakes Natl. Park (RMS 84-2964; on twigs of Myrsine). Plants occurred mixed with Austrolejeunea hispida, Drepanolejeunea sp., Radula physoloba, and Frullania spp.

Stem leaves are so elevated above the creeping stem that, in dorsal aspect, much of the stem is exposed, the leaves looking relatively distant. As in var. pulchella, leaves are rather narrowly obovate from a narrow base. If the stylus criteria prove constant, we perhaps have an autonomous species.

2. A new species of Cheilolejeunea (Spr.) Schiffn.
Cheilolejeunea novaezelandiae Schust., sp. n.

Species C. albovirenti (H. f. & T.) Hodgs. et C. campbelliensi (Steph.) Schust. similis ut: (a) inflorescentiae, autoeciae; (b) ♀ innovationes, nisi sporadicaliter nullae, typi Pycnolejeuneae (cf. Schuster, 1984). Species a C. albovirente distincta ut folium ad angulum ca. 70° patet et non cochleariforme; et transitione abrupta e carina ad lobum, ambobus ad angulum ca. 45°; sinus amphigastrii plerumque apertus, saepe forma litterae U. A C. campbelliense distincta ut: (a) lobi foliorum acuti ad anguste triangulares, deflexo-involuti; (b) cellulae carinae ut tuberculi alti pachydermates elevatae; (c) amphigastria magna, saepe imbricata, 3 plo latiora quam caulicula vel plus; (d) guttae olei 1-2(3) in omni cellula, in segmenta tenuiter divisae; (e) dens apicalis lobularis unicellularis, rectus et acutissimus.

Type. New Zealand, South Island, Buller: W. slope of Paparoa Range, W. of Morgan Tarn, 4000-4300 ft (RMS 84-1526).

This autoecious species has the ♀ innovations always paired on acrogynous gynoecia. These innovations show Pycnolejeunea-type merophyte sequencing (for terms see Schuster, 1980, where the concept of merophyte sequencing is discussed). Leaf lobes are geniculate, with the triangularly pointed lobe apex strongly deflexed or involute. Keelar cells are maximally tuberculate-produced, the apical thickening strongly biconvex. Mature leaves have marginal cells similarly, if less strongly, armed -- so that lobes are denticulate in profile. The oil-bodies are unique, in all Cheilolejeunea species I have seen, in being finely botryoidal or granular-botryoidal; they are often single and then crescentic, but more often 2 (rarely 3) per cell.

VI. TREUBIALES

The Treubiaceae were monographed by Schuster & Scott (1969), in which memoir the primitive Treubia tasmanica Schust. & Scott was described. In this species, unlike in all others from Australasia examined, about 60-85% of median leaf cells bear solitary oil-bodies and the oil-body-bearing cells are scarcely differentiated from those

which contain, as visible inclusions, only chloroplasts. This relatively small species, (4)5-9 mm wide x 15-35(40) mm long, remains known only from Tasmania. It appears to be replaced in alpine-subalpine sectors of New Zealand by the following:

Treubia pygmaea Schust., sp. n.

Species a T. tasmanica differens ut: (a) folia unistratosa per latitudinem 16-20 cellulis; cellulae folii magnitudine satis variantes, et cellulae sparsae in sectoribus marginali-periferalibus foliorum ocellos 1.8-2.4 latiores quam diameter cellularum contiguarum formantes; partes mediae laminae cellulas sparsas area multo maiores (1.5-2.5 X) quam cellulae propinquae habentes; cellulae partis mediae folii 50-60% sine guttis olei.

Type. New Zealand, South Island, Buller: E. slope of Paparoa Range, along steep rivulet, 1.5-2 km below Morgan Tarn, 3100-3200 ft (RMS 84-1664).

This species, like T. tasmanica, has oil-bodies present in over 95% of marginal leaf sectors (vs. under 25% in T. lacunosa!) so that these sectors appear quite opaque. Even though, as in T. tasmanica, epidermal leaf cells are never strikingly enlarged (vs. in T. lacunosa, where large epidermal ocelli are a prominent feature), T. pygmaea shows some very large internal cells of polystratose median and basal leaf sectors; these cells may bear oil-bodies up to 90 x 120 to 95 x 140 μ. In this respect, T. pygmaea superficially resembles T. lacunosa, but the latter has both epidermal and inner cells in part strikingly enlarged, forming ocelli.

VII. MARCHANTIALES

1. Reboulia hemisphaerica subsp. australis, subsp. n.

Subsp. a subspecie hemisphaerica differens ut: (a) ut videtur semper autoecia (♂ disci in ramis thalli distinctis a ♀ receptaculis); (b) ♂ disci subacute elevati, e tela thalli circumdente valde delimitati, per circulum parvum squamarum minutarum sed perspicuarum circumdati.

Type. New Zealand, North Island, Rangitoto I.in Auckland Harbour (RMS, John Braggins, and Margaret Brown 84-2673).

I have collected R. hemisphaerica throughout the Northern Hemisphere, from Japan to North America, Europe, Macaronesia, and North Africa. All populations seen -- probably well over 200 in the field alone -- uniformly agreed in developing ill-defined androecia, with the several aggregated, low ostioles not sharply circumscribed. Both "normal" paroecious populations have been seen as well as occasional dioecious ones (Japan and Spain; these to be reported on). No plant seen from the Northern Hemisphere ever had autoecious inflorescences and, more significantly, large, discoid, elevated, sharply defined ♂ receptacles, bounded peripherally by a circlet of small, dark scales, aside from subsp. orientalis. Such well-defined androecia are reminiscent of those seen, i.a., in Conocephalum and Lunularia.

It is possible this taxon deserves the rank of an autonomous species but since I have seen very few populations from New Zealand (and only the type had well-developed mature androecia), I hesitate to ascribe more than subspecies status to the plant. Spore criteria may yet dictate treatment as a separate species.

The status of the New Zealand plant is visibly complicated by the fact that in Japan similar plants, with well-defined androecia occur (cf. Inoue, 1976, pl. 73). These, however, differ as follows:

PRELIMINARY KEY TO SUBSPECIES OF R. HEMISPHAERICA

1. Monoecious. . . . . 2.

2. Autoecious: ♂ and ♀ receptacles normally on separate branches. ♂ Receptacle large, circular or subcircular, well delimited, elevated above thallus and circumscribed by a ringlike depression between it and thallus, the depression giving rise to small paleae. . . . . 3.

3. ♂ and ♀ Receptacles typically on leading or elongated thallus segments. [New Zealand].

R. hemisphaerica subsp. australis

3. ♀ (and sometimes ♂) Receptacles typically on abbreviated ventral-intercalary segments that are narrow-based or substipitate (main thallus usually remaining sterile, typically innovating apically, the innovation often remaining sterile, often again innovating; sometimes an innovation androecial at apex). [Japan].

R. hemisphaerica subsp. orientalis, subsp. n.

2. Paroecious: ♂ receptacle ill defined, or 1 or 2 posterior to ♀ receptacle, often reniform or irregular in form, usually small, little elevated and not sharply bounded, without well-developed circlet of peripheral scales. Both ♂ and ♀ receptacles typically at apices of leading thallus segments, sporadically to exceptionally on abbreviated lateroventral segments.

R. hemisphaerica subsp. hemisphaerica

1. Dioecious; ♂ and ♀ receptacles on different plants. [Scattered: southern Europe, etc.].

R. hemisphaerica subsp. dioica, subsp. n.

The above subclassification of the protean R. hemisphaerica is probably overly simplistic. With further study, elevations in rank may be needed, and, at the species level, numerous names are available, some of which may be applicable. It is not worth the effort to clear up now what may prove to be a major undertaking requiring decades of effort to disentangle. For the moment the 4 subspecies admitted here seem reasonably sharply separable. The 2 new subspecies admitted are distinguishable as follows:

Reboulia hemisphaerica subsp. orientalis Schust., subsp. n.

Subsp. a subspecie hemisphaerica distincta ut: (a) inflorescentia

semper autoecia; (b) ♂ disci in thallo non dorsales sed terminales. ♀ Receptaculis similes, disco bene definito, ex incisura terminali eminante, super superficiem thalli elevato, ostiola antheridialia coarctata continente; (c) ♀ receptaculae plerumque e ramis parvis stipitatis, ventrali-intercalaribus ex thallo principali (qui aut sterili aut ♂), rarius ex incisuris apicalibus segmentorum principalium, derivatae.

Type. Mt. Amagi, Izu Peninsula, Shizuoka Pref., Honshu, Japan (RMS 74-305).

The type material has ♂ disks often terminal on main segments, but sometimes terminating ventral-intercalary branches. In other populations (e.g., those figured by Inoue, 1976, pl. 73: 1,7,12), main thalli may remain sterile, but show apical innovations which may also remain sterile but may produce ♂ disks. Inoue also shows the ♂ disk as circular, well defined, with many antheridial ostioles. His pl. 73:11 shows an elevated, sharply demarcated disk, but lacking peripheral paleae. In my type the elevated ♂ disk is fringed by small, dark scales -- as in subsp. australis. Such paleae are very rarely developed and bound only the most optimally developed androecia in subsp. hemisphaerica. [The highly variable sexual situation in that subspecies will be discussed extensively in Vol. V of my The Hepaticae and Anthocerotae of North America; in sched.] Subsp. orientalis seems closest to subsp. australis in the terminal position of the always well-developed, elevated, ♂ receptacles. All of the numerous phenotypes of subsp. hemisphaerica seen have ♂ receptacles strictly dorsal on, usually leading, thallus segments.

Reboulia hemisphaerica subsp. dioica Schust., subsp. n.

Subspecies ex omni alia prole R. hemisphaericae distincta gametophyto unisexuali.

Type. Granada, Spain: gardens of the Generalife (RMS 73-001).

Unisexual populations of R. hemisphaerica have seldom been seen; they apparently do not occur at all in North America. I anticipate discussing them in more detail in another connection.

2. The genus Dumortiera new to New Zealand.

Monoclea and Dumortiera are mong the "giants" in the Marchantiidae and, correspondingly, almost impossible to overlook. Because of the translucent thalli, the two are readily confused in the field by the uninitiated. During three long periods (1961-62, 1967, 1983-84) in New Zealand, I repeatedly searched for Dumortiera -- the common Monoclea usually being found, but not Dumortiera. However, on March 18, 1984, D. hirsuta s. lat. was discovered along the "Kiwanis Track" along a small stream, at the east end of Herikino State Forest, south of Kaitaia, below an extensive Nikau Palm grove forest (RMS 84-2550).

The Dumortiera population was at the stream edge, where subject to inundation. Plants were fertile, but lacked capsules. They

lacked the velvety thallus surface of the "nepalensis" or "velutina" phase (= D. nepalensis) but had vestigial indications of the surface areolation (remnants of the vertical walls of the obsolute air chamber partitions).

It is inexplicable to me that such a conspicuous and prominent liverwort should have remained undiscovered for so many years in New Zealand. There is nothing in the habitat that cannot be repeatedly duplicated elsewhere in New Zealand -- yet the genus seems to be consistently absent from otherwise seemingly appropriate loci. At the single known station there is limited but clear evidence of human disturbance, suggesting that perhaps the species was introduced.

FOOTNOTE

⩛ Basionym: Chiloscyphus tjiwideiensis Sde.-Lac., Nedrl. Kruidk. Arch. 3:418, 1854. Placed by Grolle (1960, p. 73) and Engel (1980, p. 154) into Clasmatocolea, as C. tjiwideiensis (Sde.-Lac.) Grolle. However, anthocyanin-derived, reddish pigments never seem to occur in the Geocalycaceae, s. lat. (incl. Lophocoleaceae), and the rhizoid color alone seems to eliminate the species from Clasmatocolea and other Lophocoleoideae. Also, as Engel (l.c., p. 9) has shown, of 20 species assigned by him to Clasmatocolea, following Grolle (l.c.), only "Clasmatocolea" tjiwideiensis has branching reduced to only the ventral-intercalary type. The species is also the only one of those assigned to Clasmatocolea which is Malaysian (and tropical) in range, while all other taxa are subantarctic to temperate-antipodal in range. Pigmentation patterns, branching modes, and phytogeography all suggest that the species was misplaced by Grolle in Clasmatocolea.

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_____ & G. A. M. Scott. 1969. A study of the family Treubiaceae (Hepaticae, Metzgeriales). J. Hatt. Bot. Lab. 32:219-68, figs. 1-12.

Showalter, A. M. 1926. Studies in the cytology of the Anacrogynae. II. Fertilization in Riccardia pinguis. Ann. Bot. 40:713-26, figs. 1-4, pls. 25-27.

_____ 1928. Ibid. V. Hybrid fertilization in Riccardia pinguis. La Cellule 38:295-348, figs. 1-29, pls. 1-5.

ADDITIONAL NOTES ON THE GENUS *LIPPIA*. XX

Harold N. Moldenke

LIPPIA Houst.

Additional bibliography: Ulrich, Internat. Wörterb., ed. 1, 128 (1871), ed. 2, imp. 1, 128 (1872), and ed. 2, imp. 2. 1875; Diels, Engl. Bot. Jahrb. 29: 547. 1900; Rusby, Bull. Torrey Bot. Club 27: 80. 1900; K. Schum., Justs Bot. Jahresber. 28 (1): 496--497. 1900; Ulrich, Internat. Wörterb., ed.3, 128. 1917; Nair, Ramachandran, Ramesh, Nagarajan, & Subramanian, Indian Journ. Chem. 11: 1316--1317. 1973; Anon., Biol. Abstr. 58: 1760. 1974; Balgooy, Pacif. Pl. Areas 3: 244. 1975; B. C. Stone, Henderson Malay Wild Fls. App. 16. [1977[; Lindquist, Royas Rep. Argent. Zon. Limit. 89. 1982; Mold., Phytologia 56: 380 & 420--447. 1984.

LIPPIA ABYSSINICA (Otto & Dietr.) Cuf.

Additional bibliography: K. Schum., Justs Bot. Jahresber. 28 (1): 496. 1900; Mold., Phytologia 56: 358. 1984.

LIPPIA BURTONII J. G. Baker

Additional bibliography: K. Schum., Justs Bot. Jahresber. 28 (1): 496. 1900; Mold., Phytologia 48: 163. 1981.

LIPPIA CALLICARPAEFOLIA H.B.K.

Additional bibliography: Briq., Bull. Herb. Boiss., ser. 1, 4: 341. 1896; Mold., Phytologia 56: 427--428. 1984.

LIPPIA HIRSUTA var. *MORITZII* (Turcz.) López-Palacios

Additional bibliography: K. Schum., Justs Bot. Jahresber. 28 (1): 497. 1900; Mold., Phytologia 56: 444--445. 1984.

LIPPIA KITUIENSIS Vatke

Additional synonymy: *Lippia? kituiensis* Vatke, Linnaea 43: 528. 1882. *Lippia (?) kituensis* Vatke apud K. Schum., Justs Bot. Jahresber. 28 (1): 496. 1900.

Additional bibliography: Mold., Phytologia 48: 176--177. 1981.

LIPPIA LACUNOSA Mart. & Schau.

The corollas are described as having been "rose" on *Héringer & al. 538* & *7493* and "rose, the center yellow" on *Héringer & al. 4827* & *5392* and *Mendonça & Noqueira 147*, "rose-lilac" on *Héringer 15902*, "lilac" on *Héringer & al. 644*, "lilac, the throat yellow" on *Pereira 288*, "avermelhadas" on *Héringer & al. 205*, and "roseo-avermelhas o centro amarelado" on *Héringer & al. 5088*.

Material of *L. lacunosa* has been misidentified and distributed in some herbaria as *L. eupatorium* Schau.

Additional citations: BRAZIL: Distrito Federal: *Héringer & al. 644* (N); *Héringer, Filgueiras, Mendonça, & Pereira 7493* (N, W--

2971676); *Héringer, Figueiras, Mendonça, Pereira, Héringer Salles, & Silva 4827* (N), *5088* (N), *5392* (E--2978861, N); *Héringer, Paula, Mendonça, & Héringer Salles 205* (E--2770491), *538* (N), *644* (W--2926627); *Mendonça & Nogueira 147* (N); *Pereira 288* (N, W--2958143). Goiás: *Hatschbach 43073* (Ld); *Héringer 15902* (N).

LIPPIA LACUNOSA var. *ACUTIFOLIA* Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 177. 1981.

LIPPIA LAMIANA (Mold.) Mold., Phytologia 53: 461. 1983.

Synonymy: *Lantana lamiana* Mold., Lilloa 5: 413. 1940.

Bibliography: Mold., Lilloa 5: 413. 1940; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 40. 1942; Mold., Alph. List Cit. 1: 264. 1946; H. N. & A. L. Mold., Pl. Life 2: 68. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 99 & 188. 1949; Mold., Résumé 116 & 459. 1959; Mold., Fifth Summ. 1: 186 (1971) and 2: 886. 1971; Mold., Phytol. 2: 177 & 555. 1980; Mold., Phytologia 53: 461. 1983.

Stems branching, the branches virgate, medium-slender, obtusely tetragonal, densely incanous with short, closely appressed, white, strigose hairs, less densely so toward the base in age; nodes very obscurely annulate; principal internodes 1.5--3.8 cm. long, mostly much abbreviated; leaves numerous, decussate-opposite; petioles obsolete or to 3 mm. long, flattened and winged, incanous-strigose; leaf-blades firmly membranous, stiff, ascending, often conduplicate, narrow-lanceolate or -oblanceolate, incanoous on both surfaces, to 7.5 cm. long, 9--10 mm. wide, acute at both ends, marginally subentire or remotely dentate near the apex, densely strigose on both surfaces with short white hairs; midrib slender, subimpressed above, prominulent beneath; secondaries numerous, slender, short, 5--9 per side, ascending, not much arcuate; vein and veinlet reticulation fine, nor prominulent, mostly obscure or indiscernible above; heads subglobose, solitary in the uppermost leaf-axils, 1 or 2 pairs per branch, much shorter than the subtending leaves, incanous throughout.

The species is based on an unnumbered collection of T. Rojas (Hassler 9901; Herb. Osten 19904), collected on a high plateau and in declivities in the Sierra de Amambay, Paraguay, in December, 1907, and deposited in the herbarium of the Naturhistorisches Museum in Vienna. It is named in honor of my late respected colleague, Dr. Herman Johannes Lam, who did such noteworthy work on the *Verbenaceae* of the Pacific region.

Citations: PARAGUAY: *T. Rojas s.n.* [Hassler 9901; Herb. Osten 19904] (Ld--photo of type, N--clastotype, N--photo of type, Ug--isotype, V--type).

LIPPIA LANTANIFOLIA F. Muell.

Additional bibliography: T. B. Muir, Muelleria 2: 166. 1972; Mold., Phytologia 48: 177. 1981.

LIPPIA LASIOCALYCINA Cham.

Additional bibliography: C. Muell. in Walp., Ann. Bot. Syst. 5: 707. 1860; S. Moore, Trans. Linn. Soc. Lond. Bot., ser. 2, 4: 436.

1895; Angely, S. Amer. Bot. Bibl. 2: 676. 1980; Mold., Phytologia 48: 177 (1981) and 54: 236. 1983; Raj, Rev. Palaeobot. Palyn. 39: 350, 364, 396, 400, & 403, pl. 3, fig. 4. 1983.

Additional illustrations: Raj, Rev. Palaeobot. Palyn. 39: 403, pl. 3, fig. 4. 1983.

Recent collectors describe this plant as a shrub, 2 m. tall, and have found it growing in flooded sandy clay soil at forest borders, in both flower and fruit in March. The corollas are said by Héringer to be rose-color.

Additional citations: BRAZIL: Distrito Federal: *Héringer 16922* (E--2978845, N). Mato Grosso: *Macedo, Duarte, & Assumpçao 1399* (N).

LIPPIA LASIOCALYCINA var. *SAINTHILAIREI* Mold.

Additional bibliography: Angely, S. Amer. Bot. Bibl. 2: 676. 1980; Mold., Phytologia 48: 177. 1981.

Fernandes & Nunes describe this plant as a subshrub, with lilac-colored corollas, and found it growing in carrasco, in flower in November.

Additional citations: BRAZIL: Piaui: *Fernandes & Nunes, Herb. Prisco Bezerra 10876* (F--1931268).

LIPPIA LAXIBRACTEATA Herzog

Additional bibliography: Mold., Phytologia 48: 178 (1981) and 50: 248. 1982.

LIPPIA LIBERIENSIS Mold.

Synonymy: *Lippia libertensis* Reis & Lipp, New Pl. Sources Drugs 252 sphalm. 1982.

Additional bibliography: Mold., Phytologia 48: 178. 1981; Reis & Lipp, New Pl. Sources Drugs 252. 1982; Mold., Phytologia 54: 232. 1983.

Folsom describes this plant as suffrutescent, erect, the bracts green, and the corollas white to yellow, and found it growing in re-growth shrubbery on cutover hillsides, in flower in May.

Material has been misidentified and distributed in some herbaria as *L. callicarpaefolia* H.B.K.

Additional citations: COSTA RICA: Puntarenas: *Tonduz 4429* [1516] (W--1322892). PANAMA: Veraguas: *Folsom 3099* (E--2608125).

LIPPIA LINDMANII Briq.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 178. 1981.

LIPPIA LINDMANII f. *OPPOSITIFOLIA* Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 178. 1981.

LIPPIA LINEARIFOLIA Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 178. 1981.

Additional citations: BRAZIL: Minas Gerais: *Hatschbach 27812* (N--isotype).

LIPPIA LOJENSIS Mold., Phytologia 54: 235 nom. nud. (1983) and 55: 113, 115, & 116, pl. 2. 1984.

Bibliography: Mold., Phytologia 54: 235 (1983) and 55: 113, 115, & 116, pl. 2. 1984.

Illustrations: Mold., Phytologia 55: 116, pl. 2. 1984.

Citations: ECUADOR: Loja: *Hart 1315* (N--isotype, W--2939976--type). MOUNTED ILLUSTRATIONS: Mold., Phytologia 55: 116, pl. 2. 1984 (Ld, Ld).

LIPPIA LUCENS Standl.

Additional bibliography: Mold., Phytologia 48: 178 (1981) and 56: 432 & 433. 1984.

Dawson and his associates describe this plant as a small tree, 10 feet tall, the stems 2 inches in diameter at the base, the leaves aromatic, and encountered it in wet ravines.

The *Molina R. 549, 1134,* & *1456* distributed and previously cited by me as *L. lucens*, seem actually to be *L. controversa* Mold. instead, while *Molina R. & Molina 22835* is *L. controversa* var. *brevipeduncula* Mold.

Additional citations: HONDURAS: Comayagua: *Edwards 514* (W--1588714--isotype); *Yuncker, Dawson, & Youse 6003* (W--1638914).

LIPPIA LUPULINA Cham.

Additional & emended bibliography: D. Dietr., Syn. Pl. 3: 597. 1843; Bocq., Adansonia, ser. 1 [Baill., Rec. Obs. Bot.], 3: 244. 1863; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 152. 1895; Mold., Phytologia 48: 179 (1981), 50: 247 (1982), and 56: 342. 1984.

Recent collectors have encountered this plant in cerrado, in flower in December, February, and March. The corollas are described as having been "lilac" on *Pereira 208*, "rose, the tube yellow" on *Heringer & al. 6202*, "purple (10 P 6/8) on *Lindeman & Haas 3055*, "with white, yellow, and rose" on *Casas & al. FC.7504* and "avermelhadas" on *Heringer & al. 6642*. The bracts are described by Lindeman & Haas as having been "purple (10 P 6/6)".

The *Herbert H. Smith s.n.*, cited by me in a previous publication in this series as typical *L. lupulina*, actually represents its var. *paraguariensis* Chod.

Additional citations: BRAZIL: Distrito Federal: *Heringer, Filgueiras, Mendonça, & Pereira 6202* (N), *6642* (N); *Pereira 208* (N). Mato Grosso: *Eiten & Eiten 9034* (W--2971855); *Murça Pires & Furtado 17174* (Ld). Minas Gerais: *W. R. Anderson 8741* (W--2755316); *Regnell III.1620* [10/10/1868] (W--1232005, W--132006); *Williams & Assis 6618* (W--1932760). Pará: *Prance, Silva, Berg, Henderson, Nelson, Balick, Bahia, & Santos P.24796* (W--2868550), *P.25103* (W--2868559). Paraná: *Hatschbach 26798* (Ba), *31062* (Ba); *Lindeman & Haas 3055* (Ws). PARAGUAY: *Casas, Hahn, & Schinini FC.7504* (N). MOUNTED ILLUSTRATIONS: Ferre, Pl. Bras. Esp. Cerrado [145], fig. 61. 1969 (Ld).

LIPPIA LUPULINA f. *ALBA* Mold., Phytologia 56: 342. 1984.

Synonymy: *Lippia paraguariensis* Briq. in Chod. & Hassler, Bull. Herb. Boiss., ser. 2, 4: 1163--1164. 1904. *Lippia lupulina* var.

albiflora Troncoso, Darwiniana 12: 258 & 289--291. 1961. *Lippia paraguariensis* Briq., Chod., & Hassl., in herb.

Bibliography: Briq. in Chod. & Hassler, Bull. Herb. Boiss., ser. 2, 4: 1163--1164. 1904; Briq. in Chod. & Hassler, Pl. Hassler. 2 (11): 499. 1904; Prain, Ind. Kew. Suppl. 3: 104. 1908; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 41 & 96. 1942; Mold., Lilloa 8: 425 (1942) and 10: 378--379. 1944; Mold., Alph. List Cit. 1: 264 (1946) and 3: 693, 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 99 & 190. 1949; Mold., Résumé 117 & 462. 1959; Troncoso, Darwiniana 12: 258 & 289--291, pl. 4, & fig. 17. 1961; Hocking, Excerpt. Bot. A.5: 586. 1962; Mold., Résumé Suppl. 5: 5--7. 1962; Mold., Phytologia 12: 271. 1965; Mold., Fifth Summ. 1: 186 (1971) and 2: 563 & 892. 1971; Mold., Phytologia 39: 171. 1978; Mold., Phytol. Mem. 2: 179. 1980; Mold., Phytologia 48: 179. 1981.

Illustrations: Troncoso, Darwiniana 12: 290, pl. 4 & fig. 17. 1961.

Inasmuch as this plant seems to differ from the typical form of the species only in its white corollas, modern practice would indicate nothing higher than form rank for it, and the only epithet available for it in that category is *alba*.

Citations: PARAGUAY: *Casas & Molero FC.6409* (N--type; *Hassler 7802* (It--photo, Kr--photo, N, N--photo, W--photo); *Pedersen 9428* (N, W--2883280). MOUNTED CLIPPINGS: Briq. in Chod. & Hassler, Bull. Herb. Boiss., ser. 2, 4: 1163--1164. 1904 (W).

LIPPIA LUPULINA var. *PARAGUARIENSIS* Chod.

Additional bibliography: Mold., Phytologia 48: 179. 1981.

Casas & Molero describe this plant as 50 cm. tall, growing in sandy soil of cerrado. The Smith collection, cited below, was previously erroneously cited by me as typical *L. lupulina*. It certainly also bears striking resemblance to *L. diamantinensis* Glaz.

Additional & emended citations: BRAZIL: Distrito Federal: *Irwin & Soderstrom 5150* (W--2630582). Mato Grosso: *Herbert T. Smith s.n.* [Herb. Mus. Nac. Rio Jan. 14876] (Ja--14876, W--1199748). PARAGUAY: *Casas & Molero FC.6374* (N).

LIPPIA MARTIANA Schau.

Additional bibliography: Mold., Phytologia 48: 180. 1981; Silva, Sano, & Silva, An. Congres. Nac. Bot. 32: 21. 1981.

Recent collectors describe this plant as a shrub, the leaves "coriacea escassa", and have encountered it among disturbed cerrado vegetation, in flower in February. The corollas are said to have been "white" on *Héringer & al. 6509*.

Additional citations: BRAZIL: Distrito Federal: *Héringer, Filgueiras, Mendonça, & Peraire 6509* (W--2926786); *Héringer, Paula, Mendonça, & Salles 361* (Ld, N, N); *Herb. Tax. Class Univ. Bras. 367* (W--2975916). Goiás: *W. R. Anderson 10228* (W--2755317); *Irwin, Grear, Souza, & Santos 13726* (W--2630584).

LIPPIA MATTOGROSSENSIS Mold.

Additional bibliography: Mold., Phytologia 48: 180. 1981.

Additional citations: BRAZIL: Mato Grosso: *W. R. Anderson 9857* (W--2755322); *Irwin, Souza, Grear, & Santos 16787* (W--2630585), *17457* (W--2630583).

LIPPIA MCVAUGHI Mold.

Additional bibliography: Mold., Phytologia 48: 180 (1981) and 54: 230. 1983; Knobloch, Phytol. Mem. 6: 45. 1983; Mold., Phytologia 55: 43 (1984) and 56: 426 & 427. 1984.

Recent collectors describe this plant as an understory shrub, 2--3 m. tall, or as a tree, 5--6 m. tall, "la corteza parda, fisurada y se desprende en largas tiras", and the bracts white or greenish-white. They have found it growing in dry forests on a granitic substrate with *Bursera* and *Cochlospermum*, low deciduous woods, and secondary deciduous woods on metamorphic soil, at 200--250 m. altitude, in flower in February, and in fruit in February, May, and August. They report the vernacular name, "cuero de venado". The corollas are said to have been "white" on *Magallanes 310* & *2754* and "yellowish" on *Magallanes 982*. The *Magallanes 2754* collection is very typical of the species in all respects.

Material of *L. mcvaughi* has been misidentified and distributed in some herbaria as *L. bracteosa* (Mart. &.Gal.) Mold., *L. callicarpaefolia* H.B.K., and *L. nutans* Robinson & Greenm.

Additional citations: MEXICO: Colima: *McVaugh & Koelz 1660* (W--2452252--isotype). Jalisco: *Magallanes 310* (Me--234439), *982* (Ld), *2754* (Ld). Michoacán: *Neill 5339* (Ld). Oaxaca: *Conzatti 3202* (W--1082244); *Reko 3579* (W--888474).

LIPPIA MCVAUGHI var. *LATIFOLIA* Mold., Phytologia 55: 43. 1984.

Bibliography: Mold., Phytologia 55: 43. 1984.

Citations: MEXICO: Jalisco: *Pérez J. 389* (Ld--type).

LIPPIA MEDICA Fenzl ex Baill., Hist. Pl. 11: 94. 1891.

Bibliography: Baill., Hist. Pl. 11: 94. 1891; Mold., Phytologia 50: 255 & 269. 1982.

Nothing is known to me about this puzzling taxon.

LIPPIA MICROCEPHALA Cham.

Additional & emended bibliography: C. Muell. in Walp.,Ann. Bot. Syst. 5: 707. 1860; Bocq., Adansonia, ser. 1 [Baill., Rec. Obs. Bot.], 3: 244. 1863; Wehmer, Pflanzenst., ed. 1, 646. 1911; Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. 13: [Verb. Util. Mat. Méd.] 41--42. 1921; Wehmer, Pflanzenst., ed. 2, 1021. 1931; Mold., Phytologia 48: 180. 1981.

Recent collectors describe this plant as a shrub, 1 m. tall, growing on rocky cliffs and among stones at the edge of waterfalls, in flower in February. The corollas are said to have been "apically lilac, basally white" on *Mattos Silva & al. 258*.

Wehmer (1911) reports that the air-dried leaves contain 0.006% ethereal oil and 23% resin.

Material of *Lippia microcephala* has been misidentified and distributed in some herbaria as *Lantana* sp.

Additional citations: BRAZIL: Bahia: *Mattos Silva, Santos, & Brito 258* (N). Distrito Federal: *Herb. Tax. Class Univ. Bras. 194* (W--2975908). Minas Gerais: *Irwin, Maxwell, & Wasshausen 19813* (W--2630586); *Irwin, Santos, Souza, & Fonseca 22680* (W--2863450); *Mexia 5710* (W--1618200); *Schwacke 14890* (W--1199716). MOUNTED CLIPPINGS:

G. Gardn., Lond. Journ. Bot. 4: 133. 1845 (W).

LIPPIA MICROMERA Schau.

Additional synonymy: *Lippia macromera* Reis & Lipp, New Pl. Sources Drugs 253 sphalm. 1982. *Lippia micromelum* Meijer & Sm. ex Mold., Phytologia 54: 243 in syn. 1983.

Additional & emended bibliography: Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 152. 1895; J. T. & R. Kartesz, Syn. Checklist Vasc. Fl. 2: 467. 1980; Mold., Phytologia 48: 180--181. 1981; Liogier & Martorell, Fl. Puerto Rico 153 & 323. 1982; López-Palacios, Revist. Fac. Farm. Univ. Andes 23: 20 & 51. 1982; Reis & Lipp, New Pl. Sources Drugs 252. 1982; Mold., Phytologia 54: 234 & 243. 1983.

Recent collectors describe this plant as a shrub or subshrub, 1 m. tall, very fragrant when crushed, and have encountered it in deciduous forests, among shrubby vegetation, and in xerophytic roadside vegetation, at 20--550 m. altitude, in flower in May, August, and November. The corollas are described as having been "white" on *Croat 54671* and *Liesner & González 12146*, "white, yellowish in the throat" on *Kalloo B.688*, and "white with a yellow center" on *Davidse & González 19707*.

López-Palacios (1982) reports that the plant is used in Venezuela in the treatment of asthma, while Reis & Lipp (1982) tell us that it is used to flavor meatloaf, stuffing, and gravy in Hawaii.

The *E. C. Leonard 4116* and *Leonard & Leonard 10010*, distributed as *Lippia micromera*, actually are *Lantana exarata* Urb. & Ekm.

Additional citations: VENEZUELA: Anzoategui: *Davidse & González 19707* (Ld). Lara: *Croat 54671* (Ld); *Meijer & Smith 83* (N). Sucre: *Liesner & González 12146* (Ld, Ld). CULTIVATED: Trinidad: *Kalloo B. 688* (N). MOUNTED ILLUSTRATIONS: López-Palacios, Fl. Venez. Verb. [433] & [434], fig. 101 & 102. 1977 (Ld, Ld).

LIPPIA MICROMERA var. *HELLERI* (Britton) Mold.

Additional bibliography: J. T. & R. Kartesz, Syn. Checklist Vasc. Fl. 2: 467. 1980; Mold., Phytologia 48: 181. 1981; Liogier & Martorell, Fl. Puerto Rico 153 & 323. 1982; Reis & Lipp, New Pl. Sources Drugs 252. 1982.

Jansen found this plant growing in sandy soil with spiny cacti and much grazing by goats in the Dominican Republic, where Jiménez describes it as "very common" at 200 m. altitude and where it is known as "orégano". The corollas are said to have been "white" on *Dod & Jiménez 8963* and *Jiménez 8834*. Reis & Lipp (1982) cite *Lavastre 1857* from the Dominican Republic, while Liogier & Martorell (1982) assert that in Puerto Rico it is found wild on hillsides and in thickets at middle and lower elevations and where it is also cultivated for its aromatic foliage and known as "mejorana", "orégano", "orégano chiquito", and "orégano del pais".

Additional citations: HISPANIOLA: Dominican Republic: *Dod & Jiménez 8963* (Lc, Ld); *M. R. Jansen s.n.* [1979 and 1980] (N); *J. J. Jiménez 8834* (Me--282846).

LIPPIA MICROPHYLLA Cham.

Additional & emended bibliography: Bocq., Adansonia, ser. 1 [Baill., Rec. Obs. Bot.], 3: 244. 1863; Mold., Phytologia 48: 181--182. 1981.

Recent collectors refer to this plant as a subshrub, growing in cerrado, and have found it in flower in May and July. The corollas are described as having been "white" on *Herb. Prisco Bezerra 10403* and "yellow" on *Herb. Prisco Bezerra 8841*.

The collection by Steward and his associates, cited below, was previously misidentified and cited as the very similar *L. schomburgkiana* Schau.

Additional & emended citations: GUYANA: *Maas, Westra, & al. 3634* (N). BRAZIL: Ceará: *Fernandes & Martins, Herb. Prisco Bezerra 10403* (F--1931267). Piauí: *Fernandes & Nunes, Herb. Prisco Bezerra 8841* (F--1931273). Roraima: *Steward, Araujo, Buck, Ramos, & Ribamar 248* (N, W--2858548).

LIPPIA MODESTA Briq.

Additional bibliography: Mold., Phytologia 48: 182. 1981.

Novara found this plant in flower in November and describes the corollas as "yellow".

Additional citations: ARGENTINA: Salta: *Novara 2208* (E--2978864). MOUNTED ILLUSTRATIONS: Troncoso in Burkart, Fl. Ilust. Entre Rios 5: 277, fig. 131. 1979 (Ld).

LIPPIA MORII Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.35: 17 & 324. 1980; Mold., Phytologia 48: 182. 1981.

LIPPIA MORONGII Kuntze

Additional bibliography: Mold., Phytologia 48: 182 (1981) and 50: 250. 1982.

The corollas on *Cabrera & al. 28960* are said to have been "yellow" when fresh and the plant was found in anthesis in October -- it represents very well the broad-leaved form of this species.

Additional citations: ARGENTINA: Corrientes: *Cabrera, Botta, Kiesling, Rotman, Tur, & Zuloaga 28960* (N).

LIPPIA MULTIFLORA Mold.

Additional bibliography: Mold., Phytologia 48: 155 & 182--183. 1981.

Additional citations: MOUNTED ILLUSTRATIONS: Letouzey, Man. Bot. For. Afr. Trop. 2 (B): 361. 1972 (Ld); Meikle in Hutch. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 437, fig. 306. 1963 (Ld).

LIPPIA MYRIOCEPHALA Schlecht. & Cham.

Additional synonymy: *Lippia myrocephala* S. & C. ex Mold., Phytologia 50: 262 in syn. 1982.

Additional bibliography: F. C. Seymour, Phytol. Mem. 1: 244. 1980; Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 183--184 (1981), 50: 14 (1981), 50: 241 & 262 (1982), 52: 116 & 117 (1982), and 54: 231. 1983; Raj, Rev. Palaeobot. Palyn. 39: 350, 364, & 396.

1983; Mold., Phytologia 56: 427, 429, 434, 440, & 447. 1984.

Recent collectors refer to this plant as a "1.5 m. perennial", as a shrub, 3--4 m. tall, or as a tree, 7--10 m. tall, with a spreading crown, the flowers "small and green". They have found it growing along roadsides, in open forests, along streams in tall forests and cafetales, on disturbed roadsides with *Trema* and *Guazuma*, on steep slopes with *Pinus*, *Quercus*, *Hauya*, *Erythrina*, *Lysiloma*, *Oreopanax*, and *Ostrya*, on steep slopes covered by evergreen cloud forest, in acahual with *Eupatorium*, *Xanthosoma robustum*, and *Heliconia*, in 15-year old acahual with *Heliocarpus donnell-smithii*, *Cordia alliodora*, and *Lonchocarpus*, and "common" in acahual along roadsides associated with *Pennisetum* and *Heliconia*. Calzada refers to it as "rare" in Veracruz, Wilbur and his associates report it "occasional" in El Salvador. Cowan and Ramos found it growing in 5-year old acahual with *Trema micrantha*, *Cecropia*, and *Hampea*. Welch and his associates encountered it "in rainforest with many bamboo-walled houses with palm-thatched roofs nestled among the trees, many lianas and mostly ascending branches covered with numerous bromeliads, ferns, mosses and orchids". These recent collections have been made at altitudes of 800 to 2300 m. and the plant has been found in anthesis from September to January and in fruit in December. The wood is used for making the frames of native grass huts and for other purposes. The vernacular names, "colpanchi blanco", "copalillo blanco", "macahuité", and "tatascame".

The corollas are described as having been "cream"-color on *Cowan 2708*, "white with a yellow center" on *Stevens & Riviere 20882*, "yellowish" on *Williams & al. 43204*, "pale-yellow" on *Wilbur & al. 16328*, "dull-yellowish" on *Standley 20628*, and "cream & yellow" on *Breedlove 23258*.

A particularly small-leaved form (annotated in an unknown hand "*Lippia myriocephala* forma") is well represented by *Liebmann 11357* and *Heyde & Lux 4388*.

Material of *Lippia myriocephala*, in its nomenclaturally typical form, has been misidentified and distributed in some herbaria as *L. callicarpaefolia* H.B.K., *L. hypoleia* Briq., *L. substrigosa* Turcz., and *L. umbellata* Cav. On the other hand, the *Calderon 450*, *1995*, & *2252*, *Gentry & al. 20391*, *Herb. Nac. Costarric. 8452*, *Johnson 46*, *Liebmann 11256*, *11258*, *11270*, & *11272*, *Mohr 327*, *Nee 23224*, *Nelson 3075*, *Pittier 1907* & *7111*, *Standley 22939*, *Standley & Valerio 44201*, and *Williams & Molina R. 13170* are *L. myriocephala* var. *hypoleia* (Briq.) Mold., while *Herb. Nac. Costarric. 13032* & *13215*, *Heyde & Lux 4385*, *Heyde 236*, *Holway 372*, *Liebmann 11228*, *Miranda 5565* & *5731*, *Ørsted 11223*, *11241*, & *11247*, *Padilla 5* & *10*, *Pittier 7519* & *13032*, *Stork & Horton 8646*, *Tonduz 1460*, *8452*, & *13631*, *Tonduz & Biolley 7218*, and *Türckheim 8731* are *L. cardiostegia* Benth., *Bratz M.125* is *L. jaliscana* Mold., *Dehesa 1603*, *Germán & al. 406*, *González Ortega s.n.*, *Harking 625*, *Lay & Collie s.n.* [San Blas, Dec. 1827 -- Feb. 1828], *Lent 1783*, and *Nervaes Montes & Salazar 61* & *308* are *L. pringlei* Briq., *Gold. 254* is *L. umbellata* Cav., and *Hernández & al. 5212* is something non-verbenaceous.

Additional citations: MEXICO: Chiapas: *Breedlove 23258* (Me--223726), *42691* (Me--255761); *Hill & Cowan 1525* (Me--256632); *Miranda*

5720 (Me--71049); *Matuda 610* (Me--86157, W--1689566), *707* (W--1689523), *3642* (Me--86186). San Luis Potosí: *Roe & Roe 2362* (W--2516415); *Welch, Dunn, Robertson, Case, Torke, & Brown 107* (Au). Tabasco: *Cowan & Ramos s.n.* [C. Cowan 2712] (N). Tamaulipas: *Viereck 949* (W--1687463), *950* (W--1687464). Veracruz: *Calzada 1666* (Me--258834); *Dioscoreas 9961* (Me--176165); *Estrada & al. 765* (Me--270280); *González Leija & Garza 6726* (Me--139142), *6883* (Me--139148), *9961* (Me--179817), *9967* (Me--179815), *10095* (Me--179810), *10115* (Me--179809). State undetermined: *Liebmann 11357* [Cuesta de San Pedro] (W--1315108); *Rovirosa 636* (Me--84704). GUATEMALA: Alta Verapaz: *Tllrckheim 7933* (W--1322945); *Williams, Molina R., & Williams 42067* (Mi); *Williams, Molina R., Williams, & Molina 43204* (Mi). Amatitlan: *Kellerman 6293* (W--2442870). El Petén: *Contreras 5446* (Ws). Sacatepéquez: *J. D. Smith 1450* (W--1322939). Santa Rosa: *Heyde & Lux 4386* (W--1322946), *4388* (W--1322942). Sololá: *Holway 678* (Ld, W--862977, W--862978). Department undetermined: *Heyde 575* (W--247506), *598* (W--247505); *Pittier 1875* [Ipala] (W--578274); *Schwabe s.n.* [Volcan Pacaya, 31 Dec. 1976] (Me--220041). EL SALVADOR: Ahuachapan: *P. C. Standley 20164* (W--1136023). San Salvador: *P. C. Standley 20628* (W--11364611). Santa Ana: *Wilbur, Almeda, & Luteyn 16328* (Me--165889). San Vicente: *P. C. Standley 21536* (W--1137335). Sonsonate: *Allen 7224* (W--2296984). Department undetermined: *Rovirosa 636* [Famulte, Cesnique] (W--1322941). NICARAGUA: Matagalpa: *Stevens, Moreno, & Elmquist 21280* (Ld); *Stevens & Riviere 20882* (Ld).

LIPPIA MYRIOCEPHALA var. *HYPOLEIA* (Briq.) Mold.

Additional synonymy: *Lippia hipoleia* S. & C. ex Mold., Phytologia 50: 262 in syn. 1982. *Lippia pycnocephala* H. R. ex Mold., Phytologia 52: 128 in syn. 1982.

Additional bibliography: F. C. Seymour, Phytol. Mem. 1: 244. 1980; Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 183 (1981), 50: 262 (1982), 52: 117 (1982), and 54: 231. 1983; Raj, Rev. Palaeobot. Palyn. 39: 350, 364, 383, & 396. 1983; Mold., Phytologia 56: 427 & 440. 1984.

Recent collectors refer to this plant as a shrub, 1--5 m. tall, a treelet, or a small to tall tree, 2--13 m. tall, unpleasantly aromatic, the stems to 6 inches in diameter, the bark pale and fissured, the "heads" lavender, and the flowers slightly odorous. They have found it growing on wooded slopes, in elfin cloudforests and ordinary cloudforests, in seasonal evergreen forests along stream slopes, in secondary high evergreen forests, moist forests, mixed subtropical forests, secondary deciduous oak forests, in secondgrowth, on slopes with *Quercus*, *Dodonaea*, and *Calliandra* or with *Pinus* and *Liquidambar*, in disturbed forests of *Quercus*, *Liquidambar*, and *Clethra*, on slopes and along small streams with tropical rainforest along the ridges, in acahual, and in acahual with *Eupatorium*, *Xanthosoma robustum*, and *Heliconia*, at 300--2000 m. altitude, in flower from January to March, May, and September to December, and in fruit in November, January, and February.

Nee found the variety common in much disturbed deciduous forests on steep rocky (calcareous) slopes with maize fields and patches of secondgrowth brush dominated by *Alnus acuminata* ssp. *arguta*; Williams

and Molina report it as "common in forests and the edges of clearings". Smyth refers to it as a common shrub on dry hillsides in Veracruz, while Standley reports it "frequent" in Costa Rica and "common on volcano crater rim" in El Salvador.

The corollas are described as having been "white" on *Breedlove 26515*, *Breedlove & Thorne 20947*, *Moreno 206*, *Norris 17377*, *Rosas R. 715*, and *Zola B. 24 & 672*, "white with a yellow eye" on *Douglas 19004*, "whitish with a mustard-colored eye" on *Lundell 17632*, "cream" on *Araquistain & al. 1726* and *Martínez & Calderón 1211*, "dull-white and lavender" on *Johnson 46*, "pale-yellow" on *Dressler & Jones 190*, "verdoso-cafe" on *Dorantes & al. 1695*, "verde-cafe" on *Vazquez T. 65*, and "cafe" on *Araquistain & Sandino 1432*.

Vernacular names reported for the variety are "carbonero", "cutujuma", "calpanchi", "tamiagua", and "tatascame". The wood is used by the natives to make charcoal.

A notation accompanying *Purpus 8648* reads "leaves entire and more glabrous", but this is not true of the U. S. National Herbarium sheet of this collection.

Material of this variety has been misidentified and distributed in some herbaria as typical *L. myriocephala* Schlecht. & Cham., *L. callicarpaefolia* H.B.K., *L. graveolens* H.B.K., *L. umbellata* Cav. *Buddleia* sp., and even *Compositae*. On the other hand, the *Dioscoreas 9961*, *Esytada & al. 765*, *Miranda 5720*, and *Wilbur & al. 16328*, distributed as *L. myriocephala* var. *hypoleia*, actually represent the typical *L. myriocephala* Schlecht. & Cham., while *Contreras 9641* is *L. umbellata* Cav. and *Dorantes & al. 1126* is probably a species of *Varronia*.

Additional citations: MEXICO: Chiapas: *Breedlove 26515* (Me--199263), *28136* (Me--231870), *36623* (Me--255179); *Breedlove & Thorne 20947* (Me--99257); *Matuda 3630* (Me--86185); *E. W. Nelson 3075* (W--234012); *Ton 1724* (Me--121637), *1784* (Me--121362), *3692* (Me--133270). Chihuahua: *Berlandier 739* (W--81754); *Liebmann 11256* (W--1315068), *11258* (W--1315069). Hidalgo: *Norris 17377* (Me--255026). Puebla: *Boege 1947* (Me--96104); *Gentry, Barclay, & Arguelles 20391* (W). San Luis Potosi: *Edw. Palmer 1137* (W--82068). Tamaulipas: *Vela G. 1774* (Me--222146). Veracruz: *Balls 5489* (W--1793856); *Beaman 6429* (Me--258951); *Botteri 881* (W--242024); *Bourgeau 1471* (W--78510), *2983* (W--78513); *Dorantes, Acosta, Calles, & Marquez 1695* (Au); *Dressler & Jones 190* (Me--43011, W--2328442); *González Leija & Garza 10052* (Me--179813); *Greenman 274* (W--752602); *Liebmann 11270* (W--1315073), *11272* (W--1315074), *11273* (W--1315075); *Martínez Calderón 1211* (Me--140598, Me--140599, Mi); *Mohr 327* (W--771833); *M. Nee 23224* (N); *Ortega & al. 24* (Me--214553); *Purpus 421* (W--470241), *2254* (W--840372), *5751* (W--464429), *8648* (W--1169628); *Rosas R. 715* (Me--118849); *Rzedowski 18956* (Me--91619); *Seler & Seler 3649* (W--1205654); *C. L. Smith 1076* (Me--86159, W--312560); *Smyth 169* (W--1209017); *Sousa 2559* (Me--113187), *2647* (Me--112549); *Taylor & Taylor 7277* (W--2914927); *Vazquez T. 32* (Me--264932), *65* (Me--264897); *Zola B. 24* (Me--271784), *672* (Me--232923, Me--260648). GUATEMALA: Alta Verapaz: *H. Johnson 46* (W--1014674); *Tuerckheim II.1474* (W--860816). Baja Verapaz: *Williams, Molina R., & Williams 42122* (Mi). El Petén: *C. L. Lundell 17632* (Me--137927). Department undetermined:

Record & Kuylen G.90 (W--1315299). HONDURAS: Comayagua: *Nelson & Vargas 2353* (Ld). Morazán: *Williams & Molina R. 13710* (W--2021818). Ocotepeque: *Nelson, Romero, Rubio, & Pereira 4017* (Ld). EL SALVADOR: Cuscatlan: *Calderón 1995* (W--1266619). San Salvador: *Calderón 450* (W--1151431); *Pittier 1907* (W--578309); *P. C. Standley 22868* (W--1138593), *22939* (W--1138656). Department undetermined: *Calderón 2252* [Cerro de San Jacinto] (W--1266619). NICARAGUA: Estelí: *Atwood A.321a* (Ln--266875); *W. D. Douglas 19004* (Ld). Jinotega: *Araquistain, Moreno, & Sandino 1726* (Ld). Matagalpa: *Araquistain & Moreno 690* (Ld); *Araquistain & Sandino 1432* (Ld); *Moreno 206* (Ld); *Williams & Molina R. 42545* (Mi). COSTA RICA: Cartago: *Lent 1097* (W--2542368); *Tonduz 1876* (W--1322947). Guanacaste: *Standley & Valerio 44201* (W--1253558). San José: *Lems 650122 [01-08] 02* (W--2583496); *Pittier 7111* [Herb. Nac. Costarr. 8452] (W--1322944).

LIPPIA MYRIOCEPHALA var. *INTEGRIFOLIA* Loes.

Additional bibliography: Mold., Phytologia 48: 184. 1981.

Additional citations: GUATEMALA: Alta Verapaz: *Seler & Seler 3400* (W--1205986--cotype); *Türckheim 1088* (W--1322940--cotype). EL SALVADOR: Morazan: *Tucker 793* (W--2088087).

LIPPIA MYRIOCEPHALA var. *OVATIFOLIA* (Mold.) Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 184. 1981.

LIPPIA MYRIOCEPHALA var. *TOMENTOSA* Mold., Phytologia 50: 14. 1981.

Bibliography: Mold., Phytologia 50: 14 (1981) and 50: 241. 1982.

Citations: MEXICO: Puebla: *Bruff 1521* (Me--46996--type).

LIPPIA NANA Schau.

Additional bibliography: Mold., Phytologia 48: 184. 1981.

The *Hatschbach 19716*, *Irwin, Souza, & Reis dos Santos*, and *Regnell III.948*, previously cited by me as *Lippia nana*, seem actually to be *L. pumila* Cham., while *Macedo 3251* is *Lantana glaziovii* Mold.

LIPPIA NEPETACEA Schau.

Additional bibliography: Bocq., Adansonia, ser. 1 [Baill., Rec. Obs. Bot.], 3: 244. 1863; Mold., Phytologia 48: 184. 1981.

LIPPIA OATESII Rolfe

Additional bibliography: Mold., Phytologia 48: 184. 1981; Reis & Lipp, New Pl. Sources Drugs 253. 1982.

Reis & Lipp (1982) cite *J. C. Hopkins 10231* from Zimbabwe and report that the collector avers that this plant "keeps away snakes".

LIPPIA OAXACANA Robinson & Greenm.

Synonymy: *Lantana oaxacana* Miranda ex Mold., Phytologia 50: 261. in syn. 1982.

Additional bibliography: Mold., Phytologia 48: 184 (1981), 50: 241 & 261 (1982), and 56: 363. 1984.

Recent collectors describe this plant as a semi-woody herb, 60--80 cm. tall, or a shrub, 1.5 m. tall, with a minty odor, and have found

it growing in low deciduous forests (where Torres and his associates aver that it is abundant) with *Brahea* and *Yucca*, in regrowth woods on limestone hills, and in very dry soil with *Yucca* and cacti, at 1350--2165 m. altitude, in flower from July to November, in fruit in September. They report the vernacular names, "falsa salvia" and "oreganillo". The corollas are said to have been "white" on *L. S. Smith Mex.5* and *Torres & al. 1153*, and "yellow" on *Delgado S. & al. 568*.

It should be noted that the *Nelson 1588 & 1841* specimens, cited below, were annotated as "Type" by someone at the United States National Herbarium, but actually are not types -- the species is founded on *Pringle 6021*.

Material of *L. oaxacana* has been misidentified and distributed in some herbaria as *L. alba* (Mill.) N. E. Br. or *L. geminata* H.B.K. On the other hand, the *Bravo s.n.* [April 29, 1953], distributed as *L. oaxacana*, actually is *Aloysia chiapensis* Mold.

Additional citations: MEXICO: Guerrero: *Pringle 8417* (W--382033); *Toledo & Blanco 124* (Me--209100); *Torres C., Tenorio L., & Romero de T. 1153* (Ld), Morelos: *Miranda 1507* (Me--73531), *1567* (Me--73559); *L. S. Smith Mex.5* (Me--99358). Oaxaca: *Delgado S., García P., & Hernández M. 568* (Me--211304); *E. W. Nelson 1588* (W--566385), *1841* (W--566390); *Pringle 6021* (W--251966--isotype, W--1322967--isotype). Puebla: *Boege 616* (Me--96101), *1929* (Me--96105); *Miranda 2240* (Me--73556); *Purpus 2571* (W--840564). Veracruz: *Miranda 677* (Me--73565). State undetermined: *Botteri 516* [Tecamahua] (Mi).

LIPPIA OBSCURA Briq.

Additional bibliography: Mold., Phytologia 48: 184--185. 1981.

Recent collectors describe this plant as a slender shrub, 1.8 m. tall, the leaves very aromatic, and the flowers fragrant or rather fragrant, occasional in mata ciliar, at 800 m. altitude, in flower in March. The corollas are said to have been "white" on *Héringer & al. 3708* and *Pereira & Mendonça 408*.

Material of this species has been misidentified and distributed in some herbaria as *Lantana* sp.

Additional citations: BRAZIL: Distrito Federal: *Héringer, Figueiras, Mendonca, Pereira, Héringer Salles, & Chagas e Silva 3708* (E--2978869, W--2900655); *Pereira & Mendonça 408* (W--2971673). Parana: *Smith, Klein, & Hatschbach 14604* (W--2673677), *14637* (W--2573722).

LIPPIA ORIGANOIDES H.B.K.

Additional & emended bibliography: Walp., Repert. Bot. Syst. 4: 50 & 53. 1845; Bocq., Adansonia, ser. 1 [Baill., Rec. Obs. Bot.], 3: 244. 1863; Höck, Justs Bot. Jahresber. 23 (2): 76. 1897; Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. Paris 13: [Verb. Util. Mat. Méd.] 2 & 44. 1921; Mold., Phytologia 48: 185. 1981; López-Palacios, Revist. Fac. Farm. Univ. Andes 22: 20 & 51. 1982; Reis & Lipp, New Pl. Sources Drugs 252. 1982; Mold., Phytologia 50: 245 (1982) and 54: 236. 1983.

Recent collectors describe this plant as a small shrub, 1--2 m. tall, aromatic, the branches arched and subscandent, and the flowers

very fragrant. They have encountered it in rocky terrain of the savannas on plateaus of small tepuis, at 100 m. altitude, in flower in March, May, July, and August, and in fruit in July. They report the vernacular name, "salvinha".

López-Palacios reports that the plant is used by natives in the treatment of asthma, while Hill and his associates tell us that its leaves are used as a tea to treat stomach troubles. Reis & Lipp (1982) cite *Steyermark 58601* and note that the "leaves boiled in water with guarapo (sugar drink) used for colds", reporting the native name, "chara-ceúr".

The corollas are said to have been "white" on *Bunting 6216*, *Hill & al. 12918*, *Liesner & González 11996* & *12148*, and *Prance & Huber 28380*.

Additional citations: COLOMBIA: Magdalena: *Dugand 6262* (W--2457488); *Haught 3887* (W--1708637), *6644* (W--2046231). Santander: *St. John 20718* (W--2107515). VENEZUELA: Bolívar: *Davidse, Ramia, & Montes 4747* (Me--268505); *Maguire 32657* (W--2279173); *Prance & Huber 28380* (Ld). Distrito Federal: *Curran & Haman 966* (W--1043978). Falcón: *Curran & Haman 606* (W--1010926). Sucre: *Liesner & González 11996* (Ld), *12145* (E--2930317). Zulia: *Bunting 6216* (Ld). BRAZIL: Minas Gerais: *Schwacke s.n.* [Herb. Mus. Nac. Rio Jan. 14894] (W--1199725); *Ule 2671* [Herb. Mus. Nac. Rio Jan. 14896] (W--1199797). Roraima: *Maguire & Maguire 40022* (W--2279249). CULTIVATED: Brazil: *Hill & al. 12918* (Ld). MOUNTED ILLUSTRATIONS: López-Palacios, F. Venez. Verb. [439], fog. 103. 1977 (Ld).

LIPPIA OXYCNEMIS Schau.

Additional bibliography: Mold., Phytologia 48: 185. 1981.

Recent collectors describe this plant as a shrub, 1.5 m. tall, with aromatic pubescent leaves, and have encountered it in cerrado and "near brejo", in anthesis in April and July.. The corollas are said to have been "reddish" on *Héringer & al. 7210* and "rose" on *Pereira 465*.

Additional citations: BRAZIL: Distrito Federal: *Héringer, Filgueiras, Mendonça, & Pereira 7210* (N, W--2941379); *Irwin, Grear, Souza, & Reis dos Santos 15636* (W--2863362), *18034* (W--2630566); *Pereira 465* (N, W--2971679); *Sucre 750* (W--2564914). Minas Gerais: *Williams & Assis 7206* (W--1932936).

LIPPIA OXYPHYLLARIA (Donn. Sm.) Standl.

Additional bibliography: Pittier, Prim. Fl. Costaric. 2: 207. 1898; Mold., Phytologia 48: 185 (1981) and 56: 427 & 432. 1984.

Recent collectors describe this plant as a slender, bushy shrub, 1--2.5 m. tall, or a small tree or treelet, 3--5 m. tall, the stems 5--7.5 cm. in diameter at breast height, and the flowers fragrant. They have found it growing on lava flows,in open badly gullied lava fields, and woods adjacent to grassy slopes on lava flows, at 200--1900 m. altitude, in flower from December to March and in June, in fruit in March and December. Little refers to it as "common in groves at the edge of savannas on soil of volcanic dust and pumice and lava boulders" and in evergreen rainforests.

The corollas are said to have been "yellow on *Hammel 1598*, *Molina*

R. 3077, *Tyson 7280*, and *Wilbur & Teeri 13337* and "pale-yellow" on *Wilbur & al. 15309*.

Material of this species has been misidentified and distributed in some herbaria as *L. callicarpaefolia* H.B.K., *L. substrigosa* Turcz., and *L. umbellata* Cav.

Additional citations: HONDURAS: Morazán: *Molina R. 3077* (W--2022485). COSTA RICA: Puntarenas: *Pittier 3951* (W--1322985--cotype), *10632* (W--1322984); *Tonduz 6667* (W--1322983--cotype). PANAMA: Chiriquí: *P. H. Allen 1008* (W--1976216), *1541* (W--1820117); *Davidson 793* (W--1820756); *Hammel 1598* (Ld); *Little 6071* [U. S. For. Serv. 95251] (W--1842538); *Maurice 693* (W--1844123); *Pittier 3336* (W--677719); *Tyson 7280* (Me--202468); *Wilbur, Almeda, Luteyn, & Utley 15309* (Me--165882); *Wilbur & Teeri 13337* (Me--165898). Coclé: *R. S. Williams 151* (W--1208090). MOUNTED ILLUSTRATIONS & CLIPPINGS: Mold. in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 68, fig. 4. 1973 (Ld); Donn. Sm., Bot. Gaz. 23: 249. 1897 (W); Pittier, Prim. Fl. Costaric. 2: 207. 1898 (W).

LIPPIA PALMERI S. Wats.

Additional bibliography: Rzedowski, Veget. Mex. 360. 1978; Mold., Phytologia 48: 255. 1981; Reis & Lipp, New Pl. Sources Drugs 252. 1982; Knobloch, Phytol. Mem. 6: 88. 1983; Mold., Phytologia 54: 230 (1983) and 56: 439. 1984.

Recent collectors describe this plant as a small shrub, 1.5--2 m. tall, many-branched, and have found it growing in low matorral, on south-facing slopes, hillsides, and arid hilltops, on low hills and flats, basaltic hills, and in association with *Jatropha cinerea*, *Lysiloma candida*, and *Gochnatia arborescens*, with *Pachycereus*, *Larrea*, *Bursera*, *Fouquieria*, *Opuntia*, *Machaerocereus*, and *Stenocereus*, and with *Prosopis*, *Calliandra*, *Lantana*, and *Ruellia*. Daniel refers to it in one locality as "frequent" and in another as "infrequent". Collectors have encountered it at 5--300 m. altitude, in flower from January to April and in October, in fruit in January, April, and October. The vernacular name, "oregano", is reported for it.

The corollas are said to have been "white" on *Carter 2667* and *Gentry 3007*, "purplish" on *Daniel 2437*, and "purple" on *Daniel 2459*. The young leaves are very densely white-pubescent on *Ortega 5509* Reis & Lipp (1982) cite *Carter & Moran 5381*.

Rzedowski (1978), quoting Shreve (1951), states that in Baja California *Lippia palmeri* grows in matorral in close association with *Atriplex canescens*, *Suaeda fruticosa*, *Lycium carinatum*, *Maytenus phyllanthoides*, *Stegnosperma halimifolium*, and *Phaulothamnus spinescens*.

The *Sousa, Germán, & Rico 8074*, distributed as *Lippia palmeri*, actually is *L. graveolens* H.B.K., while *Barkley & Carr 36013* is *Aloysia sonorensis* Mold. and *Vaughn 621* is *Lantana macropoda* Torr.

Additional citations: MEXICO: Baja California: *Ames, Hones, Kopfoy, Perrill, Urry, & Turner 77-62* (Me--243280); *Brandegee s.n.* [Sierra de la Trinidad, Nov. 1902] (W--397996); *A. Carter 2667* (W--2023092); *Carter, Alexander, & Kellogg 2476* (W--2022971); *Carter & Ferris 3758* (W--2539503); *Daniel 2437* (Mi), *2459* (Mi); *Hammerly 405*

(W--1896165); *Nelson & Goldman 7318* (W--565400); *D. M. Porter 122* (Me--48266), *300* (Me--48265); *Shreve 7184* (W--1749078); *S. Walker 79H28* (N); *Wiggins 15399* (Me--104302); *Wiggins, Carter, & Ernst 319* (Me--106634); *Wiggins & Ernst 576* (Me--106633). Nuevo León: *Canby, Sargent, & Trelease 192* (W--1589223). Sinaloa: *Ortega 5509* (W--1207554); *Rose, Standley, & Russell 13500* (W--638081). Sonora: *H. S. Gentry 3007* (W--1686843); *Hastings & Turner 72-56* (Me--159225); *Edw. Palmer 277* (W--46705--cotype, W--1322971--cotype), *643* (W--82163--cotype, W--1322970--cotype), *644* (W--82162--cotype, W--1322970--cotype, W--1416746--cotype); *Turner & Duek 79-27* (Me--295918), *79-51* (Me--294692); *Wiggins 6347* (W--1684613). GULF OF CALIFORNIA ISLANDS: Coronados: *Wiggins 17489* (Me--107273). Partida: *Collins, Kearny, & Kempton 146* (W--1530544). Tiburón: *Gold s.n.* [25 Marzo 1968] (Me--117053); *Wiggins 17149* (Me--106883); *Wilkinson s.n.* [12 October 1977] (Mi).

LIPPIA PALMERI f. *SPICATA* (Rose) Mold.

Additional bibliography: Mold., Phytologia 48: 255--256. 1981.

Gold encountered this plant in low matorral. in both flower and fruit in March.

Additional citations: MEXICO: Baja California: *Edw. Palmer 62* (W--46706--type); *D. M. Porter 380* (Me--48264); *Wiggins 5539*(Me--107732), *14614* (Me). GULF OF CALIFORNIA ISLANDS: Tiburón: *Gold 388* (Me--117063); *I. M. Johnston 4267* (W--1316668). MOUNTED ILLUSTRATIONS: Wiggins, Fl. Baja Calif. [531], fig. 499. 1980 (Ld).

LIPPIA PAUCIFLORA Urb. ex Mold., Phytologia 50: 252 sphalm. 1982

This binomial is the result of an unfortunate typographic error -- the "*L.*" should stand for "*Lantana*" rather than *Lippia*. It therefore falls into the synonymy of *Lantana pauciflora* Urb.

LIPPIA PEDUNCULOSA Hayek

Additional bibliography: Mold., Phytologia 48: 256. 1981.

Additional citations: BRAZIL: Alagoas: *G. Gardner 1386* (W--1066571--isotype. MOUNTED CLIPPINGS: Hayek, Fedde Repert. Spec. Nov. 2: 87. 1906 (W).

LIPPIA PENDULA Rusby

Additional bibliography: Mold., Phytologia 48: 256. 1981.

Additional citations: BOLIVIA: La Paz: *R. S. Williams 307* (W--1159328--isotype).

LIPPIA PETIOLATA Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 256. 1981.

LIPPIA PHAEOCEPHALA Briq.

Additional bibliography: Mold., Phytologia 48: 256. 1981.

Additional citations: MOUNTED ILLUSTRATIONS: Troncoso, Darwiniana 12: 277, fig. 10. 1961 (Ld).

LIPPIA PLICATA J. G. Baker

Additional bibliography: K. Schum., Justs Bot. Jahresber. 28 (1): 496. 1900; White & Angus, For. Fl. N. Rhodes. 370. 1962; Mold., Phytologia 48: 256--257 (1981) and 56: 447. 1984.

Belsky describes this plant as a perennial herb with white corollas and found it growing in the tall grass-*Acacia* woodland association with *Hyparrhenia filipendula*, *Themeda triandra*, and *Diheteropogon amplectens*, in flower in May. White & Angus (1962) cites *Bull. 3960*, *Carson 198*, and *Richards 214* from Zambia. Kahurananga and his associates describe the plant as a shrub, 2.5 m. tall, and encountered it in highland scrub-grassland, in both flower and fruit in May, the flowers "small, white, and sparse". White & Angus (1962) describe the leaves as fragrant, variable, more or less lanceolate, 3--9 cm. long, 1--3 cm. wide, rugose and usually scabrid above, puberulous beneath, the flower-heads strobiliform. about 1.5 cm. long and wide, enlarging to 5 cm. long and 2 cm. wide in fruit, the bracts foliaceous, 7 mm. long and 4.5 mm. wide, and the corollas white.

Material of this species has been misidentified and distributed in some herbaria as *L. javanica* (Burm. f.) Spreng.

Additional citations: TANZANIA: Tanganyika: *Belsky 271* (Ba--394624); *Kahurananga, Kibuwa, & Mungai 2583* (Mu).

LIPPIA POHLIANA Schau.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 257. 1981.

Additional citations: BRAZIL: Goiás: *W. R. Anderson 8063* (W--2755319), *9995* (W--2755314). Minas Gerais: *Irwin, Santos, Souza, & Fonseca 22466* (W--2863457).

LIPPIA POHLIANA var. *LONGIBRACTEOLATA* Mold.

Additional bibliography: Brenan, Ind. Kew. Suppl. 16: 166. 1981; Mold., Phytologia 48: 257. 1981.

LIPPIA POLYTRICHA Briq.

Additional bibliography: Mold., Phytologia 48: 257. 1981.

Additional citations: PARAGUAY: *Hassler 4184* [Macbride photos 24660] (W--photo of cotype). MOUNTED ILLUSTRATIONS & CLIPPINGS: Briq., Bull. Herb. Boiss., ser. 2, 4: 1158. 1904 (W); Troncoso, Darwiniana 12: 279. 1961 (Ld).

LIPPIA PRIMULINA var. *GOYAZENSIS* S. Moore

Additional bibliography: Mold., Phytologia 48: 257. 1981.

Additional citations: BRAZIL: Distrito Federal: *Irwin, Souza, & Reis dos Santos 8577* (W--2630580); *Pereira 81* (W--2951319).

LIPPIA PRINGLEI Briq.

Additional synonymy: *Lippia pringlei* Brign., in herb.

Additional & emended bibliography: Briq., Bull. Herb. Boiss., ser. 1, 4: 340--341. 1896; K. Schum., Justs Bot. Jahresber. 28 (1): 497. 1900; Mold., Phytologia 48: 257--258 & 266 (1981) and 50: 241 & 243. 1982; Knobloch, Phytol. Mem. 6: 95. 1983; Mold., Phytologia 56: 428 & 431. 1984.

Recent collectors describe this plant as a large, single-stemmed shrub or small, conical, round-topped tree, 1.5--15 m. tall,, with heavy foliage and weak branches, the bark rather smooth and gray, the leaves fragrant with a strong lemon odor, the flower-heads greenish, and the flowers much visited by small bees. They have found it growing along roadsides and streamsides, gravel roadsides, pastures, ravines, barrancas, and secondary matorral, in deciduous and low deciduous forests, wooded quebradas, and heavily grazed secondary oak scrub, on oak-pine rocky slopes, oak-pine woods, among rank, weedy, brushy roadside vegetation in former tropical subdeciduous woodland, on dry slopes and in rocky ravines through sparse oak forests, and near the base of cliffs and talus slopes among pines and oaks, at 66--2600 m. altitude, in flower from October to March and May, in fruit from November to March and May. Nervaes Montes & Salazar refer to it as abundant in moist places in Sinaloa, where Gentry & Argüelles also speak of it as "common". Iltis and his associates found it "very common on roadsides and among xerophytic shrubs" in Jalisco. A wood sample accompanies the *Palmer 1199* collection. Common names reported for the species are "macuay", "nacare", "nacaré", "nacari", "tabanquillo", and "tefrozana".

The corollas are described as having been "yellow" on *Croat 45736*, *Ernst 2446*, *Gentry & Argüelles 18181*, *Hinton 11717*, *Miller & al. 241*, and *Neill 5410*, "yellowish" on *Croat 45792 & 46081*, "pale-yellow" on *Croat 45711* and *Standley 34678*, "yellow or cream" on *Ferris 5907*, "light-cream to yellow"on *Lent 1783*, "deep-yellow fading to pale-yellow" on *Iltis & al. 1144*, "dark-yellow fading to very pale-yellow" on *Iltis & Nee 1505*, "greenish-yellow" on *Croat 45342*, "yellow and reddish" on *Langlassé 744*, "yellow at anthesis, later nearly white" on *Wiggins 13187*, "more or less white or very pale-yellow" on *Ernst 2558*, "greenish-white" on *Croat 45324*, "green" on *Vazquez T. V.1869*, and "white" on *Langman 3148*.

Material of *Lippia pringlei* has been widely misidentified and distributed in many herbaria as *L. callicarpaefolia* H.B,K., *L. chrysantha* Greenm., *L. myriocephala* Schlecht. & Cham., *L. umbellata* Cav., and even *Compositae*.

Additional citations: MEXICO: Colima: *Lott & Magallanes 929* (Ld). Guerrero: *Croat 45711* (Ld), *45736* (Ld); *Freeland & Spetzman 127* (Me--149769); *Hinton 11717* (Me--64800, W--1822363); *Langlassé 744* (W--386156); *E. W. Nelson 2285* (W--566485), *2319* (W--566483); *Edw. Palmer 479* (W--267037, W--1689160); *Reko 5058* (W--1269846); *Schwabe s.n.* [1° de enero de 1977] (Me--220043). Jalisco: *Iltis, Guzmán M., & Nee 1144* (Ld, Mi); *Iltis & Nee 1505* (Mi); *Langman 3148* (Me); *Mexia 1354* (W--1318291); *Miller, Lorence, & Trigos 241* (Ld); *Pringle 1733* (W--42739--isotype, W--1322972--isotype), *11088* (W--1586761), *11669* (W--461127); *Purpus 508* (W--474731). México: *González Medrano & al. 5385* (Me--158522); *Hinton 7237* (W--1822265); *Matuda & al. 27854* (Me--108894), *30505* (Me--64809). Michoacán: *Chiang, González Medrano, & Ramos A. 602* (Me--153347); *Gándara s.n.* [Zamora] (Me--56593); *Germán & al. 406* (Me--282643); *Hinton 12949* (W--1805634), *13614* (W--1805674); *E. W. Nelson 6838* (W--399188), *6951* (W--399271). Morelos: *Bourgeau 1217* (W--82067); *Harking 625* (Me--64799); *Lyonnet 1166* (Me--241024,

Me--241025): *Miranda 239* (Me--73566); *Paray 3014* (Me--100006); *Pringle 11087* (W--460471), *13982* (W--1586768); *Seler & Seler 4337* (W--1206016); *Vázquez 5027* (Me--168933). Nayarit: *Croat 45193* (Ld), *45324* (Ld), *45342* (Ld); *Ferris 5796* (W--1491171), *5907* (W--1491170); *Gentry, Barclay, & Argüelles 19637* (W--2366390); *Edw. Palmer 2056* (Ld, W--305636), *s.n.* [Tepic, Jan. 5 to Feb. 6, 1892] (W--567870); *Rose, Standley, & Russell 14281* (W--637144). Oaxaca: *Boege 3025* (Me--209875); *Conzatti & Gonzalez 526* (W--327280); *Croat 45778* (Ld), *45792* (Ld), *46081* (E--2889932); *Ernst 2446* (Me--246192), *2476* (Me--270230), *2558* (Me--246193); *Funk & Ramos A. 2371* (W--2968763); *Jurgensen 431* [Macbride photos 24655] (W); *Morton & Makrinius 2416* (W--1585435); *Neill 5410* (Ld); *E. W. Nelson 1840* (W--566110), *2071* (W--566490), *2090* (W--566489); *Rzedowski 19280* (Me--95680); *Seler & Seler 4358* (W--1206017); *C. L. Smith 225* (Me). Puebla: *Boege 344* (Me--96107); *R. Weber 841* (Me--236215). Sinaloa: *Dehesa 1603* (W--1035770); *Gentry & Argüelles 18181* (W--2301939); *Gonzalez Ortega 4452* (Me--98674, W--1083293), *4744* (Me--98661, W--1268435), *4999* (W--1165045), *5004* (W--1165050), *5707* (W--1208729), *6548* (W--1317419), *s.n.* (Me--98671); *Narvaez Montes & Salazar 61* (W--1035052), *308* (W--1035211); *Edw. Palmer 1199* (Ld, W--209050, W--209051, W--1416742); *Wiggins 13187* (Me--58648). Sonora: *Gentry 1179* (W--168971). Veracruz: *Vázquez T. V.1869* (Me--265466). State undetermined: *Galeotti 795j* [Calea] (W--572881); *Lay & Collie s.n.* [San Blas, Dec. 1827 -- Feb. 1828] (W--1084827); *Liebmann 11261* [Cuesta de la San Juan] (W--1315070). COSTA RICA: Cartago: *Lent 1783* (Me--166024). Province undetermined: *P. C. Standley 34678* [La Ventolera] (W--1226787).

LIPPIA PSEUDO-THEA (A. St.-Hil.) Schau.

Additional & emended bibliography: Lindl., Veg. Kingd., ed. 1, 663 (1846), ed. 2, 663 (1847), and ed 3, 663. 1853; Bocq., Adansonia, ser. 1 [Baill., Rec. Obs. Bot.], 3: 244. 1863; Baill., Hist. Pl. 11: 94. 1891; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 152. 1895; Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. 13: [Verb. Util. Mat. Méd.] [19] & 25--26, pl. 2, fig. 9--11. 1921; Mold., Phytologia 48: 258 (1981) and 56: 436. 1984.

Additional illustrations: Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. 13: [Verb. Util. Mat. Méd.] [19], pl. 2, fig. 9--11. 1921.

The *Williams & Assis 7160*, cited by me as *L. pseudo-thea* in a previous segment of these notes and so distributed, actually is *L. florida* Cham.

LIPPIA PUMILA Cham.

Additional bibliography: Mold., Phytologia 48: 258 (1981) and 56: 446. 1984.

Recent collectors describe this plant as growing from a xylopodium and refer to it as rather frequent on rocky campos. They have found it in flower in August and September; the corollas are said to have been "yellow" on *Hatschbach 19716* and *Héringer & al. 7481*.

Material of *L. pumila* has been misidentified and distributed in some herbaria (and even cited by me in a previous installment of these notes) as *L. nana* Schau. On the other hand, the *Dusén 15736*, previously cited by me as *L. pumila*, seems, rather, to be *L. intermedia*

Cham.

Additional & emended citations: BRAZIL: Distrito Federal: *Irwin, Souza, & Reis dos Santos 8847* (Ld), *9085* (N, N). Minas Gerais: *Regnell III.948* (Ld--photo, N, N--photo). Paraná: *Hatschbach 19716* (Ld, N).

LIPPIA RAMBOI Mold.

Additional bibliography: Angely, S. Amer. Bot. Bibl. 2: 670 & 677. 1980; Mold., Phytologia 48: 258. 1981.

LIPPIA RAMBOI var. *PILOSA* Mold.

Additional bibliography: Angely, S. Amer. Bot. Bibl. 2: 677. 1980; Mold., Phytologia 48: 258. 1981.

LIPPIA RECOLLETAE Morong

Additional bibliography: Angely, S. Amer. Bot. Bibl. 2: 677. 1980; Mold., Phytologia 48: 258--259. 1981.

Recent collectors describe this plant as an abundant, spreading, coarse herb or subshrub, 50 cm. tall, and have encountered it on campos and in cerrado, at 320--3300 m. altitude, in both flower and fruit in December, but also in flower in February.

The corollas are described as having been "yellow" on *King & Bishop 7577*, "white and yellow" on *Casas & Schinini 7480* and *Schinini 22969*, "white, the interior of the tube deep-yellow" on *Hatschbach 45952* and *46114*, and "light-lilac with a yellow center" on *Casas & Molero FC.5912*.

This species is very closely related to *L. suffruticosa* (Griseb.) Kuntze and may better be regarded merely as a more shaggy variety of the latter, The Steinbach collection, cited below, has been distributed and cited under both names.

Additional & emended citations: BRAZIL: Mato Grosso: *Hatschbach 45952* (Ld), *46114* (Ld); *Murça Pires & Furtado 17243* (Ld). BOLIVIA: Cochabamba: *King & Bishop 7577* (E--2615859); *R. F. Steinbach 740* (W--2533616). PARAGUAY: *Casas & Molero FC.5912* (N); *Casas & Schinini 7480* (Ld); *Morong 62* (W--47866--isotype); *Schinini 22969* (Ld). MOUNTED CLIPPINGS: Briq., Ann. Conserv. Jard. Bot. Genev. 7-8/315--316. 1904 (W); Morong, Britton, & Vail, Ann. N. Y. Acad. Sci. 7: 196--197. 1892 (W).

LIPPIA RECOLLETAE var. *PICKELII* (Mold.) Mold.

Additional bibliography: Angely, S. Amer. Bot. Bibl. 2: 677. 1980; Mold., Phytologia 48: 259. 1981.

Solomon describes this plant as having ascending stems and pale-pink corollas. He encountered it along open roadsides in disturbed moist tropical forests with abundant epiphytes, at 600 m. altitude, in both flower and fruit in April.

Additional citations: BOLIVIA: Tarija: *Solomon 9973* (Ld).

LIPPIA RHODOCNEMIS Mart. & Schau.

Emended synonymy: *Lippia rhodomensis* Mart. & Schau. ex Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 152 sphalm. 1895.

Additional & emended bibliography: C. Muell. in Walp., Ann. Bot.

Syst. 5: 707. 1860; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 152. 1895; Mold., Phytologia 48: 259 (1981) and 50: 262. 1982.

LIPPIA RIGIDA Schau.

Additional bibliography: Mold., Phytologia 48: 259. 1981.

Additional citations: BRAZIL: Bahia: *Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15602* (W--2791573), *15756* (W--2791586), *16708* (W--2791550).

LIPPIA RIVALIS Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.35: 17 & 324. 1980; Mold., Phytologia 48: 259. 1981.

Additional citations: BRAZIL: Bahia: *Hatschbach 42128* (W--2937343--isotype).

LIPPIA RONDONENSIS Mold.

Additional bibliography: Mold., Phytologia 48: 259--260 (1981) and 50: 246 & 248. 1982.

Recent collectors describe this plant as an aromatic herb or subshrub, 1 m. tall, with green bracts, and have encountered it on wet savannas and in varzea woods, at 70--200 m. altitude, in flower in January and July. It is used by natives in the form of a tea to treat upset stomachs.

The corollas are said to have been "violet" on *Beck 5468* "lavender" on *Gentry & al. 30738*, "arroxeadas" on *Cid & Lima 3500*, and "purple with a yellow center" on *Campbell & al. P.21214*.

It seems very possible that this taxon (or, at least, some of the specimens so identified) may prove actually to represent only a form of the very variable *L. alba* (Mill.) N. E. Br., perhaps identical with its f. *intermedia* Mold. It has been misidentified as *Lantana* sp.

Additional citations: ECUADOR: Los Ríos: *Gentry, Bonifaz, Loor, & Lao 30738* (Ld). BRAZIL: Amazônas: *Campbell, Nelson, Ramos, & Insley P.21214* (Ld); *Cid & Lima 3500* (Ld). Rondônia: *Prance, Philcox, Forero, Coelho, Ramos, & Farias 5351* (W--2573137A). BOLIVIA: El Beni: *S. G. Beck 5468* (Ld).

LIPPIA ROSMARINIFOLIA Anderss.

Additional bibliography: C. Muell. in Walp., Ann. Bot. Syst. 5: 707. 1860; Mold., Phytologia 48: 260. 1981.

LIPPIA ROTUNDIFOLIA Cham.

Additional bibliography: C. Muell. in Walp., Ann. Bot. Syst. 5: 707. 1860; Mold., Phytologia 48: 260 & 290--291 (1981), 50: 247 & 269 (1982), 52: 414 (1983), and 54: 236. 1983.

Irwin and his associates encountered this plant at 900 m. altitude, in both flower and fruit in June, and describe the corollas as "purple, fading to reddish-lavender in age".

The *Ratter & al. R.2600*, distributed and previously cited as typical *L. rotundifolia*, is now regarded as the newly described var. *bahiensis* Mold., while *Hëringer & al. 644* is *L. lacunosa* Mart. & Schau.

Additional citations: BRAZIL: Goias: *Irwin, Souza, Grear, & Reis dos Santos 17922* (W--2863363); *Macedo 3313* (W--2197084).

LIPPIA ROTUNDIFOLIA var. *BAHIENSIS* Mold., Phytologia 48: 290--291. 1981.

Bibliography: Mold., Phytologia 48: 290--291 (1981) and 50: 247 & 269. 1982.

Collectors describe this plant as an herb with "rather lignified shoots", to 1.5 m. tall, and have encountered it in cerrado (tall savanna woodland). The corollas are said to have been "mauve-purple with a yellow throat" on the Ratter collection, cited below, and "rose with a yellow center" on the Héringer collection. The Ratter collection was previously incorrectly cited by me as typical *L. rotundifolia* Cham.

Additional & emended citations: BRAZIL: Bahia: *Mori 12919* (Ld--type). Distrito Federal: *Héringer, Figueiras, Mendonça, Pereira, Salles, & Chagas e Silva 5392*(W--2926855); *Ratter, Fonsêca, & Castro R.2600* (N).

LIPPIA ROTUNDIFOLIA var. *CORDATA* Mold., Phytologia 52: 414. 1983.

Bibliography: Mold., Phytologia 52: 414 (1983) and 54: 236. 1983.

Citations: BRAZIL: Distrito Federal: *Héringer 14827* (N--type).

LIPPIA RUBIGINOSA Schau.

Additional bibliography: Mold., Phytologia 48: 260. 1981.

Landrum describes this plant as a shrub, 1.5 m. tall, with white corollas, and found it growing among mainly shrubby vegetation on a very rocky iron-rich substrate, at 1200--1700 m. altitude, in both flower and **fruit in February.**

Additional citations: BRAZIL: Minas Gerais: *Landrum 4254* (N); *Macedo 2071* (W--2196797).

LIPPIA SALAMENSIS Loes.

Additional bibliography: Mold., Phytologia 48: 260. 1981.

Additional citations: GUATEMALA: Morazán: *Seler 3404* [Macbride photos 17538] (W--1205988--cotype, W--photo of cotype).

LIPPIA SALICIFOLIA Anderss.

Additional bibliography: C. Muell. in Walp., Ann. Bot. Syst. 5: 707. 1860; Mold., Phytologia 48: 261. 1981.

LIPPIA SALSA Griseb.

Additional bibliography: Mold., Phytologia 48: 261. 1981.

Recent collectors have found this plant in flower in November. The corollas are said to have been "white" on *Burkart & al. 30583* and "lilac-white" on *Burkart & al. 30600*.

Additional citations: ARGENTINA: Santiago del Estero: *Burkart, Troncoso, Bacigalupo, Guaglianone, Rotman, & Ulibarri 30583* (Me--204554), *30600* (Me--203020, W--2928384). MOUNTED ILLUSTRATIONS: Ragonese, Revist. Invest. Agric. 5: 209, fig. 44. 1951 (Ld).

LIPPIA SALVIAEFOLIA Cham.

Additional bibliography: Mold., Phytologia 48: 261. 1981.

Recent collectors describe this plant as a shrub, 1--3 m. tall, and have found it in flower in January and February. The corollas are described as having been "white" on *Shepherd & Gibbs 11248*, "cream" on *Mantovani 1678*, and "yellowish" on *Mantovani 1560*.

Additional citations: BRAZIL: São Paulo: *Mantovani 1560* (N), *1678* (N); *Shepherd & Gibbs 11248* (N). PARAGUAY: *Balansa 4624* (Me--243966).

LIPPIA SAVORYI Meikle

Additional & emended bibliography: Meikle in Brenan & al., Kew Bull. 17: 173--174. 1963; Mold., Phytologia 48: 261. 1981.

LIPPIA SCABERRIMA Sond.

Additional bibliography: Power & Tutin, Am. Journ. Pharm. 79: 449--462. 1907; Journ. Pharm. Chem., ser. 6, 26: 414--415. 1907; Wehmer, Pflanzenst., ed. 1, 646. 1911; Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. 12: [Verb. Util. Mat. Méd.] 40--41. 1921; Wehmen, Pflanzenst., ed. 2, 1021. 1931; Mold., Phytologia 48: 261--262. 1981.

Wehmer (1931) records the vernacular name "beukess boss" for this plant in South Africa. He reports that the dried plant yielded volatile formis acid, heptacosan, alcohol, hentriacontan, phytosterin, fatty oil with formic, buteric, valerianic, arachinic, stearinic, palminitic, & linolic acids, lippianol, a glycoside, tannin, etc.

Recent collectors have encountered this plant in sandy soil, describing it as aromatic.

Material of *Lippia scaberrima* has been misidentified and distributed in some herbaria as *Lantana* sp.

Additional citations: SOUTH AFRICA: Transvaal: *Giess 154* (Mu).

LIPPIA SCHLIMII Turcz.

Additional bibliography: Mold., Phytologia 48: 262 (1981) and 52: 119. 1982.

Melampy encountered this plant in dry shrub-dominated areas at 2500 m. altitude.

Additional citations: COLOMBIA: Boyacá: *Melampy 472* (W--2916213). MOUNTED ILLUSTRATIONS: López-Palacios, Fl. Venez. Verb. [445], fig. 104. 1977 (Ld).

LIPPIA SCHLIMII var. *GLABRESCENS* (Mold.) Mold.

Additional bibliography: Mold., Phytologia 48: 262--263. 1981.

Bunting & Croat describe this plant as a tree, 4 m. tall, and found it in flower in August, the corollas "white".

Additional citations: VENEZUELA: Mérida: *Bernardi 10837* (N, W--2914667). Táchira: *Bunting & Croat 38469* (Ld); *Croat 55004* (Ld); *Luteyn, Lebrón-Luteyn, & Ruiz-Terán 5994* (Mi). MOUNTED ILLUSTRATIONS: López-Palacios, Fl. Venez. Verb. [447], fig. 105. 1977 (Ld).

LIPPIA SCHOMBURGKIANA Schau.

Additional synonymy: *Lippia schomburghiana* Schau., in herb.

Additional & emended bibliography: Bocq., Adansonia, ser. 1 [Baill, Rec. Obs. Bot.], 3: 244. 1863; Mold., Phytologia 48: 263 (1981) and 56: 442. 1984.

Recent collectors describe this plant as an herb, 50 cm. tall, the leaves coriaceous, "com silica", with a pleasant odor, the flowers fragrant, and the fruit brown. They have found it growing in dry cerrado subject to periodic fires, in caatinga, and common in red sandy soil of capoeira in disturbed *Orbignya* forests, in flower in April, August, and September, and in fruit in September.

The corollas are described as having been "white" on *Martins & Angélica 8342*, "cream" on *Héringer 18056*, and "yellow" on *Chagas & Silva 206*.

The vernacular names, "alecrim" and "gapu-che-le", are reported for the plant in Brazil, where Balick and his associates note that "when a woman is menstruating and a man has intercourse with her and he gets an infection or has other problems, he makes a tea of the leaves of this plant and drinks it."

Material of *Lippia schomburgkiana* has been misidentified and distributed in some herbaria as the very similar *L. origanoides* H.B.K. On the other hand, the *Steward & al. 248*, distributed as *L. schomburgkiana*, actually is *L. microphylla* Cham.

Additional citations: BRAZIL: Ceara: *Martins & Angélica, Herb. Prisco Bezerra 8342* (F--1931271). Distrito Federal: *Chagas & Silva 206* (N); *Héringer 15788* (W--2926759); *Héringer, Filgueiras, Mendonça, & Pereira 532* (W--2926755). Goiás: *Balick, Frazão, Vieira, & Silva 1590* (Ld); *Héringer 18056* (W--2926775). MOUNTED ILLUSTRATIONS: López-Palacios, F. Venez. Verb. [451], fig. 106. 1977 (Ld).

LIPPIA SCLEROPHYLLA Briq.

Additional bibliography: Mold., Phytologia 48: 263. 1981.

Casas & Molero describe this plant as 1 m. tall and found it growing in "prados con rosales de bosquete, abundante ganado" and in open rather high forests, in both flower and fruit in February. The corollas are said to have been "white" on their *no. 6311* and "white with a yellow center" on *no. 6347*.

Material of *Lippia sclerophylla* has been misidentified and distributed in some herbaria as *Aloysia* sp.

Additional citations: PARAGUAY: *Casas & Molero FC.6255*(N), *6311* (Ld), *6347* (Ld).

LIPPIA SERICEA Cham.

Additional bibliography: Silva, SANO, & Silva, An. Congres Nac. Bot. 32: 21. 1981; Mold., Phytologia 48: 264 (1981) and 50: 262. 1982.

Heringer and his associates encountered this plant in cerrado, in anthesis in April, and describe the corollas as small and "yellow".

Some workers regard *Lippia stoechas* Briq. as a synonym of *Lippia sericea*, but it seems clear to me that is belongs in the synonymy of the lamiaceous *Lavandula stoechas* L.

Additional citations: BRAZIL: Distrito Federal: *Héringer, Figueiras, Mendonça, Pereira, Salles, & Silva 4361* (N). Goiás: *Irwin, Santos, Souza, & Fonseca 24378* (W--2630593). [to be continued]

THE INFRASPECIFIC TAXONOMY OF PINUS CULMINICOLA ANDR. ET BEAM. (PINACEAE).

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The pinyon pines of Mexico are highly variable in morphological characteristics, they also occupy a considerable range of different habitats and different ecological areas. The amount of taxonomic recognition that should be given to these factors has received considerable controversy in the literature in recent years.

Martinez (1948). originally recognized P. cembroides Zucc. ex Bay. as having 3 needles in a bundle,with stomata or white lines on all leaf surfaces , or only on the 2 inner surfaces. Other botanists soon decided to make taxonomic distinctions between populations of P. cembroides having 2 lines of stomata and that of those having lines of stomata on all surfaces. Then in 1961 Andresen and Beamen named a new species of Pinus from Neuvo Leon which was closely related to P. cembroides, but it had needles in clusters of five and stomata only on the inner surface of the needles. Bailey and Hawksworth (1979) also decided to name a new species of pinyon pine from the S.W. United States and N. Mexico, only this pine had needles in three's, yet it also had stomata only on the two inner surfaces. Interestingly, Robert (1978) described yet another species of pinyon pine with stomata on 2 surfaces and needles in clusters of 3's.

It seems however that Bailey and Hawksworth (1979) and Robert (1978) were overlooking the fact that the new taxa they described shared many common traits with a taxon named P. culminicola which had been described considerably earlier. The description of P. culminicola by Andr. et Beam. is markedly similar to that given for P. discolor and P. johannis by Bailey and Hawksworth (1983). All three taxa are described as having needles that are dark green dorsally and glaucous ventrally; needles average 3-6 cm. long; fascicle sheaths become curled into persistant rosettes; female cones are 2.5-4 cm. long with small umbos and being chesnut-brown in color. Herbarium specimens of P. culminicola from the type locality have needles consistantly in fives, but 3's and 4's do sometimes occur, hence I included P. discolor and P. johannis as synonyms of P. culminicola in my conifer checklist (Silba, 1984). However, while P. discolor and P. johannis vary in needle clusters from 3's to 5's, they are usually in 3's and there are a number of other characteristics that would make it seem necessary to recognize them at the varietal level.

Pinus culminicola and P. johannis have very dense, closely interposed foliage giving these shrub-like plants a very dense appearance. Pinus johannis is strongly three leaved with bark that is loose and of a flaky nature. Pinus discolor is very open branched and distinctly of tree proportions, also many trees tend to be dioecious in this taxon (F.T. Callahan, II, pers. comm., 7-2-84).

As currently understood typical P. culminicola occurs on the Cerro Potosi in Neuvo Leon ,P. culminicolor var. discolor occurs in the S.W. United States and N. Mexico and P. culminicolor var. johannis is described from Concepcion del Oro, Zacatecas and the Sierra Madre Oriental in Coahuila.

I would like to stress the necessary usage of the term "varietas" for infraspecific taxa of the Coniferae, not only is the term older than modern designations but it also has appeared more often in the literature on an international scale. To incorporate the term "subspecies" and abolish the term "varietas" would require a considerable number of new names and combinations which would not be necessary. The terms "subspecies" and "formas" lead to too much excessive "splitting". It is my opinion that only one term be needed for infraspecific variation in the wild, as opposed to infraspecific variation in cultivation or civilization which requires another recent term, namely the term "cultivar" which is an appropiate name. The basis for distinctions between a "subspecies", "varietas" and "formas" are ill-defined. For instance, there are many species of Pinus that are closely related (i.e., P. cembroides and P. culminicola and yet there are some species of Pinus that are markedly different from one another, such as P. krempfii and P. cembroides. However, all these taxa of Pinus are classified at the "species" rank or level, but these are justly termed into different "subgenera" or "sections". So, then if the differences between some infraspecific taxa are greater than those of other infraspecific taxa in the wild why should other terms be introduced without taking a fair or equal argument for the differences between taxa at the "species" level.

PINUS CULMINICOLA Andr. et Beam., J. Arn. Arb. 42: 438, f.2-4 (1961). "Potosi Pinyon Pine"
var. CULMINICOLA (typical variety).

P. CULMINICOLA var. DISCOLOR (Bail. et Hawksw.) Silba, comb. nova. "Border Pinyon Pine"
Synonymy: P. discolor Bail. et Hawksw., Phytologia 44(3): 130 (1979)= P. cembroides var. bicolor Little, Phytologia 17: 336

(1968).

P. CULMINICOLA var. JOHANNIS (M.F. Rob.) Silba, comb. nova.
"Johann's Pinyon Pine"
Synonymy: P. johannis M.F. Rob., Adansonia ser. 2, 18, fasc. 3: 366-367, f.2-4 (1978).

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Bailey, D.K. & Hawksworth, F.G. (1979). Phytologia 44(3) : 130.

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Martinez, M. (1948) . Los Pinos Mexic., ed.2, illus. Mexico City.

Robert, M.F. (1978). Adansonia, ser. 2, 18, fasc. 3: 366-367.

Silba, J. (1984). Phytol. Mem. 7. Plainfield, New Jersey.

Nomenclatural Changes in Mexican Mosses

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Crosby (1975) has placed Callicostella (C.M.) Mitt. in synonomy under Schizomitrium B.S.G. Therefore, a number of new combinations are required including several from Mexico. The Mexican moss flora in preparation by A. J. Sharp and H. Crum will include these species.

Schizomitrium ciliatum (Schimp. in Besch.) Bowers, comb. nov.

Basionym: Hookeria ciliata Schimp. in Besch., Mem. Soc. Nat. Sci. Natur. Cherbourg 16:231. 1872.

Synonyms include Callicostella ciliata (Schimp. in Besch.) Jaeg. and Sauerb.

Schizomitrium bernoullii (Hampe in C.M.) Bowers, comb. nov.

Basionym: Hookeria bernoullii Hampe in C.M., Bull. Herb. Boiss. 5: 207. 1897.

Synonyms include Cyclodictyon bernoullii (Schimp.) Kuntze, and Callicostella bernoullii (Hampe in C.M.) Broth.

Schizomitrium mexicanum (Robins. & Welch in Welch) Bowers, comb. nov.

Basionym: Callicostella mexicana Robins. and Welch in Welch. The Bryologist 69:9. 1966.

Crosby, M. R. 1975. Lectotypification of Schizomitrium B.S.G. (Musci, Hooperiaceae) Taxon 24: 353-355.

CONTRIBUTION TO THE LICHEN FLORA OF VENEZUELA, VI.

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The present paper is based on lichens gathered mostly from several localities of north-west Venezuela, collected by the author and preserved in Herbarium MERF.

Three new genus Catinaria, Melanotheca and Nephroma are added to the lichen Flora of Venezuela.

Baeomyces absolutus Tuck.

Distrito Federal: Cordillera de La Costa, a lo largo del camino entre la Estación del Teleférico-El Lagunaso, López-Figueiras 25270.

Estado Lara: En el camino entre el fundo "Buenos Aires" y Humocaro Alto, López- Figueiras 19644.

Estado Mérida: La Carbonera, finca San Eusebio, López-Figueiras & M. Keogh 14062.

Páramo de Quirorá, cercanías de Pueblo Nuevo, López-Figueiras 26689.

Estado Táchira: Páramo El Zumbador, López-Figueiras 14318. Vertiente occidental del Pico Banderas, páramo de Tamá, Hale, M. & López-Figueiras 45414.

Estado Trujillo: Cumbres del páramo de Guaramacal, López-Figueiras & M. Hale 19905.

Páramo El Turmal, cercanías de Carache, López-Figueiras 16819.

Baeomyces fungoides (Sw.) Ach.

Estado Mérida: Alto del Manzano, entre Mérida y La Chorrera, López-Figueiras & M. Keogh 14050.

El Picacho, páramo de El Buitre, López-Figueiras 12518.

Estado Táchira: Cercanías del páramo El Rosal, vía La Grita-San José de Bolívar, López-Figueiras 24958.

Páramo de Tamá, camino hacia las cabeceras de El Reposo,

López-Figueiras 24558.

Estado Trujillo: Páramo de Guaramacal, López-Figueiras 10341.

Páramo de Tuñame, hacia Las Mesitas, López-Figueiras 12197.

Baeomyces imbricatus Hook.
Estado Mérida: Sierra del Norte: Páramo de Los Conejos, finca San Rafael, López-Figueiras 23859.

Sierra Nevada de Santo Domingo, Páramo de Mucubají, alrededores de La Laguna Negra, López-Figueiras, T. Ahti & P.M. Jørgensen 17706.

Estado Táchira: Vía Pregonero, cercanías de El Portachuelo, López-Figueiras 24583.

Estado Trujillo: Páramo El Turmal, cercanías de Carache, López-Figueiras 16823.

Páramo Guaramacal, cercanías de Boconó, López-Figueiras 21670.

Candelaria concolor (Dicks.) Stein.
Estado Falcón: Sierra de San Luis, vía Coro-La Peña, López-Figueiras & R. Wingfield 22352, 22356.

Estado Mérida: Lagunillas, alrededores de La Laguna Yohama, Hale, M. & López-Figueiras 42336.

El Valle, cercanías de Mérida, López-Figueiras & M. Lindstrom 27164.

Estado Miranda: El Hatillo, un sector del Lagunita Country Club, López-Figueiras 25128.

Estado Táchira: Vía Rubio-Bramón, Hale, M. & López-Figueiras 45708.

Candelaria fruticans Poelt & Oberwinkler.
Estado Falcón: Sierra Ziruma, alrededores de Cerro Azul, López-Figueiras 21587, 21618.

Estado Lara: Sierra Portuguesa, Loma León, cercanías de Barquisimeto, López-Figueiras & R. Smith 21200.

Estado Mérida: El Valle, cercanías de Mérida, López-Figueiras & M. Lindstrom 25158, 27163.

Estado Trujillo: Carretera antigua Boconó-Trujillo, base del páramo La Cristalina López-Figueiras 10417.

A lo largo del páramo de La Cristalina, López-Figueiras & M. Keogh 11371.

Candelina mexicana (B. de Lesd.) Poelt.
Estado Lara: Cumbres de La Serranía Baragua, López-Figueiras & R. Smith 20924.

Carretera Barbacoas-Hato Arriba-El Tocuyo, cercanías de la Quebrada Cujisal, López-Figueiras & R. Smith 16551.

Catinaria versicolor (Fée) Sipman.

Estado Lara: Sierra Ziruma o Empalado, alrededores de Cerro Azul, López-Figueiras 21600.

Carretera Barbacoas-Hato Arriba-El Tocuyo, cuenca de la quebrada Cujisal, López-Figueiras-R. Smith 16612.

Estado Mérida: El Maciegal, cuenca del río La Pedregosa, cercanías de Mérida, López-Figueiras & Ruiz Terán 10565.

Páramo La Negra, López-Figueiras & Morales Méndez 29077.

Estado Táchira: Betania, parte alta del Valle de Tamá, López-Figueiras 26099, 26106.

Estado Trujillo: La Cava, entre Hoya del Carruzo y el páramo de Cendé, López-Figueiras 13242.

Entre Las Palmas y Agua de Obispo, carretera Carache-Las Peñas, López-Figueiras 29504.

Chiodecton antillarum Vainio.

Estado Táchira: Vía Rubio-Bramón, M. Hale & López-Figueiras 45746.

Chiodecton sanguineum (Sw.) Vainio.

Estado Falcón: Sierra de San Luis, montaña de Paraguariba, López-Figueiras & H.H. van der Herff 19275.

Sierra de San Luis, alrededores de Uria, vía Las Negritas-Curimagua, López-Figueiras 19275.

Estado Lara: Sierra de Bobare, en Pico-Pico, López-Figueiras & R. Smith 20751.

Sierra Portuguesa, en Loma Redonda, vía Barquisimeto-La Pedrera hacia la Montaña, López-Figueiras & R. Smith 16173.

Estado Mérida: Entre Mérida y la Chorrera, carretera a la Azulita, M. Hale 42120.

Páramo de Las Coloradas, potreros de San Rafael, López-Figueiras 15569.

Estado Táchira: Vertiente occidental del Pico Banderas, páramo de Tamá, M. Hale & López-Figueiras 45403.

Las Coloradas, zona xerófila de La Grita, López-Figueiras 14391.

Estado Trujillo: Páramo de La Naríz, alrededores de la torre de T.V., carretera Agua de Obispo-La Peña, López-Figueiras & M. Hale 19483.

Carretera (en construcción) Boconó-Las Negritas, López-Figueiras 11481.

Coenogonium linkii Erenberg ex Nees

Estado Falcón: Sierra de San Luis, montaña de Paraguariba, López-Figueiras 21430.

Estado Lara: Sierra de Bobare, en Pico-Pico, López-Figueiras & R. Smith 20757.

Estado Táchira: Vía Rubio-Bramón, M. Hale & López-Figueiras 45746.

Estado Trujillo: Páramo de La Naríz, López-Figueiras 16976.

Corella zahlbruckneri Schiffn.

Estado Falcón: Sierra de San Luis, alrededores del Parador Turístico, Curimagua, López-Figueiras 19336.

Sierra de San Luis, montaña de Paraguariba, López-Figueiras & H.H. van der Herff 21474.

Estado Lara: Sierra Portuguesa, cerro El Zamuro, cercanías de Villa Nueva, López-Figueiras & M. Hale 19878.

Estado Mérida: Sierra Nevada de Mérida, quebrada Fafoy, cercanías de El Carrisal, López-Figueiras & M. Hale 20164.

Finca San Isidro, un sector de La Carbonera, vía Mérida-La Azulita, López-Figueiras 16232.

Estado Táchira: Cercanías de Laguna García, proximidades de Pregonero, López-Figueiras & H. Rodríguez 25464.

Estado Trujillo: Finca Mesedero, encima de Mesa Arriba, colindante con el páramo El Turmal, cercanías de Carache, López-Figueiras 16892.

Glossodium aversum Nylander.

Estado Mérida: Sierra del Norte, páramo de Los Conejos, La Toma, López-Figueiras 24278, 24360.

Páramo de Aricagua, López-Figueiras 12804.

Estado Táchira: Páramo de Tamá, Pico Banderas, M. Hale & López-Figueiras 45531.

Páramo El Zumbador, López-Figueiras & M. Keogh 9336.

Estado Trujillo: Páramo de Guaramacal, cercanías de Boconó, López-Figueiras & M. Hale 19924.

Vertiente oriental del páramo de Las Rosas, cercanías de Carache, López-Figueiras & H. Rodríguez 26607.

Megalospora sulphurata Meyer et Flot. var. ***nigricans*** (M.A.) Rid.

Distrito Federal: Cordillera de La Costa, a lo largo del camino entre la estación del Teleférico y el Lagunaso, López-Figueiras 25321, 25343.

Estado Mérida: Prado Verde, un sector del Valle, López-Figueiras 13520.

Páramo de Las Coloradas, entre El Portachuelo y la pensión Las Nieves, López-Figueiras 25672.

Estado Táchira: Betania, parte alta del Valle Tamá, López-Figueiras 24735, 25836, 25950, 26030.

Estado Trujillo: Entre Las Palmas y Agua de Obispo, carretera Carache-Las Palmas, López-Figueiras 29492, 29505.

Páramo de Cendé, López-Figueiras 13034.

Megalospora tuberculosa (Fée) Sipman.
Distrito Federal: Caracas, cordillera de La Costa. Track from Altamira to La Silla, Sipman 10744.

Estado Mérida: Sierra del Norte, páramo de Los Conejos, El Salaíto, López-Figueiras 24401.

Páramo La Negra, López-Figueiras & Morales Méndez 29091.

Estado Trujillo: Carretera Carache-Agua de Obispo-La Peña, entre Agua de Obispo y la torre de T.V., López-Figueiras 28495, 28507.

Melanotheca cruenta (Mont.) Müll. Arg.
Estado Falcón: Sierra de San Luis, Piedra de Agua, cercanías de San Luis, López-Figueiras & R. Wingfield 22417.

Menegazzia tetebrata (Hoffm.) Mass.
Estado Mérida: En Morro Negro, área de Pico de Horma, al sur este de Mesa Quintero, López-Figueiras & H. Rodríguez 22913.

Páramo de San José de Acequias, proximidades del Zanjón del Cupis, López-Figueiras & Morales Méndez 30184.

Estado Táchira: Betania, parte alta del Valle de Tamá, López-Figueiras 25966.

Estado Trujillo: Páramo de La Naríz, alrededores de la T.V., vía Agua de Obispo, La Peña, López-Figueiras & M. Hale 19490.

Nephroma helveticum Ach.
Estado Mérida: Sierra Nevada de Santo Domingo, páramo de Mucubají, quebrada Los Patos, cercanías de la Laguna Negra, López-Figueiras 28353.

Páramo de Piñango, un sector del páramo de Mucuchíes a lo largo de la carretera entre La Quebrada Las Tapias y Piñango, López-Figueiras 27921.

Peltigera austroamericana Zahlbruckner. As ***P. americana*** Vain in Vareschi 1973.
Estado Mérida: Las Piedras-Cuenca del Aracay Arriba, López-Figueiras 9709, 9735, 9751.

Sierra Nevada de Santo Domingo, inmediaciones de Los Frailes, en la vía Apartaderos-Santo Domingo, López-Figueiras & Morales Méndez 23544.

Estado Táchira: Alrededores de Betania, parte alta del Valle de Tamá, López-Figueiras 10084.

Estado Trujillo: Páramo El Jabón, López-Figueiras 13351A.

Páramo de Guirigay, finca Guirigay-Río Burate, López-Figueiras & Ruiz Terán 11051.

Peltigera pulverulenta (Tayl.) Kremp.
Estado Mérida: A lo largo del páramo de Los Granates, López-Figueiras 14808.

Sierra del Norte, páramo de Los Conejos, finca San Rafael, López-Figueiras 23912.

Estado Táchira: Páramo El Batallón, López-Figueiras 10203.

Páramo El Rosal, López-Figueiras 10170, 10181, 10184.

Estado Trujillo: Páramo El Jabón, López-Figueiras 13334.

Carretera antigua Boconó-Trujillo, base del páramo La Cristalina, López-Figueiras 10409, 10415, 10437.
1rst. record for the Andes area.

Peltigera rufescens (Weis.) Humb.
Estado Mérida: Páramo de Los Granates, a lo largo de La Vega 14730.

Páramo de Timotes, alrededores del pico El Gavilán, López-Figueiras, T. Ahti & P.M. Jørgensen 17793.

Estado Trujillo: Páramo de Guaramacal, López-Figueiras 10293.

Peltigera ulcerata Müll. Arg.
Estado Aragua: Cercanías de la Colonia Tovar, El Junquito, López-Figueiras 25061.

Estado Mérida: Parque Nacional Sierra Nevada, alrededores de La Mucuy, López-Figueiras & M. Lindstrom 27170, 27179, 27169.

Finca San Eusebio, La Carbonera, cercanías de Mérida, López-Figueiras 25019.

Estado Táchira: Cercanías de Laguna García, proximidades de Pregonero, López-Figueiras & H. Rodríguez 25455.

Teloschistes exilis (Michx.) Vainio
Estado Falcón: Sierra San Luis, entre La Tabla y Cerro Galicia, López-Figueiras & R. Wingfield 21823.

Estado Lara: Sierra de Barbacoas entre Quebrada del Vino y Barbacoas, López-Figueiras & R. Smith 16539.

Estado Mérida: Finca La Culata, parte alta del Valle, cercanías de Mérida, López-Figueiras 13578, 13580, 13626.

El Pedregal de Jají, un sector de La Carbonera, López-Figueiras & M. Lindstrom 27124.

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PUBLICATION OF VERBESINA FUSCASICCANS

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In the Flora of Panama where Verbesina fuscasiccans was described, the place of publication and the type of the intended basionym, Wedelia fuscasiccans D'Arcy, were indicated, but the basionym itself was not cited. Verbesina fuscasiccans (D'Arcy) D'Arcy is based on Wedelia fuscasiccans D'Arcy. The present statement is being published because under 33.2 of the current code, Verbesina fuscasiccans could be regarded as not validly published.

Verbesina fuscasiccans (D'Arcy) D'Arcy (Ann. Missouri Bot. Gard. 62:1149. 1975 (1976).

Wedelia fuscasiccans D'Arcy, Phytologia 30:6. 1975. TYPE: Panama, Croat 27091 (MO). -this publication includes the Latin diagnosis.

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BOOK REVIEWS

Alma L. Moldenke

"ANNUAL REVIEW OF ECOLOGY AND SYSTEMATICS" Volume 15, 1984, edited by Richard F. Johnston & associates Peter W. Frank & Charles B. Michener, xi & 601 pp., 21 b/w fig., 25 tab. & 4 maps. Annual Reviews, Inc., Palo Alto, California 94306. 1984. $27.00 U.S.A., $30.00 foreign.

The 19 papers in this year's volume are all worth the reading and/or study, starting with Dupuis' evaluation of Hennig's logical impact on taxonomic theory. Brussard deals with geographic patterns and environmental gradients with a central-marginal model in Hawaiian fruitflies. Loveless & Hamrick provide an excellently clear and detailed 6-page table summarizing the ecological factors that can affect the genetic structure of populations and their predicted effects. There is neither the time nor the space to describe in more detail these papers and others on founding of new populations, founder effects and speciation, evolution of eusociality, comparative social ecology of carnivores, mimicry and deception in pollination, evolution of food catching by birds and mammals, optimal foraging theory and much more of value in topics and treatment.

"EXPERIMENTS IN PLANT TISSUE CULTURE" by John H. Dodds & Lorin W. Roberts, xiii & 178 pp., 10 b/w tab., 17 fig. & 30 photo. Cambridge University Press, Cambridge, England, & New York, N. Y. 1982. $32.50 clothbound & $11.95 paperbound.

The highly regarded J. Heslop-Harrison writes in the Foreword of this undergraduate text: "The chapters not only describe how to carry out procedures but offer lucid accounts of the historical background and interpretations of the results likely to be obtained, backed up by extensive bibliographies." Among others there are directly written chapters on the culture of plant cells, tissues and organs; aseptic techniques; callus; organogenesis; somatic embryogenesis and shoot apex, pollen and anther cultures. The chapters close with "Questions for Discussion" and suggested experiments. Commercial sources in both the U. K. and U. S. A. for supplies for the experimental work are given in an appendix.

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Index to supra-specific scientific names in Volume Fifty-six

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