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MISCELLANEOUS NOTES ON NEOTROPICAL FLORA, XII

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The present notes include diagnoses or descriptions of new taxa in the subtribe Espeletiinae (Heliantheae, Compositae). For previous contributions see *Phytologia* 45(1): 17. 1980.

LIBANOTHAMNUS DIVISORIENSIS Cuatr. sp. nov.

Arbor 3-5 m alta multiramosa, coma subglobosa, ramusculis ultimis robustis dense foliatis internodiis brevibus dense albo-barbatis pilis sericeis inter vaginas foliorum imbricatas adpressis.

Folia alterna crasse coriacea rigida conspicue pseudopetiolata. Lamina anguste elliptico-oblonga apice subobtusata vel subacuta basim versus attenuata cuneataque, margine integra revolutaque, 19-34 x 5-8 cm, ratio 3.8-5:1; adaxiale pallide viridis vel lutescente viridis glabra costa angusta paulo depressa notata nervis minoribus obsoletis sed superficie leviter rugulosa; abaxiale canescenti-lanata, indumento crispo denso nervatura tegenti sed conspicua, costa robusta angulata striataque valde elevata, nervis secundariis crebris parallelis bene elevatis 2-4 mm inter se distantibus in angulo 70-80° divergentibus, nervis minoribus in reticulo valde prominenti instructis, alveolis minutis profundis cum pilis flexuosis albissimis intricatis repletis. Indumentum pilis tenuissimis crispis intricatisque lanam subtilissimam sed densam formantibus totam superficiem abaxialem tegentem. Pseudopetiolus (1-)2-3 cm longus robustus basi triangulare dilatatus et in vaginam productus. Vagina subcoriacea tubulosa caulem cingens, 2.5-3 cm longa, apice abaxiale unilaterale triangulare in pseudopetiole transienti intus glabra parallele argute nervata, abaxiale densissime pilosa, pilis longis tenuibus albis ascendentibus valde appressis instructis, ad apicem triangulatum dense crasseque albo-lanata.

Inflorescentiae terminales corymboide-paniculatae inferne foliosae superne bracteosae, saepe floribundae, 30-50 cm longae et expansae, folia caulina distalia superantes. Axis valde robustus angulatus striatusque e basi ramosus, ramis principalibus 4-6, proximalibus ad 30-50 cm longis valde robustis angulatis striatisque, alternifoliosis et bracteosis, dimidia vel tertia superiore parte ramulosis. Folia subtendentia proximalia caulina similia sed breviora; laminae 18-14 x 4-3 cm, petiolo cum basi triangulari vaginanti 3-1 cm longo, mediales magnitudine decrescentes 14-9 x 4-2.2 cm, elliptico-lanceolatae acutaeque, sursum gradatim minores et in bracteis transeuntes. Bractee subtendentes ovato-

lanceolatae vel anguste lanceolatae acuminatissimae parallelinerviae, 20-7 mm longae 3-2 mm latae. Axis rami ramusculi dense albo-lanati, bracteis villosulo-lanuginosis. Pedicelli 5-20 mm longi saepe erecti densiuscule crasseque albo-lanati, insuper villosulo-lanuginosi.

Capitula parva radiata 73-90 flores ferentia, ligulis amotis 8-11 mm diam, circulo ligularum 14-21 mm, disco 8-10 mm diametro. Involucrum cupulatum herbaceum pallide viride. Phyllaria sterilia quinque, 7-6(-5) x 4.5-3.2 mm, ovato-acuminata concava, circa 9-nervata, abaxiale sparse pilosa deorsum sparse lanuginea, dorso sursum usque ad apicem dense glandulifera, glandulis subglobosis vel pyriformis, hyalinis, subsessilibus vel sessilibus 0.03-0.05 mm diametro, pilis obtusis vel subclavatis flexuosis ad 1.5 mm longis. Phyllaria fertilia exteriora herbaceo-scariosa, 5-4.2 x (3.5-)2.5-2 mm, obovata apice subite triangulata acutaeque vel cuspidata, parce concava vel subcucullata dorso parce pilosa pilis clavatis vel subclavatis parce flexuosis 0.2-0.5 mm, distale copiose glanduliferis, glandulis obovatis sessilibus vel subsessilibus 0.03-0.05 mm, interiora 4.5 x 2-2.5 mm, obovata apice triangulato-acutata, copiose ciliata pilis subclavatis 0.02-0.03(-0.05) mm, et glandulata. Receptaculum 3.5-4 mm diam conicum 2.5-3 mm altum glabrum. Paleae 4-4.3 x 1.3-2 mm, scariosae, obovatae apice triangulare acutatae, distale dense ferrugineo-pilosae pilis clavatis 0.1-0.3 mm, deorsum longioribus et glandulis subglobosis 0.04-0.05 mm latis apice propio haud pilis sed multis glandulis sessilibus vel subsessilibus praesentibus.

Flores radii ligulati 13-20 in capitulo biseriati. Corolla alba vel eburnea 4-8 mm longa, tubulo 0.8-1 mm longo crasso dense piloso pilis intricatis 0.3-1 mm longis flavescente-hyalinis flexuosis clavatis vel subclavatis; lamina crassiuscula elliptica vel oblongo-elliptica 2.3-3 mm lata, obsoleta 3-5-nervata, adaxiale minutissime mammillato-papillosa velutina, abaxiale inferne copiose superne sparse pilosa glanduliferaque pilis 0.2-0.4 mm clavatis, glandulis subglobosis subsessilibus. Stylus 2-3 mm ramis crassiusculis 1 mm longis. Achaenia marginalia (2-)2.5-3 x 1.7-1.8 mm, obovato-triangularia angulis argutis basi acutissima dorso convexo supra basim contracta, interiora 2.5-3 x 1-1.2 mm oblonga subquadrangulata angulo abaxiale obtuso.

Flores disci 55-78 in capitulo. Corolla 4-5 mm longa viridiluteola, tubulo 1.5-2 mm longo, copiose vel sparse piloso pilis 0.2-0.4(-0.6) mm longis clavatis et glandulis crassiuscule pediculatis 0.1-0.15 mm longis, limbo tubuloso-campanulato deorsum sparsis pilis ad 0.6 mm, lobis triangularibus 0.7-1 mm longis margine papillosis abaxiale barbatis pilis clavatis 0.2-0.5 mm longis et parvis glandulis globosis crassiusculis sessilibus saepe praeditis. Antherae 1.6-1.7 mm longae basi obtusiuscule sagittatae appendice apicali ovato-oblonga obtusa 0.4 mm longa. Nectarium tubulosum 0.6-0.8 mm longum. Rudimentum ovarii pediculiforme 0.2-0.3 mm longum.

Typus: Venezuela, Zulia: Sierra de Perija, Serrania de los

Motilonas, mesa below international boundary on main ridge, mostly of horizontal red sandstones and grey conglomerates, 3000 m alt, 3-5 m tall trees, rays satiny without, matte within, dirty cream white, disc flowers dirty light yellow-green, 27 Jun-5 Jul 1974, Tillett & Hoenig 746-746; holotype, US; isotypes, VEN, UCV. Other specimens: Venezuela, Zulia, Sierra de Perija, Serrania de Valledupar, along international boundary (Linea Divisoria), headwaters of Rio Apon, 2 km N of Buenavista, 3300-3650 m, tree 2.5 m tall, many-branched and forming a round crown, phyllaries yellow-green, rays cream-white, disc flowers light olive green, 9-10 Jul 1974, Tillett & Hoenig 747-921; paratype, US, VEN. Colombia, Cesar: Sierra de Perija, 25 km east of Codazzi (on the border to Venezuela), 3200 m, tree 13 ft tall 3 in diam b.h., flowers withered, Martin L. Grant 10965 (F, US).

LIBANOTHAMNUS PARVULUS Cuatr. sp. nov.

Arbuscula parva 40-100 cm alta, trunco robusto, fronde ramosa densa viridi plus minusve rotundata. Ramuli terminales dense foliati internodiis spisse sericeo-barbatis pilis 5-7 mm longis tenuibus antrorsis inter vaginas foliorum imbricatas adpressis. Gemmae terminales steriles dense crassissimeque lanato-villosae, indumento ochroleuco valde congesto superficie cum velo tenui-sericeo tecto.

Folia crassa coriacea subsessilia. Lamina elliptica vel anguste oblongo-elliptica apice obtusa vel subobtusa basi subite cuneata vel gradatim in brevem ad modum pseudopetiolum alatum attenuata, 6-10(-15) cm longa, 2.3-4.5 cm lata, ratio 2.2-4(-4.5):1, basi 6-7 mm latam contracta, margine argute revoluta; adaxiale juvenili tenuiter albo-villosa pilis longis tenuissimis adpressis denique caducis glabrata, griseo-viridis opaca plus-minusve glutinosa, tantum costa filiformi impressa notata ceteris nervis obsoletis; abaxiale dense crasse congestissimeque albido-lanata, pilis valde tenuibus flexuosisque crispatis nervatura obtegentibus, costa crassa costulato-sulcata valde eminenti nervis lateralibus patentissimis crebrisque, 1-1.5(-2) mm inter se distantibus, angulo (75°)80-90° divergentibus rectis vel subrectis parallelis, saepe bene conspicuis infra crassum indumentum prominentibus, nervis minoribus reticulum minutum prominulum formantibus, alveolis cum lana alba repletis. Pseudopetiolus 0-1 cm longus, 0.5-0.8 cm latus, costa robusta utroque latere cum lamina revoluta marginata, basi triangulato-ampliatus in vaginam productus. Vagina apice abaxiale robusta triangulata, semiamplectens, inferne tubulosa 1-1.6 cm alta membranacea, intus glabra parallele nervata, extus densissime crasseque albo-lanato-villosa pilis albis sericeis circa 5-7 mm longis.

Inflorescentiae terminales breves 6-10 cm longae, folia attingentes vel leviter superantes, pauciramosae pedicellis 5-14 mm longis. Rami pedicellique crassi vel crassiusculi cum indumento

albo lanato pilis longis tenuissimis crispatis lana subtilissima sed densissima instructis, superficie pilis adherentibus velum continuum fragilem formantibus. Folia subtendentia ramorum proximalium folia sterilia similima sed paulo breviora. Bracteae mediales subtendentes 2-1 x 0.7-0.3 cm, foliaceae coriaceae revolutae, obtusae, subtus lanatae, supremae similes magis abbreviatae ad 7-5 x 2.5 mm, acutatis.

Capitula 10-11 mm diam, 68-105 flores ferentia, circulo ligularum 16-21 mm, disco 9-10 mm diametro. Involucrum cupulatum. Phyllaria sterilia 7-8, late ovata, acuminata vel ovato-triangularata acuta, 4.5-5.5 x 4-5.5 mm, subcoriacea, inferne incrassata, incurva, extus brunneo antrorso-pilosa pilis crassis subclavatis, insuper saepe tenuiter albo-lanuginea, apice acuto plus minusve calloso glabro, marginibus sursum sparsis glandulis late subglobosis sessilibus. Phyllaria exteriora fertilia 4.5-5 x 3.5-4.5 mm, concava suborbiculata vel obovata breviter acuminata vel obtusa vel subobtusata, basi incrassata dorso dense crassi-pilosa; interiora 4.2-4.5 x 3(-2) mm navicularia subobtusata, distale dense brunnescente crassi-barbata pilis clavatis et glandulis 0.03-0.05 mm longis sparsis. Receptaculum conicum 4-4.5 mm diam, 2 mm altum glabrum. Paleae 4-4.5 x 2.2-2.5 mm, scariosae, hyalinae, obovatae obtusae apice subcucullato, amplexantes, distale dense brunneo-piloso pilis crassis clavatis vel subclavatis 0.2-0.3 mm, glandulis crassis obovoideis subsessilibus et glandulis pediculatis copiosis.

Flores radii 15-22 in capitulo, ligulati 2-3-seriati. Corolla alba 6-7 mm longa, tubo 0.8-1.1 mm longo densissime patulo-piloso, pilis crassis hyalinis obtusis vel clavatis flexuosis ad 0.5 mm longis; lamina crassiuscula elliptica vel oblongo-elliptica 2-2.8 mm lata obtuse 2-3-dentata, adaxiale minutissime mammillato-papillosa, abaxiale circa 5-nervata praecipue ad nervos sparse pilosula et parcis glandulis globosis subsessilibus munita. Stylus 2-3 mm, ramis crassis circa 1-1.3 mm longis. Achaenia marginalia 2.7-3 x 1.5-2 mm, obovato-triangularata basim attenuata basi callosa, angulis argutis, interiora 2.8-3 x 1-1.2 mm, oblonga quadrangularata angulo abaxiali obtuso.

Flores disci 53-84. Corolla 4-5 mm longa lutea vel viridi luteola, tubo 2 mm longo parcis pilis hyalinis clavatis ad 0.4 mm longis et sparsis glandulis subglobosis subsessilibus, limbo infundibuliformi parcis pilis, lobis triangularibus 0.7-0.8 mm altis marginibus incrassatis et satis papillosis, abaxiale parcis pilis crasse clavatis 0.04-0.08(-0.1) mm longis. Antherae circa 1.8 mm longae appendice ovata. Nectarium tubulosum 0.5-0.7 mm longum.

Typus: Venezuela, Lara: eastern slope of Paramo del Cende, 2900 m alt, at Laja del Dictamo, nanoform of tree, erect, "bonsai" style, 40-60(-100) cm high with distinctive trunk and crown, abundant locally, 10 Jun 1971, Ruiz-Teran & Lopez-Figueiras 2036; holotype US; isotype MERF. Other collection: Venezuela, Lara: Paramo de Las Rosas, hill west of Buenos Aires, 3200 m alt, sabana frecuentemente quemada, pastoreada por ganado bovino, planta lenosa hasta 1 m alta, flores amarillas, 15 Oct 1978, Burandt & Hambrook V0406 (UCOB, paratypus).

LIBANOTHAMNUS CRISTAMONTIS Cuatr. sp. nov.

Arbor 5-6 m alta bene ramosa ramulis ultimis distale dense foliatis internodiis brevibus spisse longeque barbatis, pilis inter bases foliorum congeste imbricatas valde appressis.

Folia alterna rigida coriacea subsessilia tubuloso-vaginata. Lamina 10-16 cm longa 3-4 cm lata ratio 3.6-4.3:1, anguste oblongo-elliptica ad apicem angustata acutata, apice mucronata basim versus attenuata basi cuneata usque ad 3 mm latitudine ad modum pseudopetioli brevi (1-8 mm longi) contracta; margine revoluta visu integra sed remotis dentibus callosis mucroniformibus recurvatis abaxiale intra indumentum occultis; adaxiale juvenilis adpresse sericeo-pilosa adulta glabrata plus minusve nitida glutinosa pallide viridis in sicco tabacina nervis fere obsoletis; abaxiale lanata in sicco ochroleuca pilis longis moderate tenuibus crispis et subcrispis intricatis indumento crassissimo densissimeque marginibus et nervis tegenti instructis; infra indumentum costa robusta elevata argute striata, nervis secundariis rectis vel leviter curvis parallelis 2-4 mm inter se distantibus angulo 70-75° divergentibus ad marginem breviter arcuatis anastomosantibus, nervis minoribus elevato-reticulatis alveolis profundis cum lana alba repletis; basi angustata ad modum pseudopetioli anguste alati inferne triangulati-ampliati in vaginam producta. Vagina tubularis 10-15 mm longa membranacea adaxiale glabra abaxiale ochroleuco-barbata.

Inflorescentiae terminales corymbiforme paniculatae floribundae plerumque foliosae superne bracteosae, 12-14 cm longae 18-23 cm latae folia paulo superantes. Axis robustus angulatus e basi ramosus ramis principalibus 4-6 alternis robustiusculis striatis erecto-patentibus, tertia vel imidia superiore parte corymboso-ramulosus ramusculis ultimis 2-3 capitulos longe pedicellatos erectos ferentibus. Pedicelli crassiusculi erecti recti vel leviter flexuosi 6-20 mm longi. Axis rami ramusculi pedicellique copiosissime tomentello-lanuginosi pilis rigidulis 2-3 mm longis flexuosis intricatis et aliquot subrectis indumento laxiusculo pallide ochroleuco instructis. Folia subtendentia inferiora caulina similia sed minora, lamina 9-7 x 2-1.8 cm etiam coriacea rigidaque acuta subsessilia sursum magnitudine decrescentia 7-3 x 1.8-1 cm, basi omnia vaginantia amplexentiaque. Bractee elliptico-oblongae 1.5-1 x 0.5 cm; bractee supremae pedicellos subtendentes 0.8-0.5 x 0.2 cm triangulatae-parallelinerviae.

Capitula breviuscula radiata, 54-90 flores ferentia ligulis amotis 8-10 mm diametro, circulo ligularum 18-20 mm, disco 8-9 mm diametro. Involucrum cupulatum crasse subherbaceum viride. Phyllaria sterilia 5-7 ovato-triangulata subobtusata vel acutata, 3.5-4 x 2.3-2.8 mm, crassiuscula basi incrassata et lanuginea, dorso praecipue sursum granulato-glandulata glandulis globosis margine distali densis, insuper pilis densis brunneis flexuosis ad 1 mm longis obtusis, subclavatis et clavatis intermixtis. Phyllaria fertilia 3.5-4 x 2.5 mm obovata vel obovato-oblonga apice subite

acute triangulata vel obtusa, dorsale et basi valde incrassata, arcuato-incurvata, intus nitida, extus brunneo-antrorso-pilosa, margine apicali copiose glanduloso, glandulis late obovoideis vel globosis hyalinis sessilibus, pilis ad 1 mm longis subclavatis vel clavatis. Receptaculum ovoideum glabrum circa 4 mm latum. Paleae obovato-oblongae subscariosae, apice obtuse subtriangulato, subcucullato, abaxiale sursum dense brunneo-pilosae pilis clavatis antrorsis 0.2-0.3 mm, distale apiceque densis glandulis globosis hyalinis praecipue ad marginem munitae.

Flores radii ligulati 14-20 in capitulo 2-seriati. Corolla alba 6-7 mm longa, tubo 0.2 mm longo dense patulo piloso pilis hyalinis plus minusve flexuosis clavatis 0.3-0.8 mm longis, lamina crassiuscula obovato-elliptica vel oblongo-elliptica 2.3-3.3 mm lata, obtuse 2-3-dentata, 6-9-nervata abaxiale sparsis pilis ad basim copiosis, adaxilae minutissime mammillato-papillosa. Stylus 2 mm, ramis crassiusculis 1 mm longis. Achaenia exteriora 2 x 1.8 mm, obovato-oblonga triangulata basi acutata, interiora 2 x 1.1 mm oblonga quadrangulata.

Flores disci 40-72 in capitulo. Corolla lutea 3.4-3.7 mm longa, tubulo 1.5 mm sursum sparsis pilis 0.3-0.4 mm hyalinis obtusis vel clavatis, limbo tubuloso-infundibuliformi tantum basi parvis pilis clavatis, lobis triangularibus 0.7-0.8 mm longis haud pilis. Antherae 1.3 mm longae. Nectarium tubulosum breviter dentatum circa 0.6 mm longum.

Typus: Venezuela, Lara-Trujillo: entre El Alto y Los Pocitos en la fila o cresta del cerro, paralela al camino hacia Humocaró Alto, divisoria entre Lara y Trujillo, 15 km de Carache, 3150 m alt, árbol 5-6 m, ligulas blanquecinas, 5 Oct 1970, Ruiz-Teran & Lopez-Figueiras 1034a; US, holotypus, isotypus; MERF, isotypí.

L. cristamontis is characterized by the subsessile, rather smaller leaves, thickly lanate below, by the crowded parallel nerves 2-4 mm distant and 70-75° deviation angle, by the smaller heads and flowers, and the glabrous disc-corolla lobes.

LIBANOTHAMNUS NERIIFOLIUS var. *BOCONENSIS* Cuatr. var. nov.

Lamina foliorum 14-30 x 3.5-7.4 cm, elliptica, apice breviter subacutata, basim attenuato-cuneata, nervis secundariis 4-9 mm distantibus angulo 60-70°(-75°) divergentibus; abaxiale dense subadpressequae crispilana, nervis secundariis tectis sed notatis. Capitula 9-10 mm diametro 61-90 flores ferentia. Flores radii 12-20, corolla ligulata lamina 1.6-2.5 mm lata oblonga, tubo 0.3-0.5 mm longo. Flores disci 48-75. Rami inflorescentiae glabrati vel laxiuscule pubescenti.

Typus: Venezuela, Trujillo: Paramo de La Cristalina, forest 2250-2300 m, tree 6-10 m, leaves coriaceous green yellowish above, ashy below, ligules white, 30 Oct 1969, Cuatrecasas, Ruiz-Teran & Lopez-Figueiras 28190; US, holotypus; MERF, isotypus.

LIBANOTHAMNUS NERIIFOLIUS var. TURMALENSIS Cuatr. var. nov.

Lamina foliorum 12-18 x 2.5-4.3 cm, oblanceolata vel elliptico-lanceolata, apice subacuta, basim attenuata, nervis secundariis 2-5(-6) mm distantibus, angulo 65-75° divergentibus; abaxiale indumento satis dense, crasseque crispilano nervos secundarios conspicuos tegenti, costa mox glabrata viridi nitidaque conspicuissima; capitula 7-9(-10) mm lata 56-90 flores ferentia. Flores radii 11-17(-20), corolla ligulata 2-3.3 mm lata, elliptica vel obovato-oblonga tubo (0.2-)0.3-0.5(-0.6) mm longo. Flores disci 45-81. Rami inflorescentiae glabrescentes vel laxe lanugineo-pubescentes.

Typus: Venezuela, Trujillo: Paramo del Turmal (continued with Paramo del Jabon), east of Carache, 2900-2800 m alt, tree 5 m tall, ligules creamy white, disc corollas pale yellow, 3 Nov 1969, Cuatrecasas, Ruiz-Teran & Lopez-Figueiras 28239; US, holotypus; MERF, isotypus.

LIBANOTHAMNUS x GRITAENSIS Cuatr. n. hybr.

= Libanothamnus neriifolius v. columbicus Cuatr. x L. occultus (Bl.) Cuatr.

A L. neriifolius capitulis et floribus majoribus, dentibus corollae disci barbatis, inflorescentia indumento copioso, bracteis subtendentibus capitulorum latioribus amplectentibus ovatis acutissimis, differt.

Arbor 5 m alta. Folia coriacea crassiuscula breviter pseudopetiolata; lamina 20-34 x 5-7.5 cm, adaxiale luteolo-viridi subnitida, abaxiale viridi-cinerea nervis secundariis conspicuis, 3.5-9 mm distantibus angulo 75-80° divergentibus, elliptico-oblonga apice subite subacutata vel subobtusa basi cuneata; pseudopetiolus valde brevis, 0.3-1(-2) cm longus.

Inflorescentiae floribundae foliis proximalibus subtendentibus non petiolatis apice acutis, et sursum bracteis subtendentibus valde amplectentibus apice acutissimis. Rami ramusculi pedicelli-que praecipue ad nodos copiose longeque lanuginosi.

Capitula 11-13 mm diametentia; circulo ligularum 21-33 mm, disco 10-11 mm diam, 71-93 flores ferentia.

Phyllaria sterilia exteriora 5 crassiuscula rigidula ovato-triangulara acuta vel acuminata apice calloso, 5-6.5 x 3.5-4.5 mm, plurinervia, extus densiuscule lanuginosa, marginibus barbatis similia. Saepissime 1-2 phyllaria additionalia interiora. Phyllaria fertilia 4-5 x 2.8-3 mm obovata vel subrhomboidea acuta crassiuscula concava sursum apice calloso glabro excepto pilosa antrorso-ciliata.

Receptaculum 4.5-5.2 mm diam ovoideo-conicum 2 mm altum glabrum. Paleae 4-4.5 x 1.5-2.5 mm, hyalinae amplectentes apice subcucullato glabro granulato-glanduloso infra apicem brunneo-pilosae pilis clavatis.

Flores radii 17-22. Corolla alba vel eburnea 7-8.5 mm longa; tubus 0.8-1 mm longus densissime pilosus pilis hyalinis clavatis ad 1 mm longis; lamina elliptica vel elliptico-oblonga, 2.8-3.2 mm lata, 2-3-dentata circa basim extus pilosula. Stylus 3 mm ramis crassiusculis 0.8-1 mm. Achaenia immatura exteriora 2.3-2.8 x 2 mm obovato-triangulara basim attenuata dorso leviter convexo basi callosa, interiora parca 2.8 x 1.2 mm oblonga.

Flores disci 57-73. Corolla lutea 4.5 mm longa, tubo 1.5 mm longo sursum antrorso-piloso pilis obtusis et clavatis; limbus tubulosus basim parvis pilis; lobi triangulares 0.5 mm alti abaxiale breviter barbati parvis pilis antrorsis. Antherae 2 mm appendice apicali ovata 0.4-0.5 mm longa. Nectarium tubulosum crassum 0.7 mm altum.

Typus: Venezuela, Tachira: Llano de Campoalegre, near La Grita on the way to Paramo del Batallon, remnants of forests, 2500 m, tree 5 m, ray corollas white or cream-white, 2 Oct 1969, Cuatrecasas, Lopez-Figueiras & Marcano-Berti 27999.

The tree partially described above, calls immediate attention because of the larger heads and flowers than Libanothamnus neriiifolius var. columbicus, the dominant species in the particular area.

Besides the larger size of heads (10-13 mm) and flowers (ray flowers 7-8.5 mm; disc flowers 4.5 mm), this specimen differs in having very short petiolated or almost sessile leaves, broader ovate, amplexant and more acute subtending bracts than in all varieties of L. neriiifolius, as well as having more copious, longer lanugineous indument on the inflorescences. In addition, the disc corollas have the lobes hairy on the outside. All indicate that the tree described above is a result of hybridization of L. neriiifolius v. columbicus with L. occultus (Bl.) Cuatr., which was also present and was collected at the same time in the area.

ESPELETIA TILLETII Cuatr. sp. nov.

Caulirosula subessilis visu albida, caule ad 10 cm longo, cum foliis marcescentibus densissime oblecto.

Folia tenuiter subcoriacea flexibilia utrique densiuscule crasseque albo-lanata pseudopetiolata, 26-36 cm longa. Lamina anguste elliptica oblanceolata utrinque attenuata apice acuta interdum subacuta, basim versus in pseudopetiolum gradatim angustata, (16-)20-24 cm longa 1.8-2.3 cm lata, ratio 11-8(-6.6):1, margine integra anguste revolutaque; costa adaxiale plana vel in vetusta deorsum leviter sulcata, abaxiale moderate prominenti subplana striolataque costulato-marginata; nervis secundariis abaxiale tantum notatis 4-8 mm inter se distantibus filiforme prominulis in angulo (30-)40-50°(-55°), ascendentibus prope marginem curvato-anastomosantibus; nervis tertiis irregulariter transversis paulo differentiatitis et cum venulis reticulum crassum uni-vel bi-stratosum valde lanigerum formantibus, alveolis subprofundis ovatis vel

ellipticis fundo subplano visu glabro, cum indumento omnino velatis; utrinque dense crispo-lanata, alba vel cinerea, et praecipue in juvenile statu insuper longe sericeo-villosa, ad costam magis sericea. Pseudopetiolus 3-4 cm longus 4-5 mm latus, costa pluristriata cum lamina utroque latere bene marginata, utrinque lanata et subsericeo-villosa. Vagina subcoriacea rigidula oblonga apice subobtusata (6-)7-8 cm longa, 1.8-2.2 cm lata, argute parallelinervata adaxiale glabra abaxiale longe fulvescenti-villoso-barbata.

Inflorescentiae axillares plures in rosula, foliis duplo triplo longiores erectae. Axis moderate robustus rigidus medullosus, 62-84 cm longus vel ultra, basi ad 1 cm diametro. Pars proximalis vegetativa 1/2-1/3 totae longitudinis, 1-2 paria foliorum sterilium ferens inferiore 1-3 cm supra basim insertum, sequens cum intermedio 3-9 cm longo separatum; folia sterilia opposita lineari-oblongata acuta 17-25 x 1-1.4 cm basi vaginis in tubum plus minusve coalitis, interdum sursum 1-2 foliis sterilibus alternis instructa. Pars distalis fertilis 2/3-1/2 totae longitudinis, 14-20 capitula ferens, tria in cyma terminali, altera in 4-6 ramis (paracladiis) thyrsideo-paniculatis dispositis; rami saepe in cyma tricephala terminantes vel distales monocephali, mediales saepe oppositi, ceteri spiraliter alternantes; inferiores 20-27 cm longi, sursum gradatim breviores: 13-18 cm, 9-12 cm, distales 5-2 cm. Pedicelli 0.3-0.5 cm, terminales 1-1.5 cm longi. Capitula cymorum saepe glomerata. Bractae subtendentes inferiores foliaceae 16-7 x 1.2-0.8 cm, anguste oblongae, distales 5-2.5 x 0.8-0.5 cm, sublineares. Interdum pare foliorum subbasale folium unum axillari fertile. Axes rami bractae dense crasse albido-lanatae et insuper indumento crassiusculo sublaxo, longe subsericeo-villosi instructae.

Capitula radiata mediocria erecta vel cernua, 130-300 flores ferentia, crasse lanata 25-28 mm diametro, circulo ligularum circa 26 mm, disco 15-16 mm diametro. Involucrum cupulatum (12-)15-16 mm altum. Phyllaria sterilia 14-19 pluriseriata, 7-9 crasse herbacea exteriora lanceolato-ovata acuminata acutissima 19-17 x 8-5 mm, extus densissime albo-lanata, intus glabra 6-8 nervata et plus minusve venoso-reticulata, 9-10 interiora membranacea 15-13 x 5-3 mm abaxiale villosa. Phyllaria fertilia exteriora membranacea 13-12 x 4-3 mm oblonga attenuata acuta adaxiale glabra plurinervata, abaxiale villosa, ad apicem lanuginosa marginibus glandulis pediculatis 0.03-0.08 mm, basi incrassata; interiora 12-11 x 3.5-2.5 mm magis amplexantia. Receptaculum subplanum glabrum 10 mm diametro. Paleae subscariosae 9 x 2 mm, oblongae acutae naviculares plurivenia distale barbatae pilis flexuosis 1 mm longis et glandulis pediculatis sursum sparsis munitae.

Flores radii ligulati 30-64 in capitulo 3-4-seriati. Corolla lutea 12-13 mm longa, tubo 2 mm longo copiose piloso apice saepe appendice adaxiali linguliformi ad 4 mm longa, pilis 0.3-0.8(-1) mm longis obtusis vel subacutis et glandulis pediculatis copiosis; lamina oblonga 2.2 mm lata profunde 2-3-dentata, deorsum marginale plicata, abaxiale copiosis glandulis brevi-pediculatis. Stylus 7-8 mm ramis 1-1.5 mm longis. Achaenia marginalia 2.5-2.7 x 1.5 mm

obovoidea 3-angulata dorso plano-convexo basi contracta; interiora 2.7-2.9 x 1 mm, oblonga quadrangulata.

Flores disci 100-235 in capitulo. Corolla viridi-lutea 7.5-8 mm longa, tubulo 2 mm longo parvis pilis obtusis 0.3-0.8 mm et praecipue sursum copiosis glandulis pediculatis 0.03-0.07 mm, limbo tubuloso tantum parvis pilis et glandulis basi munito; lobis luteis triangulari-oblongis 1.1-1.3 mm longis crasse marginatis apicem incrassatis, abaxiale copiosis glandulis globosis brevipediculatis munitis, haud pilis. Antherae 3-5 mm longae basi breviter sagittatae appendice ovata subacutata 0.5 mm longa. Stylus 7.5-8 mm, apice bilobato longe denseque papilloso. Nectarium anguste tubulosum 0.7-0.8 mm longum.

Typus: Venezuela, Zulia: Sierra de Perija-Serrania de Valledupar (Venezuela-Colombia boundary), campamento "Monte Viruela" on tepui-like limestone massif 5 x 2.5 km, 3100 m alt; stem 1 dm, pungent umbellifer odor, white hairy, rays matte medium yellow, disk flowers medium greenish yellow with yellow tips, sweet fragrance, visited by bees and hummingbirds, 21-28 Jul 1974, S.S. Tillet 474-1126, holotypus US; isotypi VEN, MYF.

Espeletia tillettii is a close relative of E. perijaensis Cuatr. from which it differs mainly by the leafy vegetative section of inflorescences, by the higher number of heads on each inflorescence, the lack of hairs on the disc-corolla lobes, and by the narrower weaker vegetative leaves, also with narrower, oblong sheaths.

ESPELETIA PRAEFRONTINA Cuatr. sp. nov.

Caulirosula usque ad 5 m alta, visu ochroleuco-sericea.

Folia coricea adulta rigida, utrinque dense ochroleuco-lanata insuper saltem juvenilia subsericeo-villoso-barbata, sessilia. Lamina anguste elliptica sub lanceolata apicem versus angustata acutae, basim versus gradatim moderate attenuata, margine integra revolutaque, 20-25 cm longa, 4-5.5 cm lata, the ratio 3.7-6:1, basi 1.3-1.8 cm lata; adaxiale dense congeste crispo-lanata insuper subadpresso subsericeo-longi-villosa pilis tenuibus ad 10 mm longis, costa leviter conspicua; abaxiale costa elevata striataque dense crispo-lanata, nervis secundariis prominentibus plus minusve notatis, 5-8(-10) mm inter se distantibus in angulo 40-50° ascendentibus, nervis tertiis transversis flexuosis prominentibus cum nervulis fere elevatis in reticulo anastomosatis, alveolis ovatis profundiusculis parce pilosulis, reticulo copiosissime longe piloso indumentum intricatum crispo-lanatum crassum laminam tegentem orienti. Vaginae rigide coriaceae ovatae vel oblongo-ovatae, apice obtuse cuneatae, 5-6 x 5-7 cm, adaxiale glabrae argute nervatae, abaxiale longe fulvescente sericeo-barbatae pilis circa 15 mm rectis antrorsis adpressis tectae, apice densissime congeste crasseque lanatae et barbatae. Folia incipientia valde revoluta crassissime adpressoque induta visu aureo-sericea.

Inflorescentiae axillares thyrsoideae, 3-5 capituliferae, omnino dense crasseque luteo-lanatae barbataeque folia rosulae paulo (1/5-1/4) excedentes. Axis mediocris 40-43 cm longus erectus striolatus. Pars proximalis vegetativa 34-37 cm longa, 1-2 paribus foliorum sterilium instructa, foliis infimis 2.5-4.5(-9) cm supra basim orientibus, internodio proximali 17-22 cm, sequenti 10-15 cm longus, foliis proximalibus oblanceolato-oblongis 10-16 cm longis 1-1.8 cm latis, basi longe vaginantibus breviterque connatis, alteris 5-9 x 1-1.3 cm oblongis brevius vaginantibus connatisque. Pars distalis fertilis brevis 5-3 capitulifera, cyma bracteata tri-cephala terminalis et uno vel duobus paraclydiis oppositis mono-cephalis instructa; internodium 2.5-3.5(-8) cm longum; rami seu pedunculi proximales 3.5-5(-8) cm longi; cyma terminalis pedicello centrali 1.8-3.5(-5) cm longo, lateraribus 1.5-2.5(-5) cm, aliquando capitulo mediali tantum evoluto ambobus lateralibus defectis et bracteis solis sterilibus remanentibus. Pedunculi seu pedicelli apice recurvi capitulis fortiter cernui, vetustis nutantibus. Bractaeae subtendentes pedunculos aequilongae, proximales 3.5-4.5 (-8) x 1-1.2 cm, oblongo-lanceolatae acutae basi ampliatae, distales 3-3.6 x 1 cm ovatae plus minusve acuminatae acutae. Inflor-escencia tota dense lutescenti-lanata et plus minusve barbata.

Capitula radiata mediana cernua 22-25 mm lata, 152-242 flores ferentia, circulo ligularum 30-35 mm, disco 13-17 mm diametientia. Involucrum cupulatum copiose lutescenti-lanatum barbatumque 14-17 mm altum. Phyllaria sterilia crassiuscula, 4 exteriora 20-17 x 11-10 mm ovata vel elliptica acuminata, dense crispo-lanata, saepe 4 interiora 14-9 x 7-4 mm ovato-oblonga vel oblonga acuta, crispo-lanata. Phyllaria fertilia exteriora (14-)8-7 x (10-)3.5-3 mm, elliptica subite acutata abaxiale lanuginosa vel villosa-lanuginea, distale ferrugineo-barbata pilis 2-1 mm longis; interiora (9-)6.5 x 3.5-2.7 mm tenuia elliptica acuta dorso marginibusque pilosa et copiosis glandulis pediculatis 0.03-0.07 mm longis. Receptaculum circa 8 mm diametro glabrum. Paleae (8-)6-5.5 x (3.6-)3-2 mm, scariosae, ovales acutae nervatae, amplexantes dorsale subapicem sublanugineo-barbatae pilis flexuosis 1 mm longis, et copiosis glandulis columnaribus 0.03-0.08 mm longis.

Flores radii ligulati 34-36. Corolla lutea 11-14 mm longa, tubo 2-2.5 mm longo, copiose piloso et sparse glanduloso pilis obtusis vel subacutis 0.2-0.4 mm interdum sursum abaxiale usque 1 mm longis, glandulis pediculatis basim incrassatis ad 0.05 mm longis; lamina crassiuscule firma, elliptico-oblonga, 2-3.5 mm lata inferne extus pilosula, abaxiale 9-11 venis prominentibus et tota sparse glandulifera, adaxiale mamillato-papillosa aspectu velutina. Stylus 3.5-4 mm ramis 1-1.3 mm longis. Achaeia exteriora 3 x 1.8 mm oblongo-obovata apice obtusa subtruncata, triangulata, interiora 3.2 x 1 mm quadrangulata oblonga.

Flores disci 116-208. Corolla lutea 6.5-7(-8) mm longa, tubo 3-3.5 mm longo angusto sparsis pilis obtusis deorsum incrassatis 0.1-0.4 mm longis et glandulis pediculatis praecipue sursum munito, limbo tubuloso-infundibuliformi tantum basi parce pilosulo

et glandulifero; lobi 0.7-0.8 mm triangulares, marginibus incrassatis valde papillois, abaxiale sparsis glandulis 0.05 mm. Antherae 2.4 mm appendice apicali ovata 0.4 mm. Nectarium tubulosum circa 1.2-1.8 mm altum quinquentatum.

Typus: Colombia, Antioquia: Cordillera Occidental, Paramo de Frontino circa Llano Grande, 3450 m, 27 Oct 1976, Jeff D. Boeke & J.B. McElroy 273 (US, holotypus; NY, isotypus). Paratype: Paramo de Frontino, 3500 m, 1 Dec 1970, Rivera, Llano & Ruiz 784 (COL, US).

ESPELETIA AZUCARINA Cuatr. sp. nov.

Caulirosula. Folia 34-37 cm totae longitudinis; lamina oblonga apice acuta basim versus sine sensu attenuata, 26-30 cm longa, 3.2-3.7 cm lata, ratio 7.8-9.3:1, supra basim 1.4 cm minima latitudine, margine integra leviter revoluta, costa supra plana subtus crasse elevata, nervis secundariis abaxiale notatis 5-7 mm inter se distantibus angulo 40-45° ascendentibus, utrinque dense albo lanata; vagina trapeziale-oblonga apice obtusa basi latiore, 6.5-8 cm longa, 5.5-7 cm lata.

Inflorescentiae circa 48 cm longae rosulam 1/3 excedentes parte sterili 4 paribus foliorum sterilium, parte fertili circa 17 capitula ferenti cum cyma terminali et 3 paribus ramorum ascendentium instructa.

Capitula radiata 20-22 mm lata erecta vel cernua 233 flores ferentia, circulo ligularum 30 mm, disco 15-16 mm diam. Phyllaria sterilia valde lanata ovata acuta, 12-9 x 8-4(-3) mm; phyllaria fertilia exteriora lanci-ovata acuminata, sparse antrorso-villosa sursum villosa-barbata, 8 x 3.2 mm. Receptaculum 7.5-8 mm latum; paleae 6-6.5 x 2 mm hyalinae dorso-distali ciliato-barbatae. Flores radii ligulati 82 triseriati, corolla lutea 9-11 mm longa tubulo 1.5-1.8 mm longo dense piloso pilis crassiusculis obtusis patulo ascendentibus, interdum subacutis, 0.2-0.4 mm longis et glandulis subsessilibus interspersis, lamina 2 mm lata, obtusa, 6-7 nervata, abaxiale basi parce pilosa reliqua sparsis glandulis praedita. Flores disci circa 150, corolla lutea 6-6.5 mm longa, tubulo 2.5 mm longo copiose piloso praecipue sursum, pilis crassiusculis obtusis vel subobtusis ascendentibus, 0.2-0.4 mm, plus parvis glandulis sparsis, lobis triangularibus crasse marginatis 1 mm longis abaxiale sparsis vel copiosis glandulis sessilibus.

Typus: Colombia, Boyaca: Macizo alto, al N de Belen, municipio Tutasa, Cerro Pan de Azucar y vecindad, paramo pedregoso seco, vert. E del cerro, 4000 m; frailejones asociados con Calamagrostis effusa; caulirosula 1 m, hojas grisaceas, ligulas amarillas, 7 May 1973, A.M. Cleef 9835 (US, holotypus; COL, U, isotypi).

Espeletia azucarina differs essentially from *E. jaramilloi* by its narrow-oblong leaves, smaller inflorescences and shorter ray corolla tube. It is also closely related to *Espeletia cleefii* because of its floral and inflorescential features; however, the strongly lanceolate (proximally contracted) type of leaf of *E.*

cleefii taxonomically separates this species from the Pan de Azucar plant.

ESPELETIA BRASSICOIDEA subsp. ANGUSTA Cuatr., subsp. nova

Folia 43-49 cm totae longitudinis, lamina elliptica oblanceolata acuta vel subacuta, 26.5-38 cm longa, 3.5-5.5 cm lata, ratio 5-9:1, basi 11-7 mm angustata; vagina 9-10 x 4.5-5 cm.

Capitula saepe latiora, 30-45 mm diametro (ligulis amotis) in sicco, 187-234 flores ferentia, 49-54 feminei, 138-180 masculi. Corollae radii 16-17 mm longi, tubulo 4-4.5 mm longo, lamina lineari 1.5-1.8 mm lata. Corollae disci 9-9.5 mm longae, tubo 3.5-4 mm, lobis 1.2-1.4 mm longis, saepe glabris sed interdum 1-2 pilis in uno vel duobus lobis. Involucrum saepe cum phyllariis sterilibus interioribus additionalibus in totum 11-14 phyllariis.

Typus: Colombia, Norte de Santander, between Pamplona and Berlin, left side of the road, km 89, subacaulirosuletum, chromosome number $n = 19$, appearance white, 23 Sep 1969, Cuatrecasas & Rodriguez 27916 (US, holotypus; COL, isotypus).

SOLANACEAS NUEVAS PARA VENEZUELA

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I.- *Jaltomata sanctae-martae* (Bitter) Benitez, nov. comb.

Saracha sanctae-martae Bitter, Rep. Sp. Nov. 18: 99
1922. TIPO: Colombia, H.H. Smith 1145 (B, n.v. destruído?). ISOTIPOS: (MO, C).

Sufrútice pequeño, ca. 1 m de alto, muy ramificado desde cerca de la base, ramas fistulosas, blanquecino por su pubescencia, pelos casi siempre estipitado-glandulosos. Hojas con 3(-4) lóbulos de cada lado, las superiores a veces enteras, pubescentes en ambas caras y especialmente sobre los nervios. Inflorescencias umbeladas, con 3-6 flores. Cáliz acrecente y extendido en la fructificación. Corola amarillo-pálida, interna- y externamente laxo-pubescente, internamente y hacia abajo con manchas verdes. Fruto una baya glabra, roja, 7-10 mm de diámetro.

Esta especie se señala por primera vez para Venezuela del Parque Nacional Yacambú, sureste de Sanare, Estado Lara y hasta ahora era conocida de la Sierra de Santa Marta, Colombia. Bitter, l.c.p. 100, señala su diferencia con *Saracha antillana* Kr. et Urb., hoy *Jaltomata antillana* D'Arcy, por sus hojas más grandes y anchas y por rematar la mayoría de sus pelos en cabecitas glanduliformes.

Estado Lara: Sufrútice víscido-piloso, ramas recostadizas, tallos huecos y surcados, corola amarillo pálido, 1,5 cm de diámetro, con dos manchitas verdes internamente en la base de cada lóbulo de la corola, frutos rojos; Parque Nacional Yacambú, SE de Sanare, Distrito Jimenez, 8-XII-1974, Carmen E. Benitez de Rojas N° 1751 (MY). Al lado de la carretera cerca de La Escalera, entre La Escalera y Cubiro, en zona montañosa, 5-III-1978, Ch. Burandt Jr. y R.F. Smith N° V0018 (MY).

II.- *Solanum paludosum* Moricand, Plant. Nouv. D'Amerique 29, tab. 20. 1837. TIPO: Brasil, Blanchet 641, in palidibus circa Bahiam.

Solanum salzmanni Dunal, DC. Prodr. 13(1):206. 1852 (nom. superfl.) Vistas las fotos siguientes del herbario de De Candolle: Salzmann N° 382 (sub *Solanum viscosum* Salzmann ex Dunal), Blanchet N° 1024 y 206 "circa Bahiam".



Jaltomata sanctae-martae (Bitter) Benitez
Benitez de Rojas N° 1751 (MY)

Planta leñosa con tallos hasta 4 m de alto, laxo-aculeados. Hojas firmemente papiráceas hasta subcoriáceas, enteras o ligeramente sinuadas, discoloras, las nervaduras surcadas en el haz y salientes de color castaño en el envés. Cáliz estrellado-pubescente por ambas caras, 5-lobulado, lóbulos lanceolados y puntiagudos, marrón claro amarillento, corola 3 veces más larga que el cáliz, pubescente por fuera y glabra por dentro, 5-lobulada, los lóbulos púrpura. Fruto globoso hasta 1,5 cm de diam., con pubescencia rojiza, esteliforme y decidua.

La especie sólo ha sido señalada de Brasil y ahora localizada en Venezuela en la Guayana venezolana, Estado Bolívar. Relacionada con *Solanum rufistellatum* Steyermark, difiere por la ausencia de acúleos en las hojas, éstas claramente discoloras y con pubescencia granulosa, diminuta y numerosa en el haz, los lóbulos del cáliz con sendas nervaduras dorsales bien marcadas.

Estado Bolívar: Arbolito de flores moradas; a lo largo del tramo de carretera a Anacoco, 23-XI-1976, Antonio Fernández N° 2628 (MY). Arbusto de flores moradas; entre Betania y Peraitepuy, en las cercanías a Peraitepuy, 6-XI-1976, Antonio Fernández N° 2334 (MY). Shrub 4-6 feet tall; leaves firmly membranaceous, deep green above, tawny, golden below; corolla lavender; calyx and pedicel tawny golden; Gran Sabana, between Kun and Uadua-parú, in Valley of Río Kukenán, South of Mount Roraima, altitude 1065-1220 meters, I-X-1944, J. Steyermark N° 59093 (MY, VEN, F). Shrub 3 m tall; leaves subcoriaceous, deep green above, buff-silvery below; petioles buff-brown to tawny; corolla violet; anthers golden, virgin forest of tall trees (20-40 m), 27-29 Km East of Peraitepuy 1000 m, 3-I-1975, J. Steyermark 111349 (VEN, F). Arbustillo hasta 3,50 m, espinoso principalmente cuando está por debajo de 1 m, después es casi inerme; flores moradas, estambres amarillos, en comejeneras, formando colonias, sabanas de Santa Elena, Gran Sabana, 4-III-1946, Francisco Tamayo N° 3035 (VEN, F). Sabanas de Santa Elena, Gran Sabana, 10-II-1946, Francisco Tamayo N° 2727 (VEN). Frútice de flores moradas; en sabanas abiertas de Santa Elena, IV-1946, Tobías Lasser N° 1373 (VEN).

III.- *Solanum rovirosanum* Donn. Smith, Bot. Gaz. (Crawfordsville) 48: 297. 1909. TIPO: Guatemala, Tuckheim N° 11021.

Planta inerme; hojas ovadas o elípticas, atenuadas en ambos extremos, de 10-20 cm de largo por 4,5 - 7,8 cm de ancho, glabras hasta menudamente pubérulas. Inflorescencias cimosas, con cicatrices conspicuas luego de escasa pubescencia decidua.

Se conocía esta especie desde Guatemala hasta Colombia y Ecuador y ahora, localizada en los Llanos Occidentales del País.

Edo. Portuguesa: Dtto. Guanare, Hda. La Sombrereta, entre Papelón y Guanarito, 20-III-1976, Francisco Ortega N° 71 (MY, VEN).

NOTES ON NEW AND NOTEWORTHY PLANTS. CXLI

Harold N. Moldenke

LANTANA TRIFOLIA f. *PLURIPEDUNCULATA* Mold., f. nov.

Haec forma a forma typica speciei pedunculis 4--6 per nodos ramulorum recedit.

This form differs from the typical form of the species in having 4 to 6 peduncles arising from each leaf-bearing node on the stems and branches.

The type of the form was collected by B. W. de Albuquerque, C. D. A. da Mota, and J. G. de Oliveira (no. 1280) in wet clay soil of low capoeira on terra firme at Quinoá, km. 22 on the Rio Branco to Porto Velho highway, Rio Branco municipality, Acre, Brazil, and is deposited in my personal herbarium. The collectors note that the plant was an infrequent shrub, 2.5 m. tall, the flowers "slightly purple" along with unripe fruit. No date of collection is given.

SYNGONANTHUS FERTILIS var. *HUBERI* Mold., var. nov.

Haec varietas a forma typica speciei recedit verticillis foliorum caulinis plerumque 2 internodiis longiter elongatis.

This variety differs from the typical form of the species in normally having only two cauline whorls of leaves (in addition to the terminal one subtending the peduncles) and the internodes between them much elongated, 6--11 cm. long.

The type of the variety was collected by Otto Huber (no. 2349) in a "Sabana de arena rosada al SE del Cerro Morrocoy, valle del Caño Camaní, 5°15' Lat., 66°09' N. Long.", at about 13 meters altitude, on August 20, 1978, and is deposited in my personal herbarium. The collector notes that the plant grows 30--40 cm. tall, has white flowering-heads, and is common in the type locality.

VITEX COMPRESSA f. *ANGUSTIFOLIA* Mold., f. nov.

Haec forma a forma typica speciei laminis foliolorum angustioribus 6--15 cm. longis 2--4 cm. latis recedit.

This form differs from the typical form of the species in its uniformly narrower leaflet-blades which are 6--15 cm. long and only 2--4 cm. wide.

The type of the form was collected by Ronald Liesner, Angel González, and Robert Wingfield (no. 8279) at Cerro Socopo, east side above Socopo, Falcón, Venezuela, 10°30' N., 70°45' W. to 10°29' N., 70°48' W., at 440 to 1200 m. altitude, on June 28, 1979, and is deposited in my personal herbarium. The collectors note that the tree was 5 m. tall and had green fruit at the time of collection.

ADDITIONAL NOTES ON THE GENUS *TEIJSMANNIODENDRON*. I

Harold N. Moldenke

TEIJSMANNIODENDRON NOVO-GUINEENSE (Kaneh. & Hatus.) Kosterm.

Additional bibliography: Mold., *Phytologia* 46: 467 & 494. 1980.

Additional synonymy: *Teijsmanniodendron novoguineense* (Kaneh. & Hatus.) Kosterm., *Reinwardtia* 1: 103. 1951. *Vitex novo-guineënsis* Kaneh. & Hatus. apud E. J. Salisb., *Ind. Kew. Suppl.* 11: 265. 1953. *Vitex novoguineënsis* Kaneh. & Hatus. ex G. Taylor, *Ind. Kew. Suppl.* 12: 141. 1959. *Teijsmanniodendron novoguineëns* (Kaneh. & Hatus.) Hosterm. apud G. Taylor, *Ind. Kew. Suppl.* 12: 141. 1959.

Bibliography: Kaneh. & Hatus., *Bot. Mag. Tokyo* 56: 116--117, fig. 8. 1942; Kosterm., *Reinwardtia* 1: 75, 79, 80, 103, & 106. 1951; E. J. Salisb., *Ind. Kew. Suppl.* 11: 265. 1953; Mold., *Résumé* 202, 387, & 470. 1959; G. Taylor, *Ind. Kew. Suppl.* 12: 141. 1959; Mold., *Fifth Summ.* 1: 337 & 339 (1971) and 2: 724 & 911. 1971; Mold., *Phytologia* 44: 222. 1979.

Illustrations: Kaneh. & Hatus., *Bot. Mag. Tokyo* 56: 117, fig. 8. 1942.

Collectors describe this species as a tree, to about 25 m. tall, the bole clear to 18 m. high, with a diameter of 90 cm. at breast height, the branchlets slender, buttresses indistinct, up to 1 m. high, the bark rough, with numerous prominent lentils, the wood yellowish, the leaflets dark-green above, light-green beneath, thin-coriaceous, without impressed dots beneath, the secondaries 5 or 6 pairs, obliquely spreading, slightly curvate, marginally not anastomosing, the inflorescences much more slender than those of *T. hollrungii*, the corollas light-purple, the lip darker purple or lilac, with an orange dot at the throat, the anthers purple, and the immature fruit light-green.

The species is based on *Kanehira & Hatusima 12578* from Ayer-jat, near Nabire, on Geelvink Bay, West Irian, New Guinea. It has been collected in lowland forests, at an altitude of 100 m., in anthesis in September. A vernacular name, "prau", has been reported for it.

Kostermans (1951) says that the species is "very close to *T. hollrungii* (Warb.) Kosterm., but can easily be distinguished from the latter by the absence of the numerous holes (glands) of the lower leaf-surface and by the fewer lateral nerves. In addition the leaves are less rigid....[It] seems to be rather rare." He notes that the *Thomson s.n.*, which he cites from West Irian, "differs from the type in its larger, paniculate inflorescence (20--30 cm) which is densely tomentose (more laxly so on the peduncles), and the larger flowers. I consider it, however, conspecific, as the leaves are identical and the type has a poorly developed in-

florescence, which even shows the same pubescence in some parts; calyx and corolla are of the same shape, the ovary in both species [sic; =specimens] has the same indumentum." He notes also that "The species comes close to *Vitex cofassus*, from which it differs by the few lateral nerves, the indumentum of the inflorescences, and lack of tiny holes in the lower leaf surface."

It is of more than passing interest to note that Van Leeuwen describes his no. 11131 as having been taken from a "liana" -- surely an error in observation!

Citations: NEW GUINEA: West Irian: *Kanehira & Hatusima 12578* (Bz--73233--isotype, N--photo of isotype, Z--photo of isotype); *Thomson 866* (Bz--73234, N); *Van Leeuwen 11131* (Bz--72697, N), 11260 (Bz--72696). NEW GUINEAN ISLANDS: Waigeo: *Van Royen 5463* (Ca--1341515).

TEIJSMANNIODENDRON PENDULUM Kosterm., *Reinwardtia* 5: 352--353 & 369, fig. 14. 1960.

Synonymy: *Teysmanniodendron pendulum* Kosterm. ex Kramer, *Excerpt. Bot. A.5*: 33. 1962.

Bibliography: Kosterm., *Reinwardtia* 5: 352--352 & 369, fig. 14. 1960; Kramer, *Excerpt. Bot. A.5*: 33. 1962; G. Taylor, *Ind. Kew. Suppl.* 13: 134. 1966; Mold., *Fifth Summ.* 1: 328 (1971) and 2: 911. 1971; Mold., *Phytologia* 46: 483 & 486. 1980.

Illustrations: Kosterm., *Reinwardtia* 5: 369, fig. 14. 1960.

A medium-sized tree, to 15 m. tall; clear bole to 9 m. high, 30 cm. in diameter at breast height, girth to 60 cm; outer bark thin, smooth, whitish or brown; inner bark yellow; living bark about 15 mm. thick, red-brown, brittle; wood light-brown, rather soft; leaves 3-foliolate; petioles slender, to 5 cm. long, glabrous, basally incrassate; petiolules slender, 1--1.5 cm. long, basally incrassate; leaflet-blades rigidly chartaceous, elliptic-lanceolate or lanceolate, 5--18 cm. long, 1.5--4 cm. wide, apically acuminate, marginally entire, basally broadly cuneate or acute, glabrous, plainly reticulate-veined on both surfaces, dark-green above and dull pale-green beneath when fresh, somewhat glaucous beneath when dry; midrib prominent beneath; secondaries 3--6 pairs, arcuately ascending, prominent beneath; veinlet reticulation "marked in grey with microscopical dark dots"; inflorescence apical (terminal), usually simple and unbranched or apically few-branched (the branches very short), to 5 cm. long in fruit, with thickened nodes and bract-scars; fruiting-calyx rounded-patelliform, incrassate, 5-lobed, the lobes about 5 mm. long; fruit (immature?) green, subglobose, about 2 cm. long and wide, glabrous, solitary, pendulous; cotyledons when young jelly-like.

The species is based on *Kostermans 13007* from Palimasen, near Tabang, at 500 m. altitude, West Kutei in the Belajan River region, Kalimantan, Borneo, deposited in the Buitenzorg (Java) herbarium.

The above description is taken in major part from Kosterman (1960). The corollas are said to have been "white to purplish" on *Talip SAN.65886*. The species has been found growing in yel-

lowish-brown soil in primary forests on hillsides, in *Agathis* forests, and in waterlogged loam soil intercalated between acid sandy soil, in anthesis in July and in fruit in September.

Citations: GREATER SUNDA ISLANDS: Kalimantan: *Kostermans 13007* (Ba, N). Sabah: *Talip SAN.65886* (N, Z).

TEIJSMANNIODENDRON PETELOTI Mold., *Lloydia* 13: 225. 1950.

Bibliography: Mold., *Lloydia* 13: 225. 1950; E. J. Salisb., Ind. Kew. Suppl. 11: 250. 1953; Mold., *Résumé* 177 & 470. 1959; Mold., *Fifth Summ.* 1: 303 (1971) and 2: 911. 1971; Mold., *Phytologia* 46: 467. 1980.

A tree, to 10 m. tall; branchlets and twigs rather slender, grayish-brown, obtusely tetragonal, the youngest parts often sulcate, glabrous, the bark apparently wrinkling and exfoliating in drying; nodes annulate, somewhat swollen; principal internodes 2.5--7.5 cm. long; leaves decussate-opposite, 1-foliolate; petioles slender, 5--10 mm. long, canaliculate above, glabrous; leaflet-blades chartaceous, uniformly dark-green on both surfaces or slightly lighter beneath, elliptic or elliptic-obovate, 7.5--14.5 cm. long, 2.5--6 cm. wide, apically acuminate, marginally entire, basally attenuate-acuminate into the petiole, glabrous and very shiny on both surfaces; midrib slender, flat above, prominent beneath; secondaries slender, 9--12 per side, flat above, prominulous beneath, beautifully and regularly arcuate-ascending, not anastomosing but terminating at the margins which they subparallel for a short distance; veinlet reticulation very abundant, conspicuous, plane or very slightly prominulous above, prominulous beneath, with numerous subparallel tertiaries; inflorescence axillary, much shorter than the subtending leaves, cymose, usually 4-flowered, mostly about 4 cm. long in all; peduncles filiform, about 2 cm. long, nigrescent, glabrous; bracts absent; bractlets setaceous, minute; pedicels filiform, 3--7 mm. long, nigrescent, glabrous, flattened; calyx campanulate, nigrescent, 3--5 mm. long, 3--3.5 mm. wide, glabrous, its rim subtruncate, very shortly 5- or 6-apiculate-toothed; corolla white, hypocrateriform, its tube broadly infundibular, about 1 cm. long, apically about 7 mm. wide, externally densely cinereous-puberulent with microscopic hairs, the limb almost 1.5 cm. wide, 5-lobed, the lobes about 5 mm. long, apically acute; stamens 4, didynamous, included; pistil included, glabrous; style glabrous; stigma deeply bifid.

This species is based on *Pételot 6801* from an open forest, at about 500 m. altitude, on Mount Bavi, Santây province, Tonkin, North Vietnam, collected on April 16, 1941, and deposited in the Britton Herbarium at the New York Botanical Garden. At present it is known to me only from the original collection.

Citations: VIETNAM: Tonkin: *Pételot 6801* (N--type).

TEIJSMANNIODENDRON PIERREI Mold., *Phytologia* 8: 273--274. 1962.

Bibliography: Mold., *Phytologia* 8: 273--274. 1962; Mold., *Biol. Abstr.* 39: 614. 1962; Hocking, *Excerpt. Bot. A.6*: 535. 1963; G. Taylor, Ind. Kew. Suppl. 14: 134. 1970; Mold., *Phytologia* 46: 467,

483, & 491. 1980.

A small tree, to about 12 m. tall; branches crowded, much twisted and tangled, glabrous, shiny; branchlets and twigs rather slender, obscurely subtetragonal or subterete, very pale gray, glabrous, very shiny; principal internodes much abbreviated, mostly only 1.5 cm. long or less; nodes not annulate; leaves decussate-opposite, 1-foliate, numerous, rarely binary; petioles rather heavy, short, 10--15 mm. long, glabrous, shiny, apically and basally swollen, apically articulate; leaflet-blades coriaceous, uniformly dark-green on both surfaces, lanceolate, 3--13 cm. long, 1.1--4.8 cm. wide, smooth and very shiny on both surfaces, apically acute or short-acuminate, marginally entire, basally subacute; midrib slender, slightly prominent above, sharply prominent beneath; secondaries slender, about 10 per side, arcuate-ascending, mostly flat above, very slightly prominulous beneath, arcuately joined near the margins beneath; veinlet reticulation indiscernible above, mostly obscure beneath; infructescence apparently racemose and axillary, perhaps also terminal and subpaniculate, rather few-fruited, apparently simple, 5--15 cm. long, the peduncle and rachis glabrous and shiny; fruiting pedicels heavy, about 5 mm. long, glabrous; fruiting-calyx cupuliform, to 7 mm. long and 15 mm. wide, heavy, glabrate, the rim entire or subentire; fruit not known.

The species is based on *Pierre 37* from Baria, in the Dinh mountains, southern Cochinchina, South Vietnam, collected in March of 1867, and deposited in the Britton Herbarium at the New York Botanical Garden. The collector reports the vernacular Annamese names as "com tao" and "kum tao" and describes the corolla as "blue". The type specimen is flowerless. Dop regarded the type as *Vitex holophylla* Baker and material has been distributed in many herbaria under that name. It has also been misidentified as *Teijsmanniodendron coriaceum* (C. B. Clarke) Kosterm., *T. hollrungii* (Warb.) Kosterm., *T. sarawakanum* (H. H. W. Pearson) Kosterm., and *Vitex glabrata* R. Br.

Citations: VIETNAM: Cochinchina: *Pierre 37* (B--isotype, B--isotype, B--isotype, Bz--73091--isotype, Ca--38165--isotype, Ca--isotype, N--type, S--isotype).

TEIJSMANNIODENDRON PTEROPODUM (Miq.) Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 29--31 [as "*Teysmanniodendron*"]. 1921.

Synonymy: *Vitex pteropoda* Miq., Fl. Ind. Bat. Suppl. 1: 242 & 567. 1860. *Vitex philippinensis* Merr., Bull. Philip. Bur. For. 1: 52. 1903. *Vitex peralata* King, Kew Bull. Misc. Inf. 1908: 112. 1908. *Vitex koordersii* H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 64. 1921. *Teysmanniodendron pteropodum* (Miq.) Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 29. 1921. *Teysmanniodendron pteropodum* Bakh. apud Heyne, Nutt. Plant. Ned. Ind., ed. 2, 2: 1313. 1927. *Teijsmanniodendron pteropodum* (Miq.) H. Lam apud E. D. Merr., Univ. Calif. Publ. Bot. 15: 262. 1928. *Teijsmanniodendron pteropodum* Bakh. apud A. W. Hill, Ind. Kew. Suppl. 7: 238. 1929. *Vitex philippinensis* Merr. a-

pud Mold., Résumé 388, sphalm. 1959. *Vitex philippinensis* H. J. Lam ex Burkill, Dict. Econ. Prod. Malay Penins. 2: 2277. 1966. *Teijsmanniodendron pteropus* (Miq.) Lam, in herb.

Bibliography: Miq., Fl. Ind. Bat. Suppl. 1: 242 & 567. 1860; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1214. 1895; Greshoff, Meded. Lands Plant. 39: 128. 1900; E. D. Merr., Bull. Philip. For. Bur. 1: 52. 1903; King, Kew Bull. Misc. Inf. 1908: 112. 1908; Prain, Ind. Kew. Suppl. 3: 189. 1908; Gamble in King & Gamble, Journ. Asiat. Soc. Beng. 74 (2 extra): 851. 1908; Prain, Ind. Kew. Suppl. 4, imp. 1, 248. 1913; Heyne, Nutt. Plant. Ned. Ind., ed. 1, 4: 124--125. 1917; H. J. Lam, Verbenac. Malay. Arch. 170--172, 214, & 370. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 29--31. 1921; E. D. Merr., Enum. Philip. Flow. Pl. 3: 398--399. 1923; Ridl., Fl. Malay Penins. 2: 633--634. 1923; Heyne, Nutt. Plant. Ned. Ind., ed. 2, 2: 1313--1314. 1927; A. W. Hill, Ind. Kew. Suppl. 7: 238 & 252. 1929; E. D. Merr., Univ. Calif. Publ. Bot. 15: 262. 1929; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1076 & 1077. 1932; Kloppenburg-Versteegh, Wenk. Raadgev. Betreff. Gebr. Ind. Pl., ed. 4, 15. 1934; Beer & Lam, Blumea 2: 228. 1936; Mold., Prelim. Alph. List Inv. Names 52. 1940; Mold., Suppl. List Comm. Vern. Names 14, 19, & 20. 1940; Mold., Phytologia 2: 114. 1944; Mold., Alph. List Inv. Names 54. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 61, 63, 65, 66, 74, 100, & 104. 1942; Jacks. in Hook f. & Jacks., Ind. Kew., imp. 2, 2: 1214. 1946; H. N. & A. L. Mold., Pl. Life 2: 67. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 139, 140, 142, 143, 145, 146, 148, 163, 196, & 202. 1949; Kosterm., Reinwardtia 1: 75, 77, 79, 92--94, & 106. 1951; Prain, Ind. Kew. Suppl. 4, imp. 2, 248. 1958; Mold., Résumé 181, 185, 187, 188, 192, 184, 198, 222, 353, 354, 384, 387, 388, & 470. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 1214. 1960; Maun, Philip. Journ. Forest. 16: 108. 1960; Menninger, Flow. Trees World 26 & 285. 1962; Mold., Résumé Suppl. 10: 7. 1964; Burkill, Dict. Econ. Prod. Malay Penins. 2: 2277 & 2280. 1966; Uphof, Dict. Econ. Pl., ed. 2, 517. 1968; Mold., Résumé Suppl. 18: 14. 1969; Mold., Fifth Summ. 1: 306, 318, 328, 331, & 369 (1971) and 2: 640, 641, 719, 725, 726, 791, & 911. 1971; Altschul, Drugs Foods 245. 1973; Mold., Phytologia 44: 222, 223, & 473 (1979) and 46: 466, 477, 479, 483, & 486. 1980.

A rather tall, nearly glabrous tree, to 35 m. tall; trunk to 61 cm. in diameter at breast height, the clear bole to 20 m. high, to 2 m. in girth, with narrow buttresses to 4 m. high, merging gradually upwards into the bole as ridges; bark thin, smooth, warty-lenticellate, peeling off in small pieces, the dead outer bark very thin, whitish or gray to yellowish, brownish-green, or reddish, sometimes "dippled black and white", the inner bark yellow or yellowish to purplish-mottled, 1.2--1.5 cm. thick, often with a disagreeable odor; wood white or "dirty-white", hard or soft, sappy, the sapwood usually yellow, gradually merging into the dark-yellow heartwood, density of the sapwood 0.55--0.37 (average 0.49), not strong (class III/IV), not durable (class V); branches borne mainly at the top or, at least, above the middle,

terete, striate, thick and rigid, not much rebranched; branchlets thick, tetragonal, laterally canaliculate, eventually striate-costate, the bark gray or pale-brown; twigs thick, erect or ascending; leaves decussate-opposite, large, horizontally spreading, digitately 3--7-foliolate, diverse in size; petioles elongate, thick, 7--30 cm. long, triangular in cross-section, laterally compressed, glabrous, apically and basally pulvinate and basally broadly sulcate, more or less foliaceous-alate, the wind narrow or broad, usually basally ampliate and there broadly rounded-subcordate or even auriculate (f. *auriculatum*), apically gradually or abruptly acuminate, green and glabrous on both surfaces like the leaflets, usually wider basally than apically, irregularly venose, sometimes on young plants very broad and cristate and to 10 cm. wide on each side of the petiole (f. *cristatum*); petiolules 0.5--5 cm. long or almost obsolete, basally pulvinate and broadly sulcate above, commonly alate; leaflets 3--7, unequal, often folded, coriaceous, rigid when dry, rather shiny or glossy and bright- or dark-green above, much lighter green beneath, lanceolate or lanceolate-obovate to lanceolate-ovate, all similar to each other in all respects except size, 10--55 cm. long, 5--19 cm. wide, the central one largest, the rest gradually smaller, the lowermost (outermost) smallest, apically abruptly and shortly acuminate or obtuse, sometimes tapering to the acute or even long-acuminate apex, marginally entire or apically more or less lacerate, revolute, basally long-acuminate or cuneate and attenuate into the subulate petiolules, glabrous on both surfaces, sparsely resinous-punctate, purplish when immature, roughish to touch, when dry with the epidermis stomatose-subbullate; secondaries 7--16 (usually 12--16) pairs, they and the midrib prominent beneath, canaliculate above, marginally anastomosing; veinlet reticulation prominulous above, inconspicuous beneath; inflorescence terminal, solitary or paniculate with 3--5 panicles arranged in flabelliorm fashion, 20--100 cm. long, 15--30 cm. wide, erect, sometimes also axillary and subpendulous, reddish-brown or pale purplish-red (especially the floral portions); peduncles dark-purple or in age yellowish-green, tetragonal, compressed, canaliculate, 5--20 cm. long, apically dilated-flattened, glabrous, sparsely lenticellate; incrassate and nutant in fruit; panicles 1--10 cm. long or the central and lower ones to 20 cm. long, opposite, or flabellately branched, the branches 3--5 pairs, the cymes small, solitary or paired, opposite or alternate, trichotomous, 1--many-flowered, 0.7--2.5 cm. long, bracteolate, on stalks 1.5--12 mm. long, glabrous; bracts whitish or pale-greenish to purple, subsessile, lanceolate or ovate, 3--10 mm. long, 3--7 mm. wide, apically abruptly acute, basally attenuate and subventricose alate, subglabrous on both surfaces or sublepidote above, resinous-punctate; bractlets in the cymes small, sessile, oblong or lanceolate, 2--5 mm. long, 0.5--1 mm. wide, purple, apically acuminate, glabrous or lepidote; flowers numerous, small, shortly pedicellate or sessile, crowded at the ends of the panicle-branches, odorous, subtended by 1 or 2 purple, lanceolate, glabrous, deciduous prophylla 0.5--1 mm. long; pedicels absent or to

3 mm. long; calyx campanulate, 1.5--3.5 mm. long, 2--2.5 mm. wide, externally purple or rose-color and sparsely fulvous-pubescent or subglabrescent, internally glabrous, resinous-punctate, the rim 5- (rarely 4-) dentate, subbilabiate, the upper lip 3- (rarely 2-0 lobed, the lower lip with 2 larger lobes, the teeth apically acute and 0.7--1.5 mm. long; corolla mostly violet or pale blue-violet to almost white, caducous, the throat brown-striate, the tube subcapuliform-tubular, 5--8 mm. long, 2.5--4 mm. wide, 2--3 times as long as the calyx, externally the lower third glabrous, the upper 2/3 pubescent, internally glabrous below the stamen insertion, sparsely long-villous above that point, resinous-punctate throughout; corolla-limb subbilabiate, the upper lip 2-lobed with ovate or broadly oblong apically acuminate lobes, the lower lip 3-lobed, whose lateral lobes are ovate-oblong, similar to the upper ones but wider, 2.5--4 mm. long, 1.5--3 mm. wide, whitish, reflexes, sparsely pubescent on both surfaces, the middle lobe much larger, broadly oblong, 3--6 mm. long, 2--5 mm. wide, apically obtuse or rounded, blue and usually darker than the upper lip, with a yellow or yellowish base, densely puberulent on both surfaces, resinous-punctate; stamens 4, didynamous, the filaments white or pale-violet, subulate-filiform, the lower 2/3 to 3/4 sparsely long-villous with whitish hairs, glabrous above, inserted above the middle of the corolla-tube, incurved, 4--7 mm. long and somewhat exserted; anthers dark-violet or dark-purple, soon blackening, opaque, glabrous, dorsifixed above the middle, the thecae elliptic, slightly divergent, 0.7--1.2 mm. long, eglandular; pollen white; style filiform, terete, 8--10 mm. long, slightly exserted, glabrous, subincurved; stigma shortly bifid, the branches divergent; ovary sessile, depressed-globose, apically villous, the remainder glabrous, resinous-punctate, bilocular, the locules 2-ovulate, often imperfectly 2-locellate; ovules pendant from above the middle or near the apex; fruiting-calyx greatly spreading hypocateriform, 3--5 cm. long, 3--4.5 cm. wide, yellowish-green when young, later brownish, marginally sinuate-undulate and recurved; fruit large, green or greenish-yellow, dry, indehiscent, 5--10 mm. in diameter, the exocarp woody, by abortion 1-seeded, ovoid-conic or ovate-oblong, costate-sulcate; seeds apically attached, pendant, ovoid or globose, white, exalbuminous, 1.5--2.5 cm. in diameter, the testa membranous, whitish or cream-color, the embryo straight, the cotyledons very thick, ovoid-orbicular, apically irregularly and very shortly emarginate, externally reticulate-rimose, the plumule inconspicuous, the radicle short, scarcely prominent.

Recent collectors have found this plant growing in freshwater swamps, forests and secondary forests, swamp forests, on brown soil, in "primary forests near rivers", and in "rocky places in jungles near waterfalls", at sealevel to 500 m. altitude, in anthesis from December to October, and in fruit in February, April, May, August, and December. It appears to be native from the Philippine Islands and Malay Peninsula to Borneo, Banka, and Sumatra. It occurs in cultivation in Java.

The corollas are said to have been "white" on *Taha* 269,

"white with a pale-blue spot" on Achmad 1013, "white and bluish-gray" on Wenzel 3163, "pale-blue" on Achmad 1545 and Elmer 7096, "pinkish-blue" on Soepadmo 43, "blue" on Elmer 21698, H.B.1070, and Ridley S.F.13439, "blue-purple" on Yates 2553, "pale-blue with a brown spot" on Achmad 1702, "violet" on Haniff 14339, "purplish" on Talip SAN.52935, "purple" on Dorst T.I.P.728, and "chocolate" on Zain SAN.62891.

The species is based on *Teijsmann* s.n. from Palembang on Danku Lematang, Sumatra, deposited in the Buitenzorg herbarium. *Vitex peralata* is based on Wray 2029, 2254, & 2305 from Perak and King's collector 2064, 6187, 6874, & 8299 from Larut. *Vitex philippinensis* is based on Herb. Philip. Forest Serv. 387 from Zambunga province, Mindanao, Philippine Islands. *Vitex koordersii* is based on Buurman van Vreeden 158 [Koorders 10832 β] and Koorders 10483 from Sumatra and Jaheri s.n. from Borneo, but Kostermans has designated the former as the type and the latter as a "syn-type". Fedde & Schuster (1932) cite *Koorders 10483 β* as the type.

There is a *Bianchi* s.n. collection from Java [cultivated] in the Show Collection at Buitenzorg. King's collector 5249 exhibits especially narrow leaflets and is said to be taken from "a very rare tree".

Kostermans, in a letter to me dated September 10, 1951, says that "*T. pteropodum* is sometimes very common and grows in[to] a tree of 20 m. height with narrow high buttresses (up to 4 m high), which merge gradually in[to] the bole. The bark of this species is yellowish. The notes that I copied from a label contending that the wood contains an itching substance [and causes skin eruptions] is false. The truth is, that the ash of the burnt wood, when blown about, is very itching. It is called miang and not "ma-ing". The word miang is commonly used for the hairs on bam-boo shoots, which are very itching."

Uphof lists (1968) this species as from "W. Malayan Arch., Indonesia" and reports that "From the seeds with coconut oil a salve is made by the natives, used for haemorrhoids". Heyne (1927) says that in Java the fruits are medicinal, used internally and externally for intestinal ailments. Burkill (1966) reports that the wood is used to make rafters and as fuel. He says that the plant occurs "almost throughout Malaysia; in the Peninsula it occurs in Larut and in the south." Greshoff (1900) says that "the tree is feared in Sumatra because of the acidity of its juice" and that it is not used there for domestic or commercial purposes.

Kostermans (1951) notes that "Dissection of the living fruit revealed that they are built along the same principle as those of *T. bogoriense* Koord. The jelly-like clear substance which fills the central part of the cotyledons in early stages, disappears later than in *T. bogoriense*. In the latter it has disappeared in a fruit of 4 cm long, in *T. pteropodum* it was found to be still present in a fruit of 5 cm. length. The fruit is deeply furrowed outside. The flowers are pale blue-violet, almost white, the lower lip, however, being darker with yellow base inside. The anthers are dark-violet."

Vernacular names reported for *T. pteropodum* are "bloeboek loepa", "buli-cahoy", "djandjoeng boekil", "djandjung bukit", "ingkuh-ingkuh", "kaju gedang", "lapak gari", "medang poedi", "medang poodi", "pinan gah", "pokok agak paya", "punggung", "pungung", "rarak gunung", "sepoegang", "sepoendang", "sepugang", "sepundang", "sepungang", "sepunggung", "sipanoeh", "sipanooh", "sipanuh-alafai", "sipanuh-pajo", "tanggunan", "tikiko", "tjempana", "tjẽmpana", "tjempana pajo", and "tjempang".

It should be noted here again that the Miquel (1860) reference in the bibliography of this species (above) is often miscited as "1862", the Gamble (1908) reference is often cited as "1909", and the Merrill (1929) reference as "1928".

Lam (1919) cites *H. Bogor. 1070* & *Teijsmann s.n.* from Sumatra and *Cuming 1698* from the Philippine Islands. Bakhuizen van den Brink (1921) cites *Beccari 429* from Borneo, *Teijsmann s.n.* from Banka, *Koorders 10481* & *10483* and *Teijsmann 3680* from Sumatra, and *Elmer 9096* and *Fenix 1326* from the Philippines. He comments that the trunk is "15--35 c.M. alta", but this surely is a typographic or stenographic error for "M."

Merrill (1923) cites *Ahern 386*, *Cuming 1689*, *Elmer 7096*, *Fajatin s.n.* [Herb. Philip. Forest Bur. 22932], *McGregor s.n.* [Herb. Philip. Bur. Sci. 18525], *Merrill 1326*, *Ramos s.n.* [Herb. Philip. Bur. Sci. 17449 & 24490], and *Wenzel 1410* from Biliran, Leyte, Mindanao, and Samar, Philippine Islands.

Fedde & Schuster (1932) cite *Teijsmann 36804* and *Koorders 10481* & *10483* from Sumatra, *Teijsmann s.n.* from Banka, *Beccari 429* from Borneo, and *Elmer 7096* and *Fenix 1326* from the Philippines.

Kostermans (1951) cites the following collections: MALAYA: Johore: *Corner S.F.24980*, *32771, s.n.*; *Ridley S.F.13493*. Kedah: *Henderson S.F.35439*. Pahang: *Evans S.F.13173*. Penang: *Ridley 2580*. Singapore: *Ridley 6752a*. Trengganu: *Corner s.n.*. Locality not designated: *Cantley's collector 2092*. MALAYAN ISLANDS: Damar: *Max 6752*. PHILIPPINE ISLANDS: Leyte: *Elmer 7096*. Mindanao: *Fenix B.S.1326*, *Ramos & Conocar B.S.83466*, *Wenzel 3163*. GREATER SUNDA ISLANDS: Kalimantan: *Endert 3333*, *4717*; *Beccari 429*, *Jaheri s.n.* Sabah: *Carr S.F.24256*; *Elmer 21698*. Simalur: *Achmad 1013*, *1074*, *1545*, *1702*. Sumatra: *Buurman van Vreede s.n.*, *Buwalda 648* [BB.30056], *deHaan 881* [BB.29567], *Dorst T.I.P.728*, *Endert E.828*, *Koorders 1048*, *10483*, *Teijsmann H.B.3680*, *Thabranie 74* [BB.12809], *Van der Zwaan T.3.P.825*, *Yates 2553*. CULTIVATED: Java: *Herb. Hort. Bot. Bogor. XI.K.9*. Altschul (1973) cites *Sulit 2636*.

The *Patrick NT.702* [SAN.39454], distributed as *T. pteropodum*, actually is *T. bogoriense* Koord., while *Lasan SAN.65646* and *Sam SAN.61572* and *T. bogoriense* var. *pentaphyllum* Mold. and *Meijer SAN.47231* is *T. glabrum* Merr.

Citations: PHILIPPINE ISLANDS: Leyte: *Elmer 7096* (Bz--73238, Bz--73239, N); *Wenzel 1410* (N), *1656* (N). Mindanao: *Fenix 1326* (Bz--73237, N); *Ramos & Conocar s.n.* [Herb. Philip. Bur. Sci. 83466] (Ba, Ba, Bz--73235); *Wenzel 3163* (Au, Au, Bz--73236, Ca--316652, Mu, N). Samar: *M. Ramos s.n.* [Herb. Philip. Bur. Sci.

17449] (W--901340), s.n. [Herb. Philip. Bur. Sci.]4490] (W--1239427). Island undetermined: *Cuming* 1698 [Herb. Reichenb. f. 71216 & 71218] (V, V, V). MALAYSIA: Johore: Corner 32771 (Bz--73287). Kedah: M. R. Henderson 35439 (Bz--73288). Perak: Haniff 14339 (Ca--243372); King's collector 5249 (Ca--529751). GREATER SUNDA ISLANDS: Kalimantan: Beccari 429 (Bz--73212, Mu, S, V); Endert 3333 (Bz--72634), 4717 (Bz--72757); Jaheri s.n. [Borneo] (Bz--73213, Bz--73214, N--photo, Z--photo); Tromsson 961 [BB. 18939] (Bz--73218). Sabah: Elmer 21698 (Bi, Bz--73215, Ca--312136, Du--175336, Mi, Mu, N, Qu); Kinted SAN.19080 (Z); Taha 269 [D. D. Wood 2578] (Ca--320387); Talip SAN.52935 (Z); Zain SAN.62891 [BK. 939] (Z). Simalur: Achmad 1013 (Bz--73285, Bz--73286), 1074 (Bz--73283, Bz--73284, N--photo, Ut--60203, Z--photo), 1545 (Bz--73281, Bz--73282), 1702 (Bz--73278, Bz--73279, Bz--73280). Sumatra: Boschproefstation T.728 (Bz--25703, Bz--25704, N); Buurman van Vreeden 158 [Koorders 10832] (Bz--73241, Bz--73242); DeHaan 881 (Bz--73248, Bz--73249); Endert E.828 (Bz--73250, Bz--73251, N, Ut--63697); H. B. 1070 (Ut--11509, Ut--11510); Koorders 10481 (Bz--25664, Bz--73243, Bz--73244), 10483 (Bz--73240); Soepadmo 43 (N, S); Teijsmann 3680 H.B. (Bz--73248, Bz--73249); Thabranie 47 [BB.12809] (Bz--73274, Bz--73275, Bz--73276, Bz--73277); Van der Zwaan T.3.P.825 [Boschproefst. T.825] (Bz--25643), s.n. [93. P.825] (Bz--73246, Bz--73247), s.n. [221.T.I.P.728] (Bz--73245); Yates 2553 (Bz--73273, Ca--318357, Mi, N). LESSER SUNDA ISLANDS: Banka: Teijsmann s.n. (Bz--25705). CULTIVATED: Java: Bianchi s. n. (Bz); Herb. Ames s.n. (Oa); Herb. Hort. Bogor. XI.K.9 (Bz--26573, Bz--26574, Bz--26575, Bz--26579, Bz--26598, Bz--73289, Bz--73290, Bz--73291, Bz--73292, N, N, Ng--16865, Ng). MOUNTED ILLUSTRATIONS: H. N. Moldenke color slides 421 (Z).

Two apparently juvenile forms of this species have been described and these are discussed herein following:

TEIJSMANNIODENDRON PTEROPODUM f. juv. *AURICULATUM* (Kosterm.) Mold., stat. nov.

Synonymy: *Teijsmanniodendron auriculatum* Bakh. ex Kosterm., Reinwardtia 1: 94, in syn. 1951. *Teijsmanniodendron pteropodum* var. *auriculatum* Kosterm., Reinwardtia 1: 94. 1951. *Teijsmanniodendron pteropodum* var. *auriculata* Bakh. ex R sum  354, in syn. 1959. *Teijsmanniodendron auriculatum* Bakh. ex Mold., R sum  354, in syn. 1959.

Bibliography: Kosterm., Reinwardtia 1: 75, 79, 94, & 106. 1951; Mold., R sum  354. 1959; Mold., Fifth Summ. 2: 640 & 641. 1971; Mold., Phytologia 46: 466. 1980.

This is a juvenile form of the species with the base of the petiole-wings distinctly auriculate. It was thought by Bakhuizen van den Brink to represent a distinct species and later by Kostermans as a variety, but Kostermans in a letter to me dated September 10, 1951, says "The variety *auriculatum* should be deleted. In young trees the wings along [the] petiole are very conspicuous, but the older the tree, the less the wings are visible. In full grown trees there is no trace of wing present, but I found the normal, winged leaves on coppice shoots of such trees." It appears,

then, that this form is similar to the juvenile forms seen in *Vitex altissima* f. juv. *alata* (Willd.) Mold. and *V. peduncularis* f. juv. *roxburghiana* (C. B. Clarke) Mold. It seems probable that *Vitex philippinensis* Merr. may also represent this form since Merrill (1903) describes its petioles as "broadly winged, the foliate wings broadly ovate, cordate at the broadly rounded base and also at the apex, the entire breadth 13 cm.", but he also describes its flowering panicles, apparently taken from the same type tree.

In his 1951 work Kostermans noted that "In Herbarium Bogoriense there are some specimens from Borneo bearing the manuscript name *Teijsmanniodendron auriculatum* Bakh. The leaves of these specimens, which are all sterile, differ from *T. pteropodum* in the small wings (auricles) at the base of the petioles.....In the specimen *bb.14752* these auricles are even absent. In other respects the leaves are not different from those of *T. pteropodum*. As in the latter species the dimensions of the wings of the petiole vary considerably (in the specimen *Corner S.F.32771*, the wing reaches only half way [up] the petiole and in the specimen mentioned below, traces of the remainder of the wings are sometimes found as small ridges along the petiole, or as narrow winglets near the tip of the petiole."

Citations: GREATER SUNDA ISLANDS: Kalimantan: *Abdulhamid* 47 [BB.12563] (Bz--73223--type, Bz--73224--isotype, N--photo of type, Z--photo of type), 115 [BB.14752] (Bz--73219, Bz--73220, Bz--73221, Bz--73222); *Van der Zwaan* 810 [BB.18550] (Bz--73217), 954 [BB.18932] (Bz--73216), 961 [BB.18939] (Bz). Sabah: *SAN.54522* (Z). Sumatra: *Buwalda* 648 [BB.30056] (Bz--73252). LOCALITY OF COLLECTION UNDETERMINED: *Herb. Acad. Rheno-Trai. s.n.* (Ut--44161).

TEIJSMANNIODENDRON PTEROPODUM f. juv. *CRISTATUM* Mold., *Phytologia* 44: 473. 1979.

Bibliography: Mold., *Phytologia* 44: 473 (1979) and 46: 466. 1980.

This curious juvenile form differs in having the wings on its petioles very much and quite uniformly enlarged in the form of a crest, the crest extending from the apex to the base on each side and about 5 cm. wide at the midpoint, making the total width of the petiole at this central point about 10 cm..

The form is based on *G. Mikil SAN.37769* from along the side of a stream 9n primary forest on a steep valley side at Sg. Sosopodon, Penampang district, Sabah, at about 800 feet altitude, collected on December 16, 1963, and deposited in my personal herbarium.

Collectors describe this plant as a tree, 30--45 feet tall, with a crown of "5 m. 40 cm.", a clear bole ro 20 feet high, a trunk 2 feet 7 inches in girth, the bark dark-gray or "gray-brown-dippled", smooth or scaly, the inner bark yellow-orange or ochre, turning pale-yellow or brown, 2 cm. thick, the outer bark slash thin, green, the inner yellowish, the outer wood yellowish, the sapwood pale-yellow or yellow-orange, the cambium "cork-green" [=dark-green?], the flowers "palish", and the fruit greenish-

yellow. They have encountered it at altitudes of 200--800 feet, in anthesis in December and in fruit in August, growing at forest margins, on hillsides, and along streams in primary forest in blackish sandstone areas on steep valley sides. The fact that collectors speak of the flowers and fruit and give such large dimensions for the tree and its trunk casts some doubt on whether this is really only a juvenile form of *T. pteropodum*.

Citations: GREATER SUNDA ISLANDS: Sabah: Abas SAN.85958 (Z); Chai SAN.26042 (Sn); Mikil SAN.37769 (Z--type).

TEIJSMANNIODENDRON SARAWAKANUM (H. H. W. Pearson) Kosterm., Reinwardtia 1: 100--102, fig. 5. 1951.

Synonymy: *Vitex sarawakana* H. H. W. Pearson, Kew Bull. Misc. Inf. 1907: 60. 1907. *Vitex tetragona* Hall. f., Meded. Rijks Herb. Leid. 37: 53. 1918.

Bibliography: H. H. W. Pearson, Kew Bull. Misc. Inf. 1907: 60. 1907; Prain, Ind. Kew. Suppl. 4, imp. 1, 248. 1913; H. Hallier, Meded. Rijks Herb. Leid. 37: 53. 1918; H. J. Lam, Verbenac. Malay. Arch. 175--176, 202, & 370. 1919; H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 48, 52--54, & 59. 1921; E. D. Merr., Enum. Born. Pl. 514 & 515. 1921; A. W. Hill, Ind. Kew. Suppl. 6: 219. 1926; Ridl., Kew. Bull. Misc. Inf. 1929: 262. 1929; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 65 & 104 (1942) and ed. 2, 146 & 202. 1949; Kosterm., Reinwardtia 1: 75, 80, 99--102, & 106, fig. 5. 1951; Prain, Ind. Kew. Suppl. 4, imp. 2, 248. 1958; Mold., Résumé 188, 193, 194, 388, 389, & 470. 1959; G. Taylor, Ind. Kew. Suppl. 12: 141. 1959; Mold., Fifth Summ. 1: 328 (1971) and 2: 727, 728, & 911. 1971; Mold., Phytologia 44: 223 (1979), 45: 490 (1980), and 46: 467, 491, & 493. 1980.

Illustrations: Kosterm., Reinwardtia 1: 101, fig. 5. 1951.

A tall shrub or more usually a small tree, to 70 feet tall; clear bole to 45 feet high, to 20 cm. in diameter at breast height, to 32 inches in girth, glabrous (except for the inflorescence), with buttresses to 1 1/2 feet high and 1 foot wide; outer bark smooth to scaly or flaky, corky, white or whitish to gray or yellowish-white, sometimes brown- and white-mottled, often covered with lichens; inner bark light-gray or greenish to pinkish, yellow, ochre, or pale-orange; cambium white; sapwood hard or very hard, white or yellowish to yellow, ochre, or pale-orange; branches tetragonal, glabrous; branchlets acutely tetragonal, gray, 2--2.5 mm. thick; nodes enlarged, often rather plainly annulate; leaves decussate-opposite, 1-foliolate, glabrous; petioles subterete, 1--2 cm. long, deeply but narrowly sulcate above with subulate margins, basally somewhat and apically greatly swollen; leaflet-blades rigid-chartaceous or thin-coriaceous, oblong or oblong-lanceolate to lanceolate, 10--42 cm. long, 2--6 cm. wide, apically subacutely acuminate or caudate-acuminate (the acumen itself to 3 cm. long), marginally entire and subrevolute or revolute, basally acute to subcuneate or rounded, glabrous, subbullate or bullate, olivaceous and rather shiny above, opaque beneath, penninerved; secondaries 6--14 per side, impressed or prominent above, plainly prominent beneath, the upper somewhat cur-

vate-ascending and often connected in loops, the lower more so and submarginally plainly subconfluent; veinlet reticulation slender, subclathrate and loosely reticulate, very distinct beneath, sometimes with a very distinct intramarginal collective vein; inflorescence paniculate; panicles terminal (up to 5) or alternately axillary (one), small and narrow, loose, to 17 cm. long, usually very shortly branched, glabrous or [the pedicels and flowers] minutely puberulous, the nodes distant on the tetragonal rachis, dichasial with 1 cm. internodes which are often conspicuously ampliate and flattened at the ramifications; flowers short-pedicellate, arranged in 3-flowered, opposite, bracteate, and short-stipitate cymules, 7--10 mm. long; pedicels short, about 1 mm. long, densely appressed-puberulent; calyx campanulate or cyathiform, 2--2.5 mm. long, externally minutely appressed-pubescent but less densely so than the pedicels, the rim shortly 5-dentate, the teeth about 0.5 mm. long, apically acute; corolla zygomorphic, often greenish or cream-color, varying to yellowish, bluish, or purple, the tube cylindric, about 5 mm. long, externally densely appressed- and ochraceous-pubescent above the middle, internally gray-puberulent or villous; corolla-limb zygomorphic, 4- or 5-lobed, the anterior (lower) lobe the largest, flabelliform, 2--3 mm. long, about 2.5 mm. wide, externally pubescent, shortly gray-villous at the base, the lateral and posterior lobes smaller, shortly oblong, apically obtuse, pubescent; stamens inserted below the middle of the corolla-tube, scarcely exerted; filaments white, finely pilose or villous; anthers "4, star-shaped", blackish; style 7--8 mm. long, apically shortly and acutely bilobed; ovary globose, densely and minutely pubescent; fruiting-calyx shallowly cupuliform, 5--8 mm. long, 12 mm. wide, enveloping the lower 2/5 of the fruit, the rim entire or 5-dentate; fruit drupaceous, obconic or obovoid to shortly ellipsoid or subglobose, about 10 mm. long and 18 mm. wide, much exerted from the accrescent fruiting-calyx, minutely pubescent or ochraceous-pulverulent or "partly covered by a dark bluish-green powder", green or greenish (immature?), 1-seeded by abortion.

The corollas are described as having been "pale-yellow" on *Sinangul SAN.57448*, "purple" on *Clemens & Clemens 21825*, "gray" on *Wing SAN.19022*, "green" on *Daud & Tachum 36052*, "brownish-blue" on *Krispinus SAN.87340*, "blue and yellow" on *Meijer SAN.37924*, "white with pale-mauve markings" on *Anderson 14717*, and "tube creamy, tinged purple, 3 small lobes light-purple, 1 large lobe purple" on *James & al. s.n.* The collection by James and his associates bears a notation to the effect that the corollas are only 4-lobed, "3 lobes small, 1 lobe large".

Collectors have encountered this species in brown, brownish, or red-brown clay or sandy-clay soil, often rocky, along roadsides, among sandstone boulders, in primary forests on ultrabasic rock strata, near rivers, on forested ridges and hilltops, on gentle slopes covered by mixed dipterocarp forests, and in disturbed forests on hillsides, at 35--750 m. altitude, in anthesis in March, April, August, September, November, and December and in fruit in February, March, and July to October. A vernacular name

reported for the tree is "entabuloh".

The species is based on *Beccari* 2280, 2506, and 2851 from Sarawak. *Vitex tetragona* is based on *Amdjah* 955 from Gunung Pemblian in eastern Borneo, collected in November of 1912 and deposited in the Rijksherbarium at Leiden..

Ridley (1929) compares the species with *Vitex havilandii* Ridl., which, he says, seems to differ only in its smaller leaves, not basally acute nor chartaceous, the calyx being not pubescent, and the corollas much smaller.

Kostermans (1951) cites *Pierre* 37 from Cochinchina, *Baumée* A. 494 from Sumatra, and *Amdjah* 955, *Clemens* 21825 & 21826, and *Laud & Tachun* 36052 & 36068 from Borneo. Of these, however, I regard *Pierre* 37 as *T. pierrei* Mold. and *Clemens* 21826 as *T. unifoliatum* (Merr.) Mold.

Material of *T. sarawakanum* has been misidentified and distributed in some herbaria as *T. hollrungii* (Warb.) Kosterm. On the other hand, the *Sinanggul* SAN.57450, distributed as *T. sarawakanum*, actually is *T. hollrungii* (Warb.) Kosterm., while *Ambullah* SAN.31476, *Sadai* SAN.43460 [Herb. Forest Dept. 40815] and *Talip & Sabirin* SAN.48750 [NT.738] are *T. subspicatum* (H. Hallier) Kosterm.

Citations: GREATER SUNDA ISLANDS: Kalimantan: *Amdjah* 955 [1224] (Bz--73121, N--photo, Z--photo). Sabah: *Ahmad & Sabirin* SAN.48731 [NT.509] (Ld), SAN.48947 [NT.495] (Ld); *Krispinus* SAN.87340 (Sn--55131); *Lajangah* SAN.32184 (Ld); *Meijer* SAN.37924 (Z), SAN.44090 [NT.142; Herb. Forest Dept. 40810] (Ld), SAN.51242 [NT.2; Herb. Forest Dept. 40816] (Ld); *Nordin & Ali* SAN.54430 (Ld); *Sinanggul* SAN.57448 (Z); *Talip* SAN.52795 (N); *Wing* SAN.19022 (Z). Sarawak: *J. A. R. Anderson* 14717 (A); *Chai & al.* s.n. [Herb. Sarawak Forest Dept. S.33142] (Ld, Z); *Clemens & Clemens* 21825 (Bz--73094, Bz--73095, E--986291); *Ilias & Azahari* s.n. [Herb. Sarawak Forest Dept. S.35648] (Ld); *James & al.* s.n. [Herb. Sarawak Forest Dept. S.35078] (Ld). Sumatra: *Beumée* A.494 (Bz--73092, Bz--73093); *H. O. Forbes* 3204 (W--2185256).

TEIJSMANNIODENDRON SCABERRIMUM Kosterm. ex Mold., Fifth Summ. 2: 911 & 969, nom. nud. 1971.

Bibliography: Mold., Fifth Summ. 2: 911 & 969. 1971.

A tree, about 13 m. tall; trunk diameter about 15 cm. at breast height; bark green, smooth, the living bark light-brown, about 5 mm. thick; wood yellowish to pale-brown; fruit (immature?) green.

This species is apparently based on *Kostermans* 13644 from on sandstone, at 100 m. altitude, Sangkulirang district, on the Karangan River near Baru Pondong, Kalimantan, Borneo, collected on September 1, 1957. As of September 4, 1980, the editors of the "Index Kewensis" supplement had not located a formal description of this taxon, nor have I been able to find one. The species is known to me only from the original collection cited below.

Citations: GREATER SUNDA ISLANDS: Kalimantan: *Kostermans* 13644 (N--isotype).

TEIJSMANNIODENDRON SIMPLICIFOLIUM Merr., Univ. Calif. Publ. Bot. 15: 263--264. 1929.

Synonymy: *Teysmanniodendron simplicifolium* Merr. ex Mold., Alph. List Inv. Names Suppl. 1: 21, in syn. 1947. *Teijsmanniodendron simplicoides* Kosterm. ex Mold., Résumé Suppl. 7: 8, in syn. 1963. *Teysmanniodendron simplicoides* Meijer, Bot. Bull. Herb. Forest Dept. Sandakan 10: 22. 1968. *Teijsmanniodendron simplicifolia* Merr., in herb.

Bibliography: E. D. Merr., Univ. Calif. Publ. Bot. 15: 263--264. 1929; A. W. Hill, Ind. Kew. Suppl. 8: 234. 1933; Fedde & Schust., Justs Bot. Jahresber. 59 (2): 417. 1939; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 65 & 100 (1942) and ed. 2, 145, 146, & 197. 1949; Kosterm., Reinwardtia 1: 75, 79, 95, 96, & 106. 1951; Mold., Résumé 188, 192--194, 354, & 470. 1959; Meijer, Bot. Bull. Herb. Forest Dept. Sandakan 10: 22. 1968; Mold., Fifth Summ. 1: 328 (1971) and 2: 641 & 911. 1971; Mold., Phytologia 43: 252 (1979) and 46: 467 & 493. 1980.

A glabrous or subglabrous tree, to 32 m. tall, with a clear bole often to 14 m. high, to 2 m. in girth and 60 cm. in diameter at breast height, with small to large, often short buttresses to 2 m. high, parallel to the deeply furrowed or fluted trunk, about 2.5 cm. thick, extending outwards to about 50 cm. from the "wadded" base; outer bark thin, 1--5 mm. thick, rather smooth and scaly or rough, fissured, papery, brittle, average in texture, white or whitish to grayish, grayish-green, greenish, or green, varying to yellowish, yellow-brown, brown, or reddish, hard or soft; inner bark fibrous, 2.5--7.5 mm. thick, soft, whitish, yellowish, or yellow to yellow-green or golden, changing to chocolate-brown after 5 minutes exposure; cambium yellow, yellowish, or yellowish-green to golden; exudate watery, slow to appear; sapwood hard or very hard, about 2 cm. thick, heavy, yellow or yellowish to ochre or honey-color or even "whitish changing to blackish", usually almost the same color as the heartwood; heartwood yellowish-brown or brown; branches and branchlets terete, pale, smooth and glabrous, the main branches ascending or spreading, ultimately much rebranched, the branchlets about 1.5 mm. in diameter, crookedly rebranched and spreading; twigs crooked, ascending, rigid; leaves decussate-opposite, 1-foliolate; petioles 8--12 mm. long; leaflet-blades coriaceous, lanceolate, 7--13 cm. long, 1.7--4.3 cm. wide, often standing at ascending or descending angles, recurved toward the tip, usually folded, without oil-glands or only scarcely glandulose, drying pale, almost uniform in color on both surfaces or paler beneath, more or less shiny above, narrowed to both ends, apically conspicuously acuminate, basally acute to obtuse; secondaries 3 or rarely 4 per side, curvate-ascending, very conspicuous beneath, arcuately anastomosing; veinlet reticulation dense, distinct; inflorescence axillary and terminal, slender, glabrous, solitary or fasciculate, about 15 cm. long, the primary branches few, slender, patulous, about 12 cm. long; flowers small, vertically symmetric, sessile, opposite, solitary or fasciculate, in terminal panicles, very fragrant with a honey-like scent; calyx small, broadly campanulate or cupuliform, about 2 mm. long, yel-

low or whitish, glabrous, the rim shortly 5-toothed, the teeth erect; corolla pale-yellow or white, about 8 mm. long, the tube about 4 mm. long, with blue-purple longitudinal stripes, externally glabrous, internally villous, the limb 5-lobed, about 5 mm. wide, the 4 smaller lobes ovate to suborbicular, about 2 mm. wide, the lower (larger) lobe broadly ovate, about 3 mm. long, with a dark-yellow spot at the base inside; filaments about 3.5 mm. long, glabrous; anthers dark-purple; ovary granulose-glandulose; infructescence greenish, the peduncles pale-green; fruiting-calyx persistent, broadly infundibular, about 1 cm. wide, the rim irregularly lobed; fruit oval or ovoid to subglobose or obovoid, averaging 1.25 cm. long, about 1.5 cm. in diameter, sometimes in pairs, glabrous, smooth, at first green, later bluish, drying purple-brown, the pericarp thin, fragile; seeds solitary, large, globose, about 1 mm. in diameter

This species is based on *Elmer 21837* from near Tawao, Sabah, originally deposited in the herbarium of the Philippine Bureau of Science, now most probably destroyed. Merrill (1929) describes the species as a tree of humid forests, the corollas "pure white except for a yellow blotch on the lower lip" and cites also *Elmer 12618* from Sabah. Kostermans (1951) asserts that it "is close to *T. smilacifolium* (H. H. W. Pears.) Kosterm. and to *T. holophyllum* (Bak.) Kosterm. From the latter it may be easily distinguished by its few (three, rarely four) pairs of lateral nerves and its slender inflorescences, the tiny, broadly campanulate (not urceolate) calyces with erect teeth. From *T. smilacifolium* it differs in its sessile flowers and more slender inflorescences. In the shape of the calyx it agrees with *T. subspicatum* (Hall. f.) Kosterm., which also has sessile flowers and erect calyx-teeth; the branchlets are also glabrous in the latter species. The shape of the leaf, however, is different, the base in *T. subspicatum* being rounded, not acute, the lateral nerves more numerous. Moreover, the inflorescences are not slender and the flowers slightly larger!"

Collectors have encountered *T. simplicifolium* in primary, very humid forests and rainforests, well-drained forests, and virgin jungles, and on hillsides, hilltops, slopes and ridge-slopes, in black or brown soil, at 33--1200 m. altitudes, in anthesis in February, April, August, and September and in fruit in March, April, and October.

The corollas are described as having been "white" on *Chai SAN. 29799*, "yellow" on *Chai SAN. 29798*, "yellow-white" on *Lajangah SAN. 44587*, "white, yellow spot on lip" on *Richards 2568*, "white, yellow spot at base or larger petal" on *Martyn SAN. 21619*, and "pure-white except for a yellow blotch on lower lip" on *Elmer 21618*.

Vernacular names reported for this species are "anggal", "butun", "kaju gadang", "kemuning", "kemuning", "osan", and "ubah sireh".

Martyn reports that the wood is used by the natives in Sabah for posts and is said to be durable against borers, that "the log dries hard and easily crushes to small pieces when dry", and that the tree is "not plentiful".

Elmer 21618 is marked "n. sp." on its printed labels, but is not

the type collection. The *Vitex simplicifolia* of C. B. Clarke is *Teijsmanniodendron hollrungii* (Warb.) Kosterm., while that of Menninger is *Vitex trifolia* var. *simplicifolia* Cham.

Kostermans (1951) cites Buwalda 431 [BB.28654] from Sumatra, Elmer 21618 & 21837 from Sabah, Richards 2568 from Sarawak, and Endert 3287 & 3625, Frijd 19 [BB.13564], and Zwaan 319 [BB.11674] from Kalimantan. Endert 3625, however, I regard as representing *T. simplicifolium* var. *kostermansi* Mold.

Material of *T. simplicifolium* has been misidentified and distributed in some herbaria as *Vitex holophylla* J. G. Baker. On the other hand, the Nicholson & Sam SAN.17687 (TN.165), distributed as *T. simplicifolium*, actually is var. *kostermansi* Mold.

Citations: GREATER SUNDA ISLANDS: Kalimantan: Endert 3287 (Bz--72759); Frijd 19 [Boschproefst. BB.13654] (Bz--73262, Bz--73263); Kostermans 12732 (N); Zwaan 319 [Boschproefst. BB.11674] (Bz--73264, Bz--73265). Sabah: Ahmad & Sabirin SAN.48683 [NT.451] (Sn--41661), SAN.52406 [NT.693] (Sn--41658); Chai SAN.21641 (Ld), SAN.26651 (Ld), SAN.29346 (Ld), SAN.29798 (Ac), SAN.29799 (Z); Elmer 21618 (Bi, Bz--73260, Ca--312138, Du--165326, Mi, Mu, N, S, Ut--86492), 21837 (Bi--isotype, Bz--73259--isotype, Ca--312135--isotype, Du--164136--isotype, Mu--isotype, N--isotype, N--photo of isotype, S--isotype, Ut--86222--isotype, Z--isotype, Z--photo of isotype); Jumatin SAN.55871 (Sn--41644); Lapangh SAN.44587 [Herb. Forest Dept. 40846] (Ld); Martyn SAN.21619 [Herb. Forest Dept. 0434/84] (Ld); Mikil SAN.28097 (Z); Villamil 155 (W--1376817). Sarawak: Pickles 3524 (W--2377006), 3564 (W--2377044); P. W. Richards 2568 (Bz--73261). Sumatra: Buwalda 431 [Boschproefst. BB.28654] (Bz--73258, N).

TEIJSMANNIODENDRON SIMPLICIFOLIUM var. *CORDIFOLIUM* Mold., *Phytologia* 43: 252. 1959.

Bibliography: Mold., *Phytologia* 43: 252 (1979) and 46: 467. 1980.

This variety differs from the typical form of the species in having the base of the leaflet-blades decidedly cordate.

The variety is based on *Gibot s.n.* from along the Simpang trail in the Ranau district of Sabah, collected on September 18, 1967, and the type (holotype) is no. 41663 in the herbarium of the Forest Department at Sandakan, Sabah. The collector notes that the plant is a tree to 50 feet tall, the trunk with a girth of 37 inches at breast height.

Other collectors report the tree as sometimes having a bole 30 feet high and a crown of 20 feet. The corollas are said to have been "reddish" on *Gibot* SAN.61833, and the tree has been found in anthesis in February.

Citations: GREATER SUNDA ISLANDS: Sabah: *Gibot* SAN.60725 (Sn--41663--type), SAN.61833 (Sn--41652).

TEIJSMANNIODENDRON SIMPLICIFOLIUM var. *KOSTERMANSI* Mold., *Phytologia* 4: 57. 1952.

Synonymy: *Teijsmanniodendron simplicoides* Kosterm., Reinwardtia 6: 303 & 325, fig. 22. 1962. *Teysmanniodendron simplicifolium*

velottinis Merr., in herb.

Bibliography: Kosterm., *Reinwardtia* 1: 96. 1951; Mold., *Phytologia* 4: 57. 1952; Mold., *Résumé* 194 & 470. 1959; Kosterm., *Reinwardtia* 6: 303 & 325, fig. 22. 1962; Mold., *Résumé Suppl.* 7: 8. 1963; Nicholson, Govt. Sarawak Sympos. Ecol. Res. Humid Trop. Veg. 86. 1965; Meijer, Bot. Bull. Herb. Forest Dept. Sabah 10: 22. 1968; G. Taylor, Ind. Kew. Suppl. 14: 134. 1970; Mold., *Fifth Summ.* 1: 328 (1971) and 2: 641 & 911. 1971; Mold., *Phytologia* 46: 467 & 493. 1980.

Illustrations: Kosterm., *Reinwardtia* 6: 325, fig. 22. 1962.

This variety differs from the typical form of the species in having its petioles and the tips of the branchlets densely ferruginous-hirsute, the hairs eventually wearing off.

It is based on *C. J. van der Zwaan 1074* from Berouw Betemoean, southeastern Borneo, collected on May 28, 1934, and deposited in the Herbarium Bogoriense at Buitenzorg.

Kostermans (1951) has suggested that this taxon might even represent a new species related to *T. simplicifolium* and in 1962 he published it as *T. simplicoides*. He also feels that the *Enderb* 3625, cited below, actually represents typical *T. simplicifolium* Merr. He cites for his new species only *Boschproefst. BB. 11204* & *19034* from Kalimantan and *Meyer SAN.19280* from Sabah, and bases his *T. simplicoides* on *BB.19034* from Betemuaer, at 25 m. altitude, deposited in the Buitenzorg herbarium.

Collectors describe the plant as a tree, to 40 m. tall, with short, steep, rounded buttresses to 2 m. high, 0.7 m. long, and about 7.5 cm. thick; clear bole to 19 m. high, straight, fluted, to 50 cm. in diameter at breast height and 25 cm. in diameter at the first branch; girth to 1.7 m. at breast height; crown to 26 m.; bark smooth or cracked and scaly, whitish or gray to pale "yellowish-brownish", often covered with mosses; outer bark thin, about 5 mm. thick, white or greenish-white to chocolate-brown; inner bark about 1 cm. thick, yellow or yellowish to greenish, grayish-ochre, or red-brown, light-brown near the cambium, discoloring on exposure; cambium yellow; wood hard, yellow, the sapwood hard, yellowish or pinkish to ochre or light reddish-brown; outer slash yellow; middle slash yellow or greenish; inner slash yellowish or gray; branches slender, stiff, gray, smooth, thickened at the nodes, glabrous; branchlets with a rich indument of stiff hairs; leaves decussate-opposite, 1-foliolate; petioles 5--10 mm. long, apically and basally incrassate; leaflet-blades stiffly coriaceous, ovate-lanceolate to elliptic-lanceolate, 6.5--13 cm. long, 2.5--5 cm. wide, apically usually long-acuminate, basally rounded, smooth above; midrib prominulous above, prominent beneath; secondaries about 4 pairs, very slender, often subimpressed above, strongly arcuate and prominent beneath; veinlet reticulation lax and prominulous beneath; corolla white or yellow to purplish or bluish; stamens yellow.

Collectors have encountered this plant in primary forests, on gentle hillslopes and the sides of valleys, in lowland forest on hills and ridges, on sandstone strata and in brownish soil, at 3--450 m. altitude, in anthesis in February, March, May, and October,

and in fruit from March to May. A vernacular name reported is "manoeek".

The corollas are described as having been "light yellowish-purple" on *Leopold & Henry SAN.48580*, and "yellow" on *Lajongah SAN.32196*, while on the label of *Sam SAN.28830* there is the cryptic statement: "flowers white, corolla bluish" and on *Sam SAN.28834* "flowers white, corolla bluish-yellow".

Sheet number 73255 in the Buitenzorg herbarium has the pubescence almost all worn off from the petioles and twig apex, but close examination shows some pubescence still remaining. Kostermans pointed out, in a notation on sheet number 73256 in the same herbarium, that this plant differs from *T. simplicifolium* only in the tomentum of the branchlets and "pedicels" [probably meaning the petioles]. On sheet number 73257 he has noted that "This may represent a new species related to *T. simplicifolium*. It has pubescent petioles." I do not regard the differences as worthy of more than varietal rank.

Sheet number 72758 in the Buitenzorg herbarium exhibits a coating of what appears to be mold on the twigs, petioles, and parts of the leaves, but the pubescence shows through on the petioles.

Material of this taxon has been misidentified and distributed in some herbaria as *T. holophyllum* (J. G. Baker) Kosterm. and as *T. smilacifolium* (H. H. W. Pearson) Kosterm.

Citations: GREATER SUNDA ISLANDS: Kalimantan: *Endert 3625* (Bz--72758); *Zwaan 152* [Boschproefst. BB.11204] (Bz--73255, Bz--73256), *1074* [Boschproefst. BB.19034] (Bz--73257--type, N--photo of type, Z--photo of type). Sabah: *Ampon & Leopold SAN.48192* (Z); *Dewol & Karim SAN.78274* (Sn--41552); *Lajongah SAN.32196* (Ld); *Leopold & Hendry SAN.48580* [TN.253] (Ld), *SAN.61081* [NT.121] (Sn--45407); *Meijer SAN.20454* [NT.38; Herb. Forest Dept. 40828] (Ld), *SAN.36695* (Z), *SAN.51194* (Ac); *Mikil SAN.46647* [Herb. Forest Dept. 40847] (Ld), *SAN.46661* [NT.240] (Ld); *Nicholson SAN.28829* (Ld); *Nicholson & Sam SAN.17687* [TN.165] (Ld); *Sam SAN.28830* [NT.228; Herb. Forest Dept. 40835] (Ld), *SAN.28834* [NT.229] (Ld); *J. Singh SAN.34721* [NT.332] (Ld).

TEIJSMANNIODENDRON SINCLAIRII Kosterm., Gard. Bull. Singapore 17: 6--8, fig. 4. 1958.

Synonymy: *Teijsmanniodendron holophyllum* var. *pubescens* Mold., Phytologia 4: 57. 1952.

Bibliography: Kosterm., *Reinwardtia* 1: 97. 1951; Mold., *Phytologia* 4: 57. 1952; Mold., *Résumé* 194 & 470. 1959; Kosterm., *Gard. Bull. Singapore* 17: 6--8, fig. 4. 1958; K. U. Kramer, *Excerpt. Bot. A.5*: 34. 1962; Mold., *Résumé Suppl. 4*: 9. 1962; G. Taylor, *Ind. Kew. Suppl. 13*: 134. 1966; Mold., *Fifth Summ. 1*: 306 & 328 (1971) and *2*: 640 & 911. 1971; Mold., *Phytologia* 46: 467, 472, & 493. 1980.

Illustrations: Kosterm., *Gard. Bull. Singapore* 17: 7, fig. 4. 1958.

A tree, to 5 m. tall; branches and branchlets compressed, stout, gray, the latter minutely scabrous; leaves unifoliate; petioles

stout, 3--4 cm. long, apically with a conspicuous globose swelling beneath; leaflet-blades medium-green with a yellowish tinge and shiny above when fresh, yellowish-green beneath, drying rigidly coriaceous, conspicuously bullate, elliptic, to 25 cm. long and 13 cm. wide, apically acuminate, marginally entire, basally acute, glabrous above, rather densely ferruginous-pubescent and scabrous and less shiny beneath, the pubescence especially on the larger venation; midrib prominent in a groove above, sharply prominent beneath; secondaries 8--10 pairs, impressed above, prominent beneath, arcuate and marginally arcuately anastomosing; tertiaries lax, rather impressed above and prominent beneath; veinlet reticulation obscure; inflorescence axillary, to 30 cm. long, raceme-like, sometimes consisting of a short main rachis and 2 or 3 long branches; peduncles stout, compressed, sparsely scabrous; flowers in groups of 2 or 3 on a very short pedicel; bractlets narrowly ovate or lanceolate, to 8 mm. long, basally narrowed, apically acute, stiff, persistent; calyx campanulate, 3 mm. long, 5-toothed or -lobed, the teeth ovate, 1.5--2 mm. long, apically subacute; corolla dark-violet or purple, with a yellow-brown patch on the lower lip; fruiting-calyx shallowly cupuliform, 5--7 mm. long, 10--12 mm. wide, the margin irregularly incised; fruit subglobose to obovoid-globose, 10--12 mm. long, apically depressed, glabrous, with an apical and often also a lateral median suture, 2-celled, 2-seeded.

The species is based on *Sinclair & Kiah bin Saleh S.F.N.40877* from Sg. Nerus, on the righthand roadbank at the 16th mile on the Kuala to Trengganu road, Trengganu, Malaysia, deposited in the Singapore herbarium. The type of *T. holophyllum* var. *pubescens* was collected by C. J. van der Zwaan (no. 609; *Boschproefst. BB. 12144*) at Berouw, Borneo, on October 25, 1927, and is deposited in the Buitenzorg herbarium as sheet number 73227.

Kostermans (1951), whose description of the species is given in somewhat modified form above, asserts that "The material collected by Sinclair and Kiah makes it clear, that the pilose (scabrous) specimens represent a new species, different from *T. holophyllum* not only by its scabrosity but also by the stout inflorescence and larger flowers and fruit. In sterile condition the species is easily recognized by the scabrous (touch) of the leaf surface." He cites only *Sinclair & Kiah S.F.N.40877* from Trengganu and *Boschproefst. BB.12144* from Borneo. He himself encountered the tree as "very common" in periodically inundated habitats, at 100 m. altitude, in flower and fruit in October, and describes the corollas as "dark-violet".

The *Chai S.31713*, distributed as *T. sinclairii*, is actually the type collection of *T. bintulense* Mold.

Citations: GREATER SUNDA ISLANDS: Kalimantan: Kostermans 21545 (E--1830112); Zwaan 609 [*Boschproefst. BB.12144*] (Bz--73227, Bz--73228, N, N--photo, Z--photo). Sarawak: Native collector 374 (W--1290523).

Synonymy: *Vitex smilacifolium* H. H. W. Pearson, Kew Bull. Misc. Inf. 1907: 159. 1907.

Bibliography: H. H. W. Pearson, Kew Bull. Misc. Inf. 1907: 159. 1907; Prain, Ind. Kew. Suppl. 4, imp. 1, 248. 1913; H. J. Lam, Verbenac. Malay. Arch. 175. 1919; ; H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 48 & 51. 1921; E. D. Merr., Enum. Born. Pl. 514. 1921; Kosterm., Reinwardtia 1: 75, 79, 95--96, & 106. 1951; Prain, Ind. Kew. Suppl. 4, imp. 2, 248. 1958; Mold., Résumé 193, 194, 389, & 470. 1959; G. Taylor, Ind. Kew. Suppl. 12: 141. 1959; Mold., Fifth Summ. 1: 328 (1971) and 2: 728 & 911. 1971; Mold., Phytologia 44: 223 (1979), 45: 490 (1980), and 46: 467 & 493. 1980.

A shrub (?) or tree, sometimes to 30 m. tall, branching, with a clear straight bole to 10 m. high, to 55 cm. in diameter at breast height, and to 1.6 m. in girth, basally buttressed, the buttresses about 52 cm. high, 60 cm. long, and 7.5 cm. thick; crown to 10 m. high; bark about 5 mm. thick, brittle, the outer bark thin, smooth or rough, flaky to peeling, white or whitish to gray, yellow, or greenish, or even fulvous, brownish, or black; inner bark gray- or grayish-brown to pale-brown or even yellow, yellowish near the cambium; cambium yellow or yellowish to white, about 6 mm. thick; sapwood white or pale-yellowish to yellowish or brown, soft to cut; branches subterete, glabrous; branchlets glabrous; nodes ampliate; leaf-scars prominent; leaves decussate-opposite, 1-foliolate; petioles stout, 1--2 cm. long, apically and basally incrassate, flattened above, glabrous; leaflet-blades sessile, elliptic-oblong, 12--20 cm. long, 4--8 cm. wide, coriaceous, apically acute or acuminate to caudate-acuminate, marginally entire and subrevolute, basally rounded, glabrous on both surfaces, shiny above; secondaries 3 or 4 per side, subparallel, ascending from below the middle of the midrib, prominulous above and prominent beneath to the apex; veinlet reticulation rather obscure above; inflorescence terminal, large, stout, paniculate, 25--30 cm. long, 20--23 cm. wide, branched, lax, more or less leafy below, glabrous, the rachis and side branches "dull dark sordidly glaucous"; cymes opposite or alternate, few-flowered, shortly stalked; bracts small or minute; pedicels very short; flower-buds and calyx apically "dull dark sordidly glaucous"; flowers about 6 mm. long; calyx campanulate, 1.5--2 mm. long, about 2 mm. wide, externally rather sparsely and minutely glandulose, internally smooth, the rim shortly 5-toothed, the teeth very small, ciliolate; corolla zygomorphic, pale-purple or blue to white, the lower lip usually darkish-violet near the throat, with a distal pale-yellow spot; corolla-tube cylindric, 4--6 mm. long, usually purplish-tinged, the upper part marked externally with sessile peltate glands, internally glabrous except for the villous throat, apically ampliate, the lobes minutely glandulose throughout, the anterior (larger) lobe flabelliform or subrotund, 2.5--3 mm. wide, the posterior and lateral lobes smaller; stamens inserted below the middle of the corolla-tube, barely exerted; filaments dark-purplish to faintly violet, basally dilated and villous; anthers dark-purplish or black; style white, 6 mm. long; stigma bifid; ovary globose, densely or minutely glandular-dotted; fruiting-

calyx somewhat accrescent, about 6 mm. wide; fruit drupaceous, obovoid, greenish when immature and about 4 mm. long and 3 mm. wide, black and larger when fully mature, glandulose.

This species is based on *Beccari 1097* and *1137* from Sarawak, Borneo. As *Kostermans (1951)* has pointed out, it is very closely related to *T. simplicifolium* Merr. "from which it differs mainly in its larger leaves, the stout inflorescences, and pedicellate flowers. It is quite possible that that taxon represents only a luxuriously developed specimen of *T. simplicifolium*."

Collectors have found *T. smilacifolium* growing in primary or secondary forests, on hillsides and ridgetops, often along stream-sides, on lowland and on undulating land, in logged-over areas on flatlands, in clayey or black stony soil, at 33--1000 m. altitudes, in anthesis in January and from July to September, in fruit in November. The *Native collector 1830* & *1910* collections are indicated as topotypes by Merrill.

The corollas are said to have been "white" on *Abullah SAN.37158*, "whitish" on *Leopold & Amin SAN.75369* and *Wing SAN.32582*, "yellowish-green" on *Madani SAN.88898*, "pale-purple" on *Clemens & Clemens 21825*, "purplish" on *Talip SAN.54971*, "pale-blue" on *Hallier B.219*, and "upper corolla-lobe faintly blue, lower 3 lobes darkish-violet near the throat, with a distal pale-yellow spot" on *Jacobs 5391*.

Merrill (1921) cites *Beccari 1097* & *1137* and *Native collector 1830* & *1910* from Sarawak and *Hallier 219* from Kalimantan, Borneo.

Material has been misidentified and distributed in some herbaria as *Vitex havilandii* Ridl., *V. holophylla* Baker, and *Lagerstroemia* sp. On the other hand, the *SAN.28830* [NT.228; Herb. Forest Dept. 40835], distributed as *T. smilacifolium*, actually is *T. simplicifolium* var. *kostermansi* Mold.

Citations: GREATER SUNDA ISLANDS: Kalimantan: *Hallier 219* (Bz--73270, Bz--73271), *B.219* (Bz--73268, N); *Jacobs 5391* (Ba, W--2377573, W--2377574). Sabah: *Abullah SAN.37158* (Z); *Agama 575* (N--photo, Ph, Z--photo); *Baker SAN.26866* [Herb. Forest Dept. 40859] (Ld); *Butok SAN.45864* (Sn--408820; *Gibot SAN.31276* [Herb. Forest Dept. 40860] (Ld); *Leopold & Amin SAN.75369* (Sn--40886); *Madani SAN.88898* (Z); *Sinanggul SAN.39981* (Z); *Talip SAN.54971* (Ld); *Termiji SAN.72860* (Sn--115913), *SAN.72862* (Sn--40885); *Wing SAN.32582* (Ld). Sarawak: *Beccari 1097* (Mu--1675--cotype, N--cotype, N--tracing, N--photo of cotype, S--cotype, V--cotype, Z--cotype, Z--photo of cotype); *Clemens & Clemens 21825* [field no. 6119] (N, N); *Native collector 1830* (N--photo, Ph, W--1174178, Z--photo), *1910* (N--photo, Ph, Z--photo).

TEIJSMANNIODENDRON SUBSPICATUM (H. Hallier) Kosterm., *Reinwardtia* 1: 99--100. 1951.

Synonymy: *Vitex subspicata* H. Hallier, *Meded. Rijks Herb. Leid.* 37: 52--53. 1918.

Bibliography: H. Hallier, *Meded. Rijks Herb. Leid.* 37: 52--53. 1918; H. J. Lam, *Verbenac. Malay. Arch.* 166 & 177--178. 1919; H. J. Lam in Lam & Bakh., *Bull. Jard. Bot. Buitens.*, ser. 3, 3: 52. 1921; E. D. Merr., *Enum. Born. Pl.* 514. 1921; A. W. Hill, *Ind. Kew. Suppl.* 6: 219. 1926; Mold., *Known Geogr. Distrib. Verbenac.*,

ed. 1, 64, 65, & 104 (1942) and ed. 2, 143, 146, & 203. 1949; Kosterm., *Reinwardtia* 1: 75, 79, 96, 99--100, 103, 104, & 106. 1951; Mold., *Résumé* 188, 193, 194, 389, & 470. 1959; G. Taylor, *Ind. Kew. Suppl.* 12: 141. 1959; Mold., *Fifth Summ.* 1: 328 (1971) and 2: 728 & 911. 1971; Mold., *Phytologia* 43: 252 (1979), 44: 223 (1979), and 46: 467, 489, 491, & 493. 1980.

A small tree, to 16 m. tall, glabrous throughout except for the inflorescence; clear bole to 3 m. high, 90 cm. in girth, 20 cm. in diameter at breast height; crown to 5 m. high; buttresses to 1 m. high, parallel to the trunk, and 30 cm. long, or absent; outer bark white or whitish to gray or yellowish, papery to flaky or scaly, about 5 mm. thick; inner bark white or light-greenish to yellowish, yellow, or orange, granular, soft; living bark brown, about 5 mm. thick; cambium yellowish; wood pale-brown or honey-color; sapwood yellowish; branchlets white or pale-ochraceous, stout, terete or obscurely tetragonal, 3--5 mm. thick; leaves rather large, 1-foliolate; petioles short, stout, subterete or semi-terete, 1--3 cm. long; leaflets sessile on a basal conspicuously swollen articulation, to 13 mm. long and 7 mm. in diameter; leaflet-blades rigidly chartaceous, dark-green, ovate-lanceolate, 8--39.5 cm. long and 3--16 cm. wide, often falcate-recurved, apically gradually long-acuminate, marginally entire and revolute, basally acute or rounded, shiny, glabrous on both surfaces, bullate above, subbullate and paler beneath; venation much arcuate-ascending, marginally arcuately joined, impressed above, very prominent beneath, even the veinlet reticulation prominent beneath; inflorescence terminal, paniculate, rarely also axillary in the upper leaf-axils, pedunculate, decussately branched, to 25 cm. long and (including the branches) 10 cm. wide, dark-purple or fuscous, very minutely puberulent, the branches spicate or subspicate; cymules opposite, at the nodes of the rachis, few-flowered, small, sessile; bracts and bractlets minute, linear; flowers small, short-pedicellate; calyx cyathiform, dark red-purple, scarcely 1.5 mm. long, the rim 5-dentate, the teeth deltoid; corolla about 6 mm. long, externally ochraceous-pubescent, white or pink to purple, or even pale-yellow or brownish, the tube dark red-purple, the limb zygomorphic, blue or pale bluish-purple, darker within, the anterior lobe much larger than the others, the lower lip with a yellow band and white hairs or internally basally rufescent-villose; stamens shortly exserted; filaments white, basally pale-blue; anthers almost black, the thecae divaricate; style white, basally pale-blue, long-exserted; fruiting-calyx much accrescent and enlarged, to 7 mm. long and 17 mm. wide, "dirty-brownish-yellow", the rim obsoletely and irregularly dentate, the teeth apically obtuse; fruit at first green, finally black, drupaceous, globose, to 17 mm. long and 11 mm. in diameter, the lower 2/3 enclosed by the fruiting-calyx.

This species is based on *Hallier B.1064* & *1122* from along the larger Sambas River and from between it and the smaller Sambas in Kalimantan, Borneo, and *Forbes 3204* from Sumatra, but Kostermans (1951) has designated *Hallier B.1064* as lectotype. He cites in addition *Endert 2529, 2819, & 4746*. Hallier says that of his *B.*

1064: "In meinem Reiseaufzeichnungen als Liane bezeichnet, war aber vielleicht auf Überkleidung des Baumes mit einer Liane und unrichtiger Beobachtung vom Boote aus beruht". He cites also Koorders s.n. from Mount Pamaltopas as probably a montane form of the species. He points out its clear relationship with *T. hollrungii* from which he says it differs in the "foliorum articulatione valde tumida, nervis subtus valde prominentibus intermedisque subbullatis, paniculae ramis subspicatis". Kostermans (1951) maintains that these characters are not sufficient to distinguish the two species. Lam (1919) separated *T. subspicatum* from *T. hollrungii* by the size of the fruit -- 2--2.2 cm. in diameter in *T. holophyllum* and only 1.1 cm. in diameter in *T. subspicatum*. In his 1921 work he included *T. subspicatum* somewhat doubtfully in *T. hollrungii*, but specifically calling attention to the gradually acuminate leaflet-apex in *T. subspicatum*. Kostermans (1951) asserts that *T. subspicatum* differs from *T. hollrungii* "in the glabrous, or almost glabrous, inflorescences, and in the presence [sic! = absence] of the numerous tiny holes (glands) on the lower leaf-surface. I consider the latter character, which characterizes *T. hollrungii*, of sufficient importance to keep *T. subspicatum* as a distinct species.....very close to *T. sarawakanum*."

Collectors have encountered *T. subspicatum* in evergreen tropical forests, on riverbanks in primary forests, in virgin jungles and mixed dipterocarp forests, in open places along roadsides, and in logged-over areas of flatland, at altitudes of 100--830 m., in anthesis in May, June, August, and November, and in fruit in March, May, August, September, and November. Kostermans refers to it as "very common on acid soil" and "rare in dry loamy soil with lime" in Kalimantan, Borneo.

A pencil rubbing of a leaf of *Haviland* 3550/796 in the Kew herbarium was made by Merrill at Kew and is deposited in the Britton Herbarium at the New York Botanical Garden.

The corollas are said to have been "white" on Native collector 5222, "pale-yellow" on Native collector 5105, "pink" on Hallier 1064 and Native collector 5076, "purple" on Cockborn SAN.64971, "dark-purple, velvety" on Kostermans 5151, and "brownish" on Krispinus SAN.87314.

Vernacular names reported for the species are "entabuloh", "medang sisit", and "ubah putih".

Material has been misidentified and distributed in some herbaria as *T. hollrungii* (Warb.) Kosterm., *T. sarawakanum* (H. H. W. Pearson) Kosterm., *Vitex* sp., and *Lagerstroemia* sp.

Citations: GREATER SUNDA ISLANDS: Kalimantan: Endert 2529 (Bz--72756), 2819 (Bz--72760, Bz--72761, N), 4746 (Bz--72754, Bz--72755); H. Hallier B.1064 (Bz--73266--lectotype, N--photo of lectotype, Z--photo of lectotype), B.1122 (Bz--73267); Kostermans 5151 (Ng--16904), 12755 (N). Sabah: Ambullah SAN.31476 (Ld); Cockborn SAN.64971 (Sn--64971); Krispinus SAN.87314 (Sn--55107); Sadau SAN.49460 [Herb. Forest Dept. 40815] (Z); Talip & Sabirin SAN.48750 [NT.738] (Ld). Sarawak: Chai S.34719 [F.98] (Z); Native collector 5076 (Ca--357238, N), 5105 (Ca--357545, N), 5222 (Ca--357566, N).

Sumatra: Iwatsuki, Murata, Dransfield, & Saerudin S.365 (Ac).

TEIJSMANNIODENDRON SUBSPICATUM var. *PARVIFOLIUM* Mold., Phytologia 43: 252. 1979.

Bibliography: Mold., Phytologia 43: 252 (1979) and 46: 467 & 493. 1980.

This variety differs from the typical form of the species in its smaller leaflets, the blades of which when mature are only 5--9 cm. long and 2.3--4.5 cm. wide.

The variety is based on *Meijer SAN.39328* from ultrabasic soil at Ulu Karamuak, at 2000 feet altitude, on the Tavail Plateau, Sandakan District, Sabah, collected on August 3, 1963, and deposited in the Sandakan herbarium. Thus far, the taxon is known only from the original collection which is in fruit only and was misidentified and distributed as *T. holophyllum* (J. G. Baker) Kosterm. The collector describes the plant as a tree, the clear bole about 8 m. high, 15 cm. in diameter at breast height, the inner bark and sapwood yellowish-ochre, turning brownish after exposure.

Citations: GREATER SUNDA ISLANDS: Sabah: *Meijer SAN.39328* (Sn--40880--type, Z--isotype).

TEIJSMANNIODENDRON UNIFOLIOLATUM (Merr.) Mold., Phytologia 4: 58. 1952.

Synonymy: *Vitex unifoliolata* Merr., Philip. Journ. Sci. Bot. 20: 438--439. 1922.

Bibliography: E. D. Merr., Philip. Journ. Sci. Bot. 20: 438--439. 1922; E. D. Merr., Enum. Philip. Flow. Pl. 3: 398. 1923; A. W. Hill, Ind. Kew. Suppl. 7: 252. 1929; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1077. 1932; Mold., Alph. List Comm. Names 3. 1939; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 63 & 104. 1942; Mold., Phytologia 2: 123. 1944; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 142 & 203. 1949; Kosterm., Reinwardtia 1: 104 & 106. 1951; Mold., Phytologia 4: 58. 1952; Mold., Résumé 193 & 470. 1959; G. Taylor, Ind. Kew. Suppl. 12: 141. 1959; Mold., Résumé Suppl. 2: 14. 1960; Mold., Fifth Summ. 1: 318 (1971) and 2: 731 & 911. 1971; Mold., Phytologia 46: 466. 1980.

A shrub or small tree, glabrous except for the inflorescence; branches somewhat tetragonal, pale-grayish, glabrous, the ultimate ones about 3 mm. in diameter; leaves 1-foliolate; petioles about 1 cm. long, glabrous; leaflet-blades coriaceous, pale-olivaceous when dry, oblong, 20--27 cm. long, 7--10 cm. wide, apically rather slender-acuminate, marginally entire, basally rounded, shiny, more or less bullate above, glabrous on both surfaces, slightly paler and more densely punctulate beneath; secondaries 9--12 per side, prominent on both surfaces, curvate-anastomosing; veinlet reticulation loose, very prominent; inflorescence solitary, terminal, slender, about 40 cm. long; peduncles about 6 cm. long, rather slender, about 2.5 mm. in diameter; primary inflorescence-branches only 1 or 2, greatly elongated, slightly pubescent; individual cymes widely scattered, few-flowered, 3--4 cm. long; calyx cupuliform, about 3 mm. long,

the rim equally 5-lobed, the lobes ovate, about 0.5 mm. long, apically obtuse, appressed-pubescent with short hairs; corolla blue, about 11 mm. long, its tube about 5 mm. long, externally slightly pubescent, the lower lip 3-lobed, with the middle lobe large, orbicular, about 5 mm. in diameter, entire, glabrous, the 2 lateral lobes elliptic, apically rounded, about 3 mm. long, the upper lip about 2 mm. long; stamens somewhat exserted, basally villous; young fruit glabrous or nearly so, enclosed by the accrescent fruiting-calyx.

This species is based on *Ramos & Edaño s.n.* [Philip. Bur. Sci. 37048] from forests along streams at low altitude at Malangas, Zamboanga District, Mindanao, Philippine Islands, collected on October 27, 1919, and deposited in the herbarium of the Philippine Bureau of Science in Manila, now most probably destroyed.

A vernacular name recorded for the species is "babaka" and Merrill (1922) points out that *T. unifoliolatum* is very similar in habit to what is now known as *T. hollrungii* (Warb.) Kosterm., from which it differs in its very slender inflorescences, details of the corolla (such as the middle lobe of the lower lip being orbicular, marginally entire, and glabrous), and in its glabrous (not tawny-pubescent) fruits. Kostermans (1951) was of the opinion that the 2 taxa are "likely to be conspecific", basing his belief on the "densely punctilate [*sic!*] lower leaf-surface" of both. The collection cited below he tentatively identified as *T. sarawakanum*, apparently at the time not having seen any authentic material of either Merrill's or Pearson's species. Merrill's description states that the leaflets of his plant are basally rounded, as they are in the collection cited below, while the material cited by Kostermans, exclusive of this collection, has the leaflets basally acute. I am rather sure, therefore, that this collection represents Merrill's species.

Citations: GREATER SUNDA ISLANDS: Sarawak: *Clemens & Clemens* 21826 [field no. 6529] (Bz--73096, N, N--photo, Z--photo).

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ADDITIONAL NOTES ON THE GENUS *AEGIPHILA*. XXVIII

Harold N. Moldenke

AEGIPHILA Jacq.

Additional bibliography: Arechav., Anal. Mus. Nac. Montev. 4: 62. 1903; Fournet, Fl. illust. Phan. Guad. Mart. 1391 & 1410--1412, fig. 672. 1978; Hocking, Excerpt. Bot. A.33: 88 & 89. 1979; Mold., Phytologia 46: 288, 317--337, & 504. 1980; Mold. & Bromley in Harley & May, Towards Checklist Fl. Bahia 188. 1980.

AEGIPHILA ALBA Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.33: 88 & 89. 1979; Mold., Phytologia 46: 318--319. 1980.

Recent collectors have found this plant growing in disturbed forests along rivers, flowering in April, and describe it as a tree, 10 m. tall, with white flowers.

Additional citations: ECUADOR: Azuay: *Gentry, Bonifaz, & Horne 28530* (Ld).

AEGIPHILA AMAZONICA Mold.

Additional bibliography: Mold., *Phytologia* 46: 319. 1980.

Additional citations: BRAZIL: Amazonas: *N. T. Silva 4461* (N).

AEGIPHILA BRACHIATA Vell.

Additional bibliography: Mold., *Phytologia* 46: 320. 1980.

Illustrations: Vell., *Fl. Flum. Icon.* 1: pl. 93. 1827; *Arechav.*, *Anal. Mus. Nac. Montev.* 4: 62. 1903.

Pedersen describes this plant as a shrub or small tree, 3--4 m. tall, and found it growing in woodlands and in sandy soil at the edge of woodlands, flowering in October. He reports the vernacular name, "tajyí-tý", for it. The corollas are said to have been "yellow" on *Pedersen 5226* and "yellowish" on *Pedersen 9252*. Both these collections were misidentified and distributed to herbaria as the closely related *A. hassleri* Briq.

Additional citations: PARAGUAY: *Pedersen 5226* (W--2883172), *9252* (W--2883276).

AEGIPHILA BRACTEOLOSA Mold.

Additional bibliography: Mold., *Phytologia* 46: 320. 1980.

Anderson describes this plant as a shrub, 1.5 m. tall, and encountered it at the edge of a forest, at 200 m. altitude, flowering in March.

Additional citations: BRAZIL: Rondônia: *W. R. Anderson 12318* (N).

AEGIPHILA CANDELABRUM Briq.

Additional bibliography: Mold., *Phytologia* 40: 211--212. 1978.

Pedersen describes this plant as a shrub, 2--3 m. tall, with yellow corollas, and found it growing in moist woodlands, flowering in January.

Additional citations: PARAGUAY: *Pedersen 3192* (W--2883202).

AEGIPHILA CORDATA Poepp.

Additional bibliography: Mold., *Phytologia* 46: 321--322. 1980.

Additional citations: PERU: Loreto: *Schunke Vigo 922* (W--2865783).

AEGIPHILA CORDATA var. *VILLOSISSIMA* (Mold.) Mold.

Additional bibliography: Mold., *Phytologia* 46: 321--322. 1980.

Recent collectors describe this plant as a treelet, 5 m. tall, the flower-buds and flowers "greenish", and found it growing in clay soil, flowering in October.

Additional citations: BRAZIL: Rondônia: *Vieira, Zarucchi, Peterson, Ramos, & Mota 572* (Ld).

AEGIPHILA CORDIFOLIA (Ruíz & Pav.) Mold.

Additional bibliography: Mold., *Phytologia* 46: 302. 1980.

The *Schunke Vigo* 1676 and 2173 distributed as *A. cordifolia*, actually are *A. spicata* (Rusby) Mold., which see.

AEGIPHILA COSTARICENSIS Mold.

Additional bibliography: Mold., *Phytologia* 46: 322. 1980.

Recent collectors describe this plant as a shrub or small tree, 1--8 m. tall, the leaf-blades whitened beneath, the flowers pendent, the corollas white, anthers pale-yellow, and fruit blue. They have found it growing in deep black soil of high primary woods, in the understory formation in forests, and in disturbed evergreen forests, at 100--1350 meters altitude, flowering in February, and fruiting in May. Neil & Vincelli encountered it in cloud forests.

Additional citations: MEXICO: Veracruz: *Calderon* 3000 (N).

NICARAGUA: Rivas: *Neill & Vincelli* 3263 (Z); *W. D. Stevens* 6531 (Ld). Yelaya: *W. D. Stevens* 6334 (Ld).

AEGIPHILA CUNEATA Mold.

Additional synonymy: *Aegophila cunneata* Mold., in herb.

Additional bibliography: Mold., *Phytologia* 46: 322. 1980.

Foster has encountered this plant in forests and describes it as a shrub, 2--3 m. tall, with white corollas. He found it in anthesis in August.

Additional citations: PERU: Madre de Dños: *R. B. Foster* 2487 (N).

AEGIPHILA DEPPEANA Steud.

Additional bibliography: Mold., *Phytologia* 46: 322. 1980.

Neill describes this plant as a sprawling shrub, 2 m. tall, with ovoid yellow-green fruit (in June), the fruit indented at its apex, and encountered it in secondgrowth forest, at 100 m. altitude.

Additional citations: NICARAGUA: Yelaya: *Neill* 4272 (Ld).

AEGIPHILA ELATA Sw.

Additional bibliography: Mold., *Phytologia* 46: 323. 1980.

Recent collectors describe this plant (as it occurs in Central America) as a shrub, 3--4 m tall, the calyx green, "closely enveloping but not adhering to the ovary" in the fruiting stage, and have found the plant growing in dry thickets on rocky slopes and in cloudforests, at 1300--1520 m. altitude, in flower and fruit in April. The corollas are said to have been "yellowish" on *Gentry & al.* 28696.

Additional citations: NICARAGUA: Yelaya: *Neill* 3713 (Ld).

PANAMA: Darién / COLOMBIA: Chocó boundary: *Gentry, Forero, Dillon, Renteria, Skog, Sousa, & Lellinger* 28696 (Ld).

AEGIPHILA FARINOSA

Additional bibliography: Mold., *Phytologia* 40: 319--320, 336, & 338. 1978; López-Palacios, *Revist. Fac. Farm. Univ. An-*

des 20: 11. 1979.

AEGIPHILA FASCICULATA Donn. Sm.

Additional bibliography: Mold., Phytologia 46: 324. 1980.

Recent collectors have found this species in forests and cut-over cloudforests and at the edges of forests, as well as "in pastures and patches of cloudforest", at 1360--1600 m. altitude, flowering in January and fruiting in March. They describe it as a small, weak tree, 5--6 m. tall. The corollas are said to have been "white" on *Stevens* 5962.

Additional citations: GUATEMALA: Alta Verapaz: *Williams, Molina R., Williams, & Molina* 40143 (W--2866527). NICARAGUA: Jinotega: *W. D. Stevens* 5962 (Z). Matagalpa: *Molina R.* 20573 (W--2866558).

AEGIPHILA FILIPES Mart. & Schau.

Additional bibliography: Mold., Phytologia 46: 325 & 327. 1980.

The corollas are said to have been "white" on *Cordeira* 1330.

AEGIPHILA FLUMINENSIS Vell.

Additional bibliography: Mold., Phytologia 46: 325. 1980.

Additional citations: BRAZIL: Paraná: *Hatschbach* 41829 (N).

AEGIPHILA GLANDULIFERA Mold.

Additional bibliography: Mold., Phytologia 46: 288 & 325--326. 1980.

Recent collectors describe this plant as shrubby,, the stems elongating, and the calyx pale-green. They have encountered it in forests and swampy depressions on level terrain, at 30 m. altitude, flowering in November. The corollas are said to have been "pale-yellow" on *Steyermark & al.* 120473.

Additional citations: VENEZUELA: Táchira: *Steyermark, Liesner, & González* 120473 (Ld). BRAZIL: Acre: *Santos, Mota, & Ramos* 101 (Ld). Pará: *Silva & Bahia* 3100 (N).

AEGIPHILA GLANDULIFERA var. *PARAËNSIS* Mold.

Additional bibliography: Mold., Phytologia 40: 220. 1978.

Recent collectors describe the fruit of this plant as red-orange (in July) and have found the plant growing in tropophilous woods and areas of high savannas of *Trachypogon* at 250--260 m. altitude.

Additional citations: VENEZUELA: Bolívar: *Delascio & Liesner* 7024 (Z).

AEGIPHILA GLANDULIFERA var. *PYRAMIDATA* L. C. Rich. & Mold.

Additional bibliography: Mold., Phytologia 46: 326. 1980.

Liesner describes this plant as a liana "leaning on trees" or as a tree, 3--4 m. tall, with drooping branches and stems about 2 cm. in diameter or as a tree with "pendent branches", and has found it growing in disturbed forests, at 120 m. altitude,

flowering in May. He reports the vernacular name, "hoja babaso". The corollas are said to have been "whitish" on *Liesner* 7309 and "cream" on *Liesner* 7492 and 7544.

Additional citations: VENEZUELA: Amazonas: *Liesner* 7309 (Ld), 7492 (Ld), 7544 (Z).

AEGIPHILA GLORIOSA Mold.

Additional bibliography: Mold., *Phytologia* 46: 326--327. 1980; Mold. & Bromley in Harley & Mayo, Towards Checklist Fl. Bahia 188. 1980.

AEGIPHILA GLORIOSA var. *PARAËNSIS* Mold.

Additional bibliography: Mold., *Phytologia* 46: 326--327. 1980; Mold. & Bromley in Harley & Mayo, Towards Checklist Fl. Bahia 188. 1980.

AEGIPHILA HASSLERI Briq.

Additional bibliography: Mold., *Phytologia* 40: 211 & 224--225. 1978.

The *Pedersen* 5226 and 9252, distributed as *A. hassleri*, actually represent the closely related *A. brachiata* Vell.

AEGIPHILA INTEGRIFOLIA (Jacq.) Jacq.

Additional bibliography: Mold., *Phytologia* 46: 328--330. 1980.

Recent collectors describe this plant as a shrub or tree, 1.5--3 m. tall, the leaves membranous, pale rich-green, and the fruit green (in April). They have encountered it in white sand areas and in tall forests on wooded hills, at 120 m. altitude, in anthesis in April and November and in fruit in April. The corollas are said to have been "cream" on *Liesner* 6070 and "creamy-white" on *Steyermark & al.* 120574.

Additional citations: VENEZUELA: Amazonas: *Liesner* 6070 (Ld). Táchira: *Steyermark, Liesner, & González* 120574 (Ld).

AEGIPHILA LAXICUPULIS Mold.

Additional synonymy: *Aegiphila laticupulis* Neill, in herb.

Additional bibliography: Mold., *Phytologia* 46: 331. 1980.

Stevens refers to this plant as a sprawling shrub or vine with bright-orange fruit. He found it growing in black deeply cracked soil in fields and along roadsides and in secondgrowth forests along rivers, at 20 m. altitude, fruiting in March and December.

The *Neill* 2948, distributed as *A. laxicupulis*, actually seems better placed as *A. magnifica* Mold.

Additional citations: NICARAGUA: León: *W. D. Stevens* 5476 (Z). Zelaya: *W. D. Stevens* 7259 (Ld).

AEGIPHILA MAGNIFICA Mold.

Additional bibliography: Mold., *Phytologia* 46: 332 & 336. 1980.

Neill describes this plant as a shrub or tree, 3--10 m. tall, with yellow fruit, and encountered it in forests, tropical dry forests, and secondary scrub, at 200--500 m. altitude, fruiting in November. Material has been misidentified and distributed in

some herbaria as "*Aegiphila laticupulis*".

Additional citations: MICARAGUA: Managua: Neill 1254 (Z). Masaya: Neill 2948 (Ld).

AEGIPHILA MOLDENKEANA López-Palacios

Additional bibliography: Mold., Phytologia 46: 334. 1980.

Bernardi comments that in this plant the leaves are opposite, exstipulate, the stigma is bifid, and the fruit resembles that of a *Solanum* -- actually it is a drupe, not a berry. He found it in anthesis in February.

Additional citations: VENEZUELA: Mérida: Bernardi s.n. [15-2-57] (N).

AEGIPHILA MOLLIS H.B.K.

Additional bibliography: Mold., Phytologia 46: 334. 1980.

Steiermark and his associates refer to this plant as a shrub, 2 m tall, the leaves membranous, and the "flowers" pale-green to greenish-white in November.

Additional citations: VENEZUELA: Táchira: Steiermark, Liesner, & González 119452 (Ld).

AEGIPHILA PANAMENSIS Mold.

Additional bibliography: Mold., Phytologia 46: 330 & 336. 1980.

Recent collectors describe this plant as a common scandent shrub, about 2 m. tall, the flower-buds yellow-green, and the fruit orange, and have found it along fences and in cutover pine forests and thickets, at 400--700 m. altitude, in flower in September, and in fruit in November.

Additional citations: HONDURAS: Copán: Molina R. & Molina 24740 (W--2866768). NICARAGUA: Chontales: W. D. Stevens 4203 (Ld).

AEGIPHILA PARAGUARIENSIS Briq.

Additional bibliography: Mold., Phytologia 40: 340 & 394--395. 1978.

Recent collectors refer to this plant as a shrub, 1.5 m. tall, and have found it in anthesis in October.

Additional citations: BRAZIL: Rondônia: Vieira, Zarucchi, Petersen, Ramos, & Mota 688 (Ld).

AEGIPHILA RACEMOSA Vell.

Additional synonymy: *Aegiphylla racemosa* Vell., in herb.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 43. 1948; Mold., Phytologia 40: 329, 344--345, & 398. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 10. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 15. 1979; Mold., Phytologia 45: 468. 1980.

Additional illustrations: Vell., Fl. Flum. Icon. 1: pl. 88. 1827.

Recent collectors refer to this plant as a shrub, 0.9--2.5 m. tall, as a tree, 5 m. tall, or even as a vine climbing on large trees, the leaves hairy beneath, the inflorescences axillary, the "botões verdes, flores maduras marrom", and the immature

fruit green, finally becoming vermillion. They have encountered it at the edges of forests, in sandy soil of woods (mata) on terra firme (not inundated land), and in bana (white sand areas with shrubs and small trees). at 100--200 m. altitude, flowering in February, June, and December, fruiting in April. The corollas are said to have been "white" on *Silva* 2154 and "yellow" on *Anderson* 11093.

The Croat 20738, distributed as typical *A. racemosa*, is the type collection of its var. *cordatifolia* Mold.

Additional citations: BRAZIL: Amazonas: *Liesner* 7240 (Ld). Pará: W. R. *Anderson* 11093 (N); *Lobo, Vilhena, & Ribeiro* 153 (N); N. T. *Silva* 2154 (Ld); *Silva & Bahia* 3048 (N).

AEGIPHILA RACEMOSA var. *CORDATIFOLIA* Mold., *Phytologia* 45: 468. 1980.

Bibliography: Mold., *Phytologia* 45: 468. 1980.

The type collection, *Croat* 20738, was originally identified and distributed to herbaria as the typical form of the species, from which it differs in its deeply cordate leaf-bases.

Citations: PERU: Loreto: *Croat* 20738 (W--2846423--type).

AEGIPHILA RETICULATA Mold.

Additional bibliography: Mold., *Phytologia* 40: 345. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 15. 1979.

AEGIPHILA RIEDELIANA Schau.

Additional bibliography: Mold., *Phytologia* 40: 345. 1978; Reitz, Klein, & Reis, *Proj. Madeira S. Catar.* 42. 1978.

Illustrations: Vell., *Fl. Flum. Icon.* 1: pl. 92. 1827.

Reitz and his associates (1978) record "gaioleira" as a vernacular name for this species.

Additional citations: BRAZIL: Santa Catarina: *Reitz & Klein* 3915 (W--282991).

AEGIPHILA RIMBACHII Mold.

Additional bibliography: Mold., *Phytologia* 40: 345. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 15. 1979.

AEGIPHILA RORAIMENSIS Mold.

Additional bibliography: Mold., *Phytologia* 40: 345--346, 395, & 397. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 15. 1979.

Additional citations: VENEZUELA: Bolívar: *Steyermark, Berry, Dunsterville, & Dunsterville* 117355 (Ld).

AEGIPHILA SALTENSIS Legname

Additional bibliography: Mold., *Phytologia* 40: 393. 1978; Hocking, *Excerpt. Bot. A.33*: 89. 1979.

AEGIPHILA SCANDENS Mold.

Additional bibliography: Mold., *Phytologia* 40: 394. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 15. 1979.

The *Steysmark*, *Bunting*, & *Blanco 101487*, previously referred to under *A. scandens*, seems definitely to be *A. elata* var. *macrophylla* (H.B.K.) López-Palacios.

AEGIPHILA SCHIMPFII Mold.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 81. 1948; Mold., Phytologia 27: 369. 1973; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 15. 1979.

Recent collectors refer to this plant as a tree, 6 m. tall, the "flores fasciculados en espiga" [actually they are in heads], and the fruit orange in color, and have encountered it at 600 m. altitude, fruiting in April and May.

Additional citations: ECUADOR: El Oro: *Escobar 1225* (Z).

AEGIPHILA SELLOWIANA Cham.

Additional & emended bibliography: H. N. & A. L. Mold., Pl. Life 2: 74 & 82. 1948; Mold., Phytologia 40: 394--395. 1978; Kummrow, Bol. Mus. Bot. Munic. 38: 14. 1979; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 15. 1979.

Recent collectors describe this plant as a shrub, 1.5--5 m. tall, or tree, 15 m. tall,, the stems 12--30 cm. in diameter, the "galhos alados", the flower-buds green, and the immature fruit green. They have found it in flower in November and December and in fruit in February and March, growing in capoeira and cerrado.

The corollas are said to have been "esverdeadas" on *Mori & al.* 9289 and "white" on *Gibbs & Leitão Filho 3551*, *Hatschbach 41890*, and *Mattos Silva & Hage 318*. Kummrow (1979) cites *Hatschbach 13664 & 14234* from Paran , Brazil.

Additional citations: BRAZIL: Amazonas: *Vieira, Zarucchi, Silva, Mota, & Monteiro 88* (Ld). Bahia: *Mattos Silva & Hage 318* (Ld); *Mori, Kallunki, & Pennington 9289* (Ld). Parana: *Hatschbach 41865* (N), *41890* (Ld, N). S o Paulo: *Gibbs & Leit o Filho 3551* (Eu--59507).

AEGIPHILA SMITHII Mold.

Additional bibliography: Mold., Phytologia 40: 395--396. 1978; L pez-Palacios, Revist. Fac. Farm. Univ. Andes 20: 15. 1979.

Revilla encountered this plant on the "borde de purma", reporting the fruits as green in August.

Additional citations: PERU: Loreto: *Revilla 1227* (Ld).

AEGIPHILA SPICATA (Rusby) Mold.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 49. 1948; Mold., Phytologia 40: 396. 1978.

Recent collectors describe this species as a tree, 2.5 m. tall, or as a liana, 4--7 m. long,, the fruit yellow or orange, in racemes, and have found it growing in low woods and forests, at 250--400 m. altitude, in anthesis from October to December, and in fruit in February and September. The corollas are said to have been "cream-color" on *Froehner 35*, "creamy-white" on *Froehner 108*, and "greenish-yellow" on *Schunke Vigo 1300*.

Additional citations: PERU: Hu nuco: *Schunke Vigo 1676* (W--

2865775), 2173 (W--2865774). Loreto: Froehner 35 (N), 108 (E--2680079); Schunke Vigo 906 (W--2865203), 1300 (W--2865169).

AEGIPHILA STEINBACHII Mold.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 66. 1948; Mold., Phytologia 27: 354 & 365. 1973.

AEGIPHILA SUFFLAVA Mold.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 67. 1948; Mold., Phytologia 40: 397. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 15. 1979.

AEGIPHILA SYLVATICA Mold.

Additional bibliography: Mold., Phytologia 40: 397. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 15. 1979.

AEGIPHILA TERNIFOLIA (H.B.K.) Mold.

Additional synonymy: *Aegiphila terniflora* H.B.K. ex Steyererm. & Huber, Fl. Avila 864. 1978. *Aegiphila ternifolia* López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 15, sphalm. 1979.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 607. 1927; Mold., Phytologia 40: 397--398. 1978; Steyererm. & Huber, Fl. Avila 814, fig. 21a. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 15. 1979.

Additional illustrations: Steyererm. & Huber, Fl. Avila 864, fig. 21a. 1978.

Knuth (1927) cites *Humboldt & Bonpland s.n.* as questionably from Bermudez, Venezuela.

Aristeguieta found the plant in flower in January, and the corollas are said to have been "white" on his no. 2972.

Additional citations: VENEZUELA: Distrito Federal: Aristeguieta 2972 (W--2882568)

AEGIPHILA TERNIFOLIA f. *OPPOSITIFOLIA* López-Palacios

Additional synonymy: *Aegiphila termnifolia* f. *oppositifolia* López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 15, sphalm. 1979.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 607. 1927; Pittier, Supl. Pl. Usual. Venez. 54. 1939; Mold., Phytologia 40: 398. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 15. 1979.

Knuth (1927) cites from Venezuela Moritz 897 and Pittier 5884, the latter from Distrito Federal. Pittier (1939) records the vernacular name, "chicharra", for this plant.

Material of this form has been distributed in some herbaria as "*Aegiphylla* sp." and even as *Acanthaceae* and *Sapotaceae*.

AEGIPHILA VALLENSIS Mold.

Additional bibliography: Mold., Phytologia 40: 399. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 15. 1979.

Additional citations: COLOMBIA: Valle del Cauca: Cuatrecasas 15115 (W--2819150). [to be continued]

BOOK REVIEWS

Alma L. Moldenke

"THE TREE KEY -- A Guide to Identification in Garden, Field and Forest" by Herbert Edlin, 280 pp., 12 color pl. of 96 photos of boles, 12 color pl. of tree structures & 2 b/w & 9 color pl. of tree draw. with matching text. Charles Scribner's Sons, New York, N. Y. 10017. 1978. \$8.85 paperbound.

This is a most helpful, attractive fieldbook for the easy identification of 237 species in 77 genera found native, naturalized and/or cultivated anywhere in temperate North America and western Europe. The short introductory chapters on tree naming, structures and uses are interesting and clearcut. A small error is not considering the *Taxus* open seed cover as just an aril but as a fruiting berry. On opposing pairs of pages the author's descriptive text appears on the left-hand side and the excellent color plates by Ian Garrard on the right-hand side, usually showing seed, seedling, buds, leaves, flowers, tree in winter (if leafless), in fall (if with colored foliage) and in summer (full-leaved).

"NATIVE PLANTS FOR USE IN THE CALIFORNIA LANDSCAPE" by Emile L. Labadie, 248 pp., 106 b/w plates, 2 fig. & 1 map. Sierra City Press, P. O. Box 2, Sierra City, California 96125. 1978. Paperbound.

The author, an emeritus professor of ornamental horticulture at Merritt College, directs home, student and professional gardeners through easy keys to 101 illustrated and described trees, shrubs and ground covers for all desired locations. Pests, shapes, propagation, soil, etc. are listed. Right in the preface pest control is urged by first good plant management, then the use of any feasible biological controls, and lastly by safely recommended chemicals only as needed in an integrated safe program.

"POLLEN AND ALLERGY" by R. Bruce Knox, iii & 60 pp., 29 b/w plates, 21 figs. & 1 tab. The Institute of Biology's Studies in Biology No. 107, University Park Press, Baltimore, Maryland 21202. 1979. \$4.95.

The author has presented a good and interesting survey of pollen structure, production, transport by various agents, fertilization and incompatibilities -- pollen in the life of the flowering plant. The author has presented well in the second part of the book the effects of aero-transport of certain pollens incidental-

ly to certain people rather than to corresponding female flowers so that allergens in intine and exine walls produce the hay-fever and/or asthma syndrome.

"AQUACULTURE" by P. J. Reay, ii & 60 pp., 5 b/w photo, 8 fig., & 7 tab. The Institute of Biology's Studies in Biology no. 106, University Park Press, Baltimore, Maryland 21202. 1979. \$4.95.

The near five dollar price for this small booklet that defines the virtually obvious seems to be too much for the simple information imparted under such topics as maximizing growth, minimizing mortality, etc., if either financial gains or successful research goals are involved. Perhaps the information on selecting a system may be useful to some readers.

"RUDERAL VEGETATION ALONG SOME CALIFORNIA ROADSIDES" by Robert E. Frenkel. California Library Reprint Series Edition of University of California Publications in Geography Volume 20 (1970), vii & 163 pp., 13 b/w fig., 4 maps & 30 tab. University of California Press, Los Angeles, New York, N. Y. 10017 & Berkeley, California 94720. 1978. \$10.75.

There is still demand for this report of central and northern California based on 87 study sites involving 723 kinds of vascular plants with 11.5% or 86 established in at least 9 sites and with only superficial homogeneity. From the latter *Verbena officinalis*, reported on p. 144, is probably a species misidentification. The text gives excellent analyses of ruderal plants and ruderal growing conditions.

"GRASSES OF MARATHWADA" by B. W. Patunkar, xii & 300 pp. & 81 b/w fig., 4 maps & 3 tab. Scientific Publishers, Jodhpur 342001 India. 1980. Rs100 or U.S.\$20.00.

The author has just earned his doctorate on the basis of this study from the Department of Botany (misspelled on the title-page) of the University of Marathwada. The voucher specimens are deposited in its herbarium. The introduction describes the major vegetational, climatic, ecological and economic features of this part of the Deccan plateau in the state of Maharashtra. The taxonomy follows that of N. L. Bor. Botanically this is a worthwhile study that will probably prove to be of considerable use, but it should never have been rolled off the printing press -- and from a scientific publisher at that -- without galley and page proof reading, because there are hundreds of spelling errors. Pages 299 and 300 are examples of only a very few of them!

"PLAGUE! The Shocking Story of a Dread Disease in America Today"
by Charles T. Gregg, viii & 278 pp., 1 b/w map & 5 fig.
Charles Scribner's Sons, New York, N. Y. 10017. 1978.
\$12.50.

This reliably recounted, interestingly written report of recent incidents and deaths from pneumonic, septicemic and bubonic plague will certainly startle folks who (1) assumed that most cases have been left behind in the Middle Ages, (2) with poorer, primitive and less sanitary conditions, and (3) with flea-infected rat-infested ships and ports. The frontispiece of the book is a World Health Organization worldwide map showing suspected, probable and known plague foci in 1974, with the U.S.A. marked up to the 100th meridian for the latter two categories. As in other parts of the world, and especially with us, the wild rodents and their flea parasites that harbor *Yersinia pestis* are the culprits. There are realistic estimates of possible future epidemics and the use of plague in biological warfare.

"BIOLOGY OF SEAWEEDS -- Levels of Organization" by A. R. O. Chapman, xv & 134 pp., 54 b/w figs., 7 photo, 1 color pl. & 10 tab. University Park Press, Baltimore, Maryland 21202. 1979. \$10.75 paperbound.

Rather than the typical systematic approach, already well covered in texts, this book deals with marine macroscopic green, brown and red algae through an organizational approach in (1) cells through their structure and function in biochemical and molecular terms, (2) whole thalli and their reproduction, (3) population biology, and (4) community structure analyses and interactions. The figures and charts are apt foci for students' attention. The text is planned for upper level undergraduate students interested in phycology and ecology.

"THE WASTE WATCHERS -- A Citizen's Handbook for Conserving Energy and Reserves" by Arthur H. Purcell, xxvi & 286 pp., 1 b/w map, 8 fig. & 12 tab. Anchor Books of Doubleday Publishers, Garden City, New York 11530. 1980. \$4.50 paperbound.

For the many concerned folks this book provides convincing and sensible motivation, facts, figures and citizen action guides for reducing and recycling discards, deriving energy from garbage, and treating hazardous wastes. Now, if only the unconcerned would be converted by this good book!

"EXPLORING THE OLYMPIC PENINSULA" Third Revised Edition by Ruth Kirk, viii & 120 pp., 72 b/w photo. & 11 maps. University of Washington Press, Seattle, Washington 98105. 1980. \$7.95 paperback only.

This is an enticing, detailed introduction to this unique mountainous, sea-shored, temperate rain forest area just as the previous editions have been, but it is needed to announce the location of new campgrounds, new environment-protecting regulations, the ferry system replacing the sunk Hood Canal Bridge, etc. "This book is intended as a guide for the eyes and the feet and also to mind." The photographs by the author and her husband are wonderful.

"NAN-FANG TS'AO-MU CHUANG" A Fourth Century Flora of Southeast Asia -- Introduction, Translation, Commentaries by Hui-Lin Li, 168 pp., 39 b/w fig, & 1 map. Chinese University Press, Hong Kong & University of Washington Press, Seattle, Washington 98105. 1979. \$15.00.

"Plants of the Southern Regions" is the translation of this Chinese language title for the manuscript by Chi Han in A.D. 304 and "is reputed to be the oldest work on subtropical and tropical botany". Even if it is not complete or if possibly altered, it is still characteristic of its time of origin and "has been well known for many centuries in China for its interesting accounts and refined literary style." Dr. Li has provided the first whole translation with annotations as to botanical identifications of eighty plants, ethnology, agriculture, biographical information about the author and his family, histo-geographical notes and selected illustrations added from other later sources. The entire text is also printed in Chinese for the benefit of readers in Chinese studies. This publication is a gem!

"DOUGLAS OF THE FORESTS -- The North American Journals of David Douglas" by John Davies, 192 pp, 16 b/w photo pl. & 4 maps. University of Washington Press, London & Seattle, Washington 98105. 1980. \$14.95.

This abridged edition is for Douglas' second expedition during 1824-1827 over and through land and water today mostly mapped in Oregon, Washington and British Columbia. Phrases from a May 2nd entry include: "stones of several tons weight are carried across the valley by the force of the current"; "no more huge conifers, *Acer* nor *Berberis*, so abundant only a few miles on the other side"; "in dry hilly parts *Ledum buxifolium*, *Arbutus Uva-ursi*". Davies' introduction evaluates David Douglas' scientific and exploratory contributions. Appendices excerpt Douglas' field letters to his mentor, Dr. William Hooker, provide "thumb-nail" biographical sketches of Douglas' acquaintances, list plants horticultural-

ly introduced to Britain, give some notes made in 1828-1829 by Douglas on North American conifers, and print maps (without marked itineraries!) of areas covered. Interesting, arduous pioneering.

"PLANT METABOLISM -- Physiology and Biochemistry of Primary Metabolism" by Gerhard Richter, translated and revised from the German 3rd edition by David J. Williams, viii & 475 pp., 101 b/w fig., 4 photo. & 1 tab. Georg Thieme Verlag, Stuttgart & University Park Press, Baltimore, Maryland 21202. 1978. \$22.75.

For phytochemistry, plant physiology, etc. courses of various orientations and levels, this meticulous text will definitely prove an asset on the students' reading shelf, the professor's and laboratory technicians' desks, as well as in college, university and botanical institute library shelves. The detailed, clearly explained content is presented as (1) the laws governing metabolic reactions, (2) plant autotrophy, (3) biological oxidation and energy production, (4) water and ions in metabolism, (5) metabolism of the cellular components and (6) metabolic regulation.

"TREE GROWTH AND ENVIRONMENTAL STRESSES: by Theodore T. Kozlowski, vii & 194 pp., 9 b/w fig., 3 photo. & 20 tab. University of Washington Press, London & Seattle, Washington 98105. 1979. \$10.00.

This valuable book is composed of three lectures in the Geo. S. Long Publication Series. The first is on "The Complexity of Environmental Stresses (biotic and physico-chemical) and Tree Responses (death, injury, avoidance and/or tolerance)". The second is on "Water Supply (dew, fog, precipitation, soil retention, flooding, root grafts) and Tree Growth (usually more limited by too little rather than too much)". The third is on "The Environmental Impact on Seeds and Seedlings (the most vulnerable growth stages)". The author closes with an inviting statement to student listeners and readers on the "Challenges of Research in Forest Biology".

"GRASSES OF LOUISIANA" by Charles M. Allen, iii & 358 pp., 304 b/w fig. with 226 parish geogr. distrib. maps. University of Southwestern Louisiana Publications, Lafayette, Louisiana 70504. 1979. \$9.00 paperbound.

This careful, useful study is prepared from the author's Ph.D. dissertation and is applicable not only to Louisiana but also to all adjacent coastal plain physiographic provinces. The keys to the 99 genera and within them to the 308 species seem readily workable.

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TRISETELLA, A NEW NAME IN THE PLEUROTHALLIDINAE
(ORCHIDACEAE)

Carlyle A. Luer

The Marie Selby Botanical Gardens
800 South Palm Avenue
Sarasota, Florida 33577 U.S.A.

A new generic name in the Pleurothallidinae is necessary because of prior use of Triaristella for a fossil spore (Triaristella V. S. Malyavkina, Trudy Vsesojuzn. Neftian Nauchno-Issl. Geol. Razvedochn. Inst. ser. 2, 33:32, 45. 1949.). Trisetella is proposed for this small genus of closely related species.

Trisetella Luer, nom. nov.

Syn.: Masdevallia Ruiz & Pavon sect. Triaristellae Rchb. f., Gard. Chron. 6:226. 1876.
Triaristella (Rchb. f.) Brieg. ex Luer, Selbyana 2:205. 1978.

TYPE: Trisetella triaristella (Rchb. f.) Luer (Masdevallia triaristella Rchb. f.)

ETYMOLOGY: From the Latin tri-, "tri-," seta, "a bristle," plus the diminutive -ella, in allusion to the minute hair-like apices of the three sepals.

The following new combinations become necessary:

Trisetella didyma (Luer) Luer, comb. nov.
Masdevallia didyma Luer, Phytologia 39:195. 1978.
Triaristella didyma (Luer) Luer, Selbyana 2:205. 1978.

Trisetella dressleri (Luer) Luer, comb. nov.
Masdevallia dressleri Luer, Selbyana 3:20. 1976.
Triaristella dressleri (Luer) Luer, Selbyana 2:205. 1978.

Trisetella gemmata (Rchb. f.) Luer, comb. nov.
Masdevallia gemmata Rchb. f., Gard. Chron. 19:294. 1883.
Triaristella gemmata (Rchb. f.) Luer, Selbyana 2:205. 1978.

Trisetella huebneri (Schltr.) Luer, comb. nov.
Masdevallia huebneri Schltr., Beih. Bot. Centralbl. 62(2):88. 1925.
Triaristella huebneri (Schltr.) Luer, Selbyana 2:205. 1978.

Trisetella pantex (Luer) Luer, comb. nov.
Masdevallia pantex Luer, Phytologia 39:218. 1978.
Triaristella pantex (Luer) Luer, Selbyana 2:206. 1978.

Trisetella tenuissima (C. Schweinf.) Luer, comb. nov.

Masdevallia tenuissima C. Schweinf., Bot. Mus. Leaflet. 4:11. 1937.

Masdevallia butcheri Luer, Selbyana 3:16. 1976.

Triaristella tenuissima (C. Schweinf.) Luer, Selbyana 2:206. 1978.

Trisetella triaristella (Rchb. f.) Luer, comb. nov.

Masdevallia triaristella Rchb. f., Gard. Chron. 6:226. 1876.

Triaristella reichenbachii Brieg., Die Orchideen 449. 1976.

Trisetella trichaete (Rchb. f.) Luer, comb. nov.

Masdevallia trichaete Rchb. f., Gard. Chron. 19:360. 1883.

Masdevallia triseta Rchb. f. ex Krzl., Repert. Spec. Nov. Regni
Veg. Beih. 34:201. 1925.

Triaristella trichaete (Rchb. f.) Luer, Selbyana 2:206. 1978.

Trisetella tridactylites (Rchb. f.) Luer, comb. nov.

Masdevallia tridactylites Rchb. f., Gard. Chron. 18:784. 1883.

Masdevallia allenii L. O. Wms., Ann. Missouri Bot. Gard. 27:273.
1940.

Triaristella tridactylites (Rchb. f.) Luer, Selbyana 2:206. 1978.

Trisetella triglochin (Rchb. f.) Luer, comb. nov.

Masdevallia triglochin Rchb. f., Gard. Chron. 8:648. 1877.

Triaristella triglochin (Rchb. f.) Luer, Selbyana 2:206. 1978.

Trisetella vittata (Luer) Luer, comb. nov.

Masdevallia vittata Luer, Phytologia 39:233. 1978.

Triaristella vittata (Luer) Luer, Selbyana 2:206. 1978.

MISCELLANEOUS NEW SPECIES
IN THE PLEUROTHALLIDINAE (ORCHIDACEAE)

Carlyle A. Luer

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Dracula hirsuta Luer & Andreetta, sp. nov.

Inter species generis Draculae Luer species haec foliis angustis, flore mediocri cupula non profunda, sepalis atropurpureis dense hirsutis, petalis bivalvatis et hypochilio labelli ovato obtuso concavo multilamellato distinguitur.

Plant medium in size to large, epiphytic, caespitose; roots coarse, flexuous. Secondary stems erect, channeled, unifoliate, 4-5.5 cm long, enclosed by 2-3 thin, imbricating sheaths. Leaf erect to slightly arching, thinly coriaceous, carinate dorsally, very narrowly obovate, 16-28 cm long, 1.5-1.8 cm wide, the apex subacute, tridenticulate, gradually narrowed below into the conduplicate base. Inflorescence a few-flowered, congested raceme of successive flowers borne by a red, descending peduncle 5-9 cm long, with a few, distant bracts, from a node low on the secondary stem; floral bract 15 mm long; pedicel 10 mm long; ovary 4 mm long; sepals glabrous and reddish purple externally, dark purple with a dense, purple pubescence within, the dorsal sepal broadly ovate, 12 mm long, 12 mm wide, connate to the lateral sepals for 5 mm to form a broad, shallow sepaline cup, the apex obtuse, with a few white hairs near the margin, contracted into a slender, maroon tail ca. 6.5 cm long, the lateral sepals white along the inferior margin with white hairs, ovate, oblique, 18 mm long, 11 mm wide, connate 13 mm to form an obtuse, shallow mentum, the subacute apices contracted into tails similar to that of the dorsal sepal; petals yellow, marked with purple, oblong, 3 mm long, 2 mm wide, the apex bivalvate, verrucose between the laminae, the internal lamina denticulate, the outer rounded and recurved; lip white, spatulate, 10 mm long, 6 mm wide, the hypochile obovate, 4 mm long, 3.5 mm wide, with erect, obtuse marginal angles, cleft centrally, the concave base hinged to the column-foot, the epichile ovate, 6 mm long, 6 mm wide, concave with erect, denticulate margins, the apex rounded, the concavity filled with 3 (sometimes 5) tall, radiating, undulating lamellae plus shorter, incomplete segments; column yellow, semiterete, 3 mm long, with a short, thick foot.

ETYMOLOGY: From the Latin hirsutus, "covered with erect hairs," in reference to the hirsute sepals.

TYPE: ECUADOR: MORONA-SANTIAGO: epiphytic in wet forest near Rio Calagras, alt. 1600 m, April 1979, A. Andreetta & M. Portilla, cultivated in Cuenca, flowered in cult. 29 Sept. 1980, C. Luer 5591 (HOLOTYPE: SEL); same locality, 19 Sept. 1980, C. Luer et al. 5506A (SEL).

DISTRIBUTION: Southeastern Ecuador.

Although similar to many species with narrow leaves and medium-sized flowers, this species may be distinguished by the dark purple, densely hirsute flowers, and a white lip with a relatively small, concave, multilamellate epichile.

Dracula hubeinii Luer, sp. nov.

Inter species generis Draculae Luer species haec foliis parvis angustissimis pedunculo descendenti longioribus, flore parvo cupula profunda intus brunneo verrucosissimis et epichilio labelli concavo trilamellato hypochilio minore dignoscenda.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems channeled, unifoliolate, 2-3.5 cm long, enclosed by a close, thin, tubular sheath. Leaf erect, thinly coriaceous, carinate dorsally, very narrowly elliptical, 12-17 cm long, 0.7-1.0 cm wide, the apex acute, tridenticulate, gradually narrowed below the middle to the conduplicate base. Inflorescence a 1-flowered (always ?), more or less horizontal peduncle 4-10 cm long, with a few bracts, from a node low on the secondary stem; floral bract 8 mm long; pedicel 13 mm long; ovary brown, 4 mm long; sepals glabrous and buff-colored externally, yellow-white and covered with brown, tuberculated warts within, the dorsal sepal suborbicular, 9.5 mm long, 11.5 mm wide, connate to the lateral sepals for 6 mm to form a deep sepaline cup, the rounded, free portion abruptly contracted into a slender, maroon tail 22 mm long, the lateral sepals connate 9 mm into a broadly concave lamina 11 mm long, 17 mm wide, the obtuse apices contracted into tails similar to that of the dorsal sepal; petals white, marked with brown, oblong, 3.25 mm long, 1.1 mm wide, the apex subacute, bivalvate, tuberculate between the valves; lip pale pink, pandurate, 5 mm long, 2.5 mm wide, the hypochile oblong, 3 mm long, 2.25 mm wide, with erect, narrowly rounded marginal angles, cleft centrally, the concave base hinged to the column-foot, the epichile ovate, 2.25 mm long, 2.5 mm wide, obtuse with smooth margins, concave with 3 undulating lamellae; column yellow, semiterete, 4 mm long, with a stout foot 2 mm long.

ETYMOLOGY: Named in honor of Herr Hubein of Berlin, Germany, who discovered this species.

TYPE: COLOMBIA: CUNDINAMARCA ?: without locality, collected near Bogota by Hubein, cultivated by B. Würtle at Spielberg, West Germany, flowered in cultivation 19 May 1980, C. Luer 5247

(HOLOTYPE: SEL).

DISTRIBUTION: Colombia.

This small species may be distinguished by the very narrow leaves and a single, little, deeply cupped flower intensely warty inside. The epichile of the lip is smaller than the hypochile.

Dracula portillae Luer & Andreetta, sp. nov.

Inter species generis Draculae Luer species haec habitu longi-repentis, pedunculo gracili erecto foliis angustissime ellipticis subaequilongo, flore parvo brevicaudato, petalis bivalvatis et labello obovato epichilio indistincto rotundato plano distinguitur.

Plant medium in size, epiphytic, repent, the rhizome more or less ascending, 10-20 cm or more long, 1-3 cm long between secondary stems, enclosed by tubular sheaths; roots coarse, flexuous, from nodes along the rhizome. Secondary stems ascending, slender, channeled, unifoliate, 3-4.5 cm long, enclosed by 2 loose, tubular, imbricating sheaths. Leaf erect, thinly coriaceous, sharply low-carinate along the midrib dorsally, very narrowly elliptical, 13-18 cm long, 1.5-1.6 cm wide, the apex acute, tridenticulate, gradually narrowed below into the conduplicate base. Inflorescence a congested, few-flowered raceme of small, successive flowers borne by a slender, erect peduncle 14-17 cm long, with 2-3 thin, widely spaced bracts, from a node about midway on the secondary stem; floral bract 7-8 mm long; pedicel 6-7 mm long; ovary 4 mm long; sepals glabrous, ovate, ca. 10 mm long, 5 mm wide, connate basally into a shallow cup, the apices contracted into tails ca. 10 mm long; petals oblong, 3 mm long, 1 mm wide, the apex bivalvate, verrucose between the valves; lip obovate-pyriform, 4 mm long, 2.5 mm wide, the hypochile indistinct, with erect, obtuse, marginal angles, cleft centrally, the concave base hinged to the column-foot, the epichile rounded and flat; column semiterete, 3 mm long.

ETYMOLOGY: Named in honor of Mario Portilla of Cuenca, Ecuador, who discovered this species.

TYPE: ECUADOR: MORONA-SANTIAGO: epiphytic in wet forest east of the pass between Gualaceo and Limon, alt. 2000 m, 19 Sept. 1980, C. Luer, J. Luer, A. Andreetta, M. Portilla et al. 5477 (HOLOTYPE: SEL).

DISTRIBUTION: Eastern Ecuador.

This species is closely related to D. quilichaoensis (Lehm. & Krzl.) Luer, but D. portillae may be distinguished immediately by the long-repent habit.

Dracula ubangina Luer & Andreetta, sp. nov.

Species haec D. vampirae (Luer) Luer similis sed statura floribusque minoribus, sepalis atris glabris lateralibus prope marginem inferiorem exceptis differt.

Plant medium in size, epiphytic, caespitose; roots coarse, flexuous. Secondary stems erect, channeled, unifoliate, 2-4 cm long, enclosed by 2-3 loose, imbricating sheaths. Leaf erect, thinly coriaceous, narrowly obovate, 10-15 cm long, 2-3.5 cm wide, the apex acute, tridenticulate, cuneate below into an ill-defined, conduplicate petiole. Inflorescence a few-flowered, congested raceme of successive, black flowers borne by a horizontal to descending peduncle 10-15 cm long, with a few, distant bracts, from a node low on the secondary stem; floral bracts 10-13 mm long; pedicel 15-18 mm long; ovary subverrucose, 8 mm long; dorsal sepal black with radiating black veins on green at the base, glabrous, ovate, 24-26 mm long, 22-26 mm wide, connate to the lateral sepals for 9 mm to form a flat flower, the subacute apex contracted into a slender, black tail 5-6 cm long; lateral sepals glabrous except for a sparse, short pubescence on the lower, inner portions, black except occasionally for a few, scattered, colorless spots, mostly on the lower, inner portions, ovate, oblique, 27-30 mm long, 21-25 mm wide, connate 15 mm to form a shallow mentum behind the lip, the subacute apices contracted into tails similar to that of the dorsal sepal; petals white, marked with purplish black, oblong, 6.5 mm long, 2 mm wide, the apex bivalvate, verrucose between the valves, the inner denticulate, the outer rounded; lip white, spatulate, 18 mm long, 11 mm wide, the hypochile ovate, 6 mm long, 5 mm wide, with obtuse, erect, marginal angles, cleft centrally, the concave base hinged to the column-foot, the epichile oblong-rounded, 13 mm long, 10-11 mm wide, concave, the concavity filled with 3 major carinae and multiple, lesser carinae radiating to the denticulate margin; column white, semiterete, 6.5 mm long, the foot 3 mm long.

ETYMOLOGY: Named for the fancied resemblance of the black flower with a large, round lip to a Ubangi tribesman.

TYPE: ECUADOR: PICHINCHA: epiphytic in cloud forest near Mindo, alt. 1800 m, Jan. 1975, A. Andreetta & A. Hirtz 038, cultivated by Andreetta in Cuenca, flowered in cultivation 6 Feb. 1978, C. Luer 2470 (HOLOTYPE: SEL).

DISTRIBUTION: Western Ecuador.

I had considered this species to be a small, particularly dark form of D. vampira, with which it is sympatric, but after seeing additional living material, Padre Andreetta has convinced me that specific differences exist. The plants of D. ubangina are medium in size with the leaves considerably smaller and narrower than those of D. vampira. The flowers are also consistently smaller and

solid black except for the radiating veins above the column in the center of the flower. Occasionally a few colorless flecks occur, usually on the lower inner portions of the lateral sepals where there is a short, sparse pubescence. The sepals of D. vampira are striped, the stripes visible even in darker forms, and they are totally glabrous.

Masdevallia bottae Luer & Andreetta, sp. nov.

Planta parva caespitosa, foliis ellipticis petiolatis apice rotundatis, pedunculo gracili suberecto unifloro, sepalis pallide flavis glabris lateribus cum macula parva basali apicibus rotundatis abrupte longicaudatis, petalis magnicarinatis cum dente prominenti retrorso, labello oblongo albo apice atropurpureo lobulato.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems slender, blackish, unifoliate, 3-7 mm long, with 1-2 loose, tubular sheaths. Leaf erect, coriaceous, elliptical, petiolate, 4-8 cm long including the 1.5-3 cm long petiole, the apex obtuse to rounded, minutely notched, the base cuneate into the slender, blackish petiole. Inflorescence a solitary flower borne by a slender, suberect peduncle 4-5.5 cm long, with a bract near the base, from a node on the secondary stem; floral bract tubular, 8-9 mm long; pedicel 9-10 mm long; ovary light green, 5 mm long; sepals pale yellow, glabrous, the dorsal sepal broadly ovate, cucullate, 13 mm long, 11 mm wide, connate 4 mm to the lateral sepals to form a short, wide-spread cup, the free portion rounded, concave, translucent white near the lateral angles, abruptly contracted into a slender, yellow-green erect tail ca. 3.5 cm long, the lateral sepals broadly ovate, oblique, 10 mm long, 9 mm wide, connate 2-3 mm over a transverse fold below the column-foot, with a small, dark purple spot at the base, the free portions with more or less reflexed margins, the apices obtuse to rounded, abruptly contracted into deflexed tails similar to that of the dorsal sepal; petals white, erect, oblong-cuneate, 5-6.5 mm long, 2-3 mm wide, the truncate apex tridentate, the labellar margin with a thick, incurved carina ending in a prominent, retrorse, rounded tooth; lip white, dotted with dark purple, erect, oblong, 4.5 mm long, 3.5 mm wide, the truncate apex dark purple with a deflexed, midline lobule, the truncate base hinged beneath, the disc with a pair of low, longitudinal elevations; column white with a pair of dark purple, apical teeth, semiterete, 5 mm long, the slender foot 2.5 mm long with a short, incurved extension.

ETYMOLOGY: Named in honor of Padre Angel Botta, Salesian missionary, co-discoverer of this species.

TYPE: ECUADOR: MORONA-SANTIAGO: epiphytic in rain forest near Rio

Calagras, alt. 1600 m, 19 Sept. 1980, C. Luer, J. Luer, A. Andre-
etta et al. 5502 (HOLOTYPE: SEL); same locality, Jan. 1978, A.
Andreetta, M. Portilla & A. Botta s.n. (SEL); ZAMORA-CHINCHIPE:
between Loja and Zamora, B. Malo, cult. at Tarqui, flowered in
cult. 27 Sept. 1980, C. Luer 5560 (SEL).

DISTRIBUTION: Southeastern Ecuador.

This species is closely related to the Colombian M. xanthina Rchb. f., but the former may be distinguished by the glabrous, pale yellow flowers. It is also closely related to M. pallida (Woolward) Luer, but M. bottae may be distinguished by the smaller, pale yellow flowers with rounded sepals.

Masdevallia grossa Luer, sp. nov.

Species haec M. ophioglossae Rchb. f. persimilis sed habitu floribusque majoribus et caudis sepalorum grossis differt.

Plant small, epiphytic, densely caespitose; roots slender, flexuous. Secondary stems slender, 4-10 mm long, unifoliate, enclosed by 2 thin, imbricating, tubular sheaths. Leaf erect, coriaceous, narrowly obovate, petiolate, 3-7 cm long including the 1.5-3 cm long petiole, 7-10 mm wide, the apex subacute to rounded, tridenticulate, gradually narrowed below into the slender petiole. Inflorescence a solitary flower borne by a slender, erect peduncle 3.5-7 cm long, with a bract below the middle, from a node on the secondary stem; floral bract 5-7 mm long; pedicel 3 mm long; ovary green, tricarinate, 2.5 mm long; sepals glabrous, white, 15 mm long including the green tails, the dorsal sepal oblong, concave, curved, carinate, 7-8 mm long, 3-5 mm wide spread out, connate to the lateral sepals for 6-7 mm to form an arched, constricted, sepaline tube, the free portion immediately occupied by a 2-2.5 mm thick, terete tail 7-10 mm long, the lateral sepals connate ca. 6 mm, more or less globose-dilated at the base, narrowed and cylindrical above, the free apices similarly occupied by thick, diverging tails 8-9 mm long; petals white, triangular, 2.5-3 mm long, 1.25-1.5 mm wide, the narrowed apex obtuse, microscopically erose, the labellar margin with a carina forming a broad-based acute lobe, the base unguiculate, inserted onto the side of the base of the column; lip pale yellow, narrowly ovate, the apical third narrowed, terete, verrucose, yellow, the disc thickened and cleft centrally, 4.5 mm long, 1.5 mm wide; column white, terete, 2.5-3 mm long, the curved foot equally long, with a slender, curved extension.

ETYMOLOGY: From the Latin grossus, "thickened, enlarged," referring to the thick, terete tails.

TYPE: ECUADOR: AZUAY: epiphytic on the western slopes of Azuay, 1972, B. Malo, cultivated near Cuenca, flowered in cultivation 14 July 1977, C. Luer 1696 (HOLOTYPE: SEL).

DISTRIBUTION: Western Ecuador.

This species is very closely allied to M. ophioglossa from the western slopes of Pichincha, about 250 Km to the north. No intermediate populations are known. Masdevallia grossa may be distinguished by the considerably larger habit and larger flowers. The orifice of the sepaline tube is constricted and the free portions of the sepals are immediately thickened into spreading, terete tails. Except for the anterior third of the lip being coarsely verrucose, the petals and lip of the two species are extremely similar.

Masdevallia porphyrea Luer, sp. nov.

Inter species sectionis Polystictarum Krzl. planta mediocris porphyrea, foliis longipetiolatis purpureo suffusis maculatisque, floribus glabris purpureo guttatis transverse compressis, sepalo dorsali orbiculari infra medium saccato, sepalis lateralibus parvis, petalis nanis retusis, labello grandibilamellato trilobato obtuso, lobis lateralibus latis obliquis erectis distinguitur.

Plant medium in size, epiphytic, densely caespitose to shortly ascending; roots slender, flexuous. Secondary stems slender, 2-3.5 cm long, mottled with rose, unifoliate, with 2 close, tubular sheaths at the base. Leaf erect, coriaceous, dull pinkish tan, suffused and mottled with purple, narrowly elliptical, long-petiolate, 7-13 cm long including the slender, red-spotted petiole 3-4.5 cm long, 1.5-2.2 cm wide, the apex subacute, tridenticulate, the base narrowly cuneate into the petiole. Inflorescence a raceme 3-5 cm long of 4-6 simultaneous flowers, the peduncle erect, slender, 14-17 cm long including the rachis, with a bract near the middle and another near the base, from a node on the secondary stem; floral bract inflated, oblique, 4-5 mm long; pedicel green, spotted with purple, 2-3 mm long; ovary green, spotted with purple, 2 mm long, with 3 double crests; sepals glabrous, light dull green, with minute, transverse bars of purple, with minutely serrulate margins; dorsal sepal suborbicular, deeply concave, more or less saccate below the middle, 8 mm long, 9 mm wide, connate to the lateral sepals for 5 mm to form a gaping, more or less transversely compressed sepaline cup, the rounded apex abruptly contracted into an erect, green tail 7 mm long; lateral sepals ovate, 9 mm long, 5 mm wide, connate 2 mm over a transverse fold in front of the column-foot, the acute apices contracted into tails similar to that of the dorsal sepal; petals translucent green, marked with purple, oblong, 1.75 mm long, 0.75 mm wide, the apex retuse, slightly thickened toward the base on the labellar half; lip light purple-brown, broadly ovate-trilobed, 3.75 mm long, 3.5 mm wide across the lateral lobes, 2.5 mm wide across the middle lobe, the lateral lobes erect, oblique, broadly ovate, obtuse, the middle lobe with 3 elevated veins, obtuse to rounded, with undulate margins, the disc

with a pair of oblique lamellae near the middle, the broadly rounded base hinged to the column-foot; column dull green, mottled with red, semiterete with broad wings, 3.5 mm long, with a thick, spotted foot equally long.

ETYMOLOGY: From the Latin porphyreus, "purple" (Greek porphyra), referring to the purplish leaves and flowers.

TYPE: ECUADOR: AZUAY: epiphytic in Valle de Yunguilla, alt. 1900-2000 m, western slopes of Azuay, B. Malo, cultivated by him near Cuenca, flowered in cultivation 26 Sept. 1980, C. Luer 5566 (HOLOTYPE: SEL).

DISTRIBUTION: Western Ecuador.

This species may be distinguished by the pinkish tan leaves mottled with purple, but this condition might not always be present. The glabrous, transversely flattened flowers are distinctive in the saccate bulge of the dorsal sepal below the middle, minute retuse petals, and a comparatively large, three-lobed lip with broad, erect, lateral lobes.

Masdedevallia pulcherrima Luer & Andreetta, sp. nov.

Inter species sectionis Polystictarum Krzl. species haec statura mediocris, foliis longipetiolatis, floribus glabris albis sparsim purpureo maculatis, petalis apiculatis serrulatis, labello late oblongo distinguitur.

Plant medium in size, epiphytic, caespitose to shortly ascending; roots slender, flexuous. Secondary stems slender, unifoliate, 2-4 cm long, enclosed by 2-3 close, imbricating sheaths. Leaf erect, coriaceous, elliptical, petiolate, 11-14 cm long including the 2.5-3 cm long petiole, 2.3-2.7 cm wide, the apex subacute, tridenticulate, narrowly cuneate below into the petiole. Inflorescence an arching, simultaneously several-flowered raceme 12-15 cm long including the 6-7 cm long rachis, the peduncle slender, erect to suberect, with bracts below the middle and near the base, from a node on the secondary stem; floral bract thin, oblique, 3-5 mm long; pedicel 5-6 mm long; ovary green with purple dots, 3 mm long, irregularly crested; sepals white with a few large, irregular, purple spots and orange tails, glabrous, the free margins minutely erose; dorsal sepal ovate, cucullate, 10 mm long, 9 mm wide unspread, connate 4 mm to the lateral sepals to form a gaping cup, the rounded apex abruptly contracted into an erect tail 12 mm long; lateral sepals oblong, 10 mm long, 5 mm wide, connate ca. 1 mm to form a short mentum beneath the column-foot, the obtuse apices contracted into deflexed, 12 mm long tails; petals yellow-white, marked with purple, orange at the apex, oblong, 5 mm long, 2 mm wide, the margins minutely serrulate, with a carina from the base extending along and above the lower margin, the apex truncate with

an acute, apical tooth; lip yellow-white, orange at the apex, oblong, 4.5 mm long, 2.75 mm wide, with broad, obtuse, marginal folds in the distal third, the apex convex, obtuse to rounded, the disc sulcate centrally, the truncate base hinged to the column-foot; column yellow-white, semiterete, 4.5 mm long, the foot equally long including a short, incurved extension.

ETYMOLOGY: From the Latin pulcherrimus, the superlative of pulcher, "pretty," referring to the beauty of the flowers.

TYPE: ECUADOR: BOLIVAR: epiphytic in cloud forest below Guaranda, alt. ca. 2000 m, Aug. 1978, C. Luer, J. Luer, A. Andreetta & A. Hirtz, cultivated by Andreetta in Cuenca, flowered in cultivation 26 Sept. 1980, C. Luer 5558 (HOLOTYPE: SEL).

DISTRIBUTION: Western Ecuador.

This species is closely allied to the variable M. polysticta Rchb. f., but M. pulcherrima is readily identified by the white, glabrous flowers with a few large, purple spots and orange tails.

Masdevallia roseola Luer, sp. nov.

Species haec M. pumilae Poepp. & Endl. similis sed foliis latioribus, floribus majoribus, sepalis albis roseolo suffusis latioribusque et petalis sine dente acuto basali differt.

Plant small, epiphytic, caespitose; roots slender, fasciculate. Secondary stems slender, blackish, unifoliate, 2-3.5 cm long, provided with 2 close, tubular sheaths. Leaf erect, coriaceous, narrowly elliptical, 6-8 cm long, 1.1-1.2 cm wide, gradually narrowed below into an ill-defined petiole. Inflorescence a solitary flower borne by an erect to suberect, filiform peduncle 3.5-4 cm long, from a node low on the secondary stem; floral bract tubular, 7-9 mm long; pedicel 7-9 mm long; ovary olive-green, pitted, 4 mm long; sepals white, suffused with rose, glabrous, the dorsal sepal ovate, ca. 13 mm long, 7 mm wide, connate to the lateral sepals for 8 mm into a cylindrical tube, the triangular free portion subacute, contracted into a slender, white tail ca. 23 mm long, the lateral sepals oblong, oblique, ca. 20 mm long, 6 mm wide, the apices gradually tapered into slender, ascending, white tails ca. 18 mm long, the total length 38 mm; petals white, oblong, 5 mm long, 1.75 mm wide, the apex rounded, the lower margin thickened, terminating in an obtuse angle above the unguiculate base; lip white, suffused with rose, thick, obovate, 5 mm long, 2.25 mm wide, the apex rounded, the base subcordate, hinged beneath; column white with purple margins, semiterete, 4.5 mm long, the short foot with an incurved extension.

ETYMOLOGY: From the Latin roseolus, the diminutive of roseus, "rosy," referring to the color of the flowers.

TYPE: ECUADOR: ZAMORA-CHINCHIPE: epiphytic in cloud forest between Loja and Zamora, alt. ca. 1500 m, R. Hawley, cultivated in Mill Valley, California, flowered in cultivation 15 Dec. 1978, C. Luer 3643 (HOLOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

Although very closely allied to M. pumila, M. roseola may be recognized by the larger flowers generously suffused with rose, the sepals about twice as wide tapered into slender, up-curved tails.

Masdevallia sanchezii Luer & Andreetta, sp. nov.

Planta pumila caespitosa foliis fusiformibus acutis petiolatis, pedunculo unifloro gracili plus minusve decumbenti, sepalis tricar-
inatis atropurpureo striatis anguste caudatis, petalis ovatis apice
setiformibus, labello elliptico acuto quinquistriato.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems slender, blackish, 2-5 mm long, unifoliate, enclosed by 1-2 close, tubular sheaths. Leaf erect, coriaceous, fusiform, petiolate, 2-4.3 cm long including the 0.8-1.5 cm long petiole, 5-9 mm wide, the apex acute, tridenticulate, narrowly cuneate below into the blackish petiole. Inflorescence a single flower borne by a more or less transverse, slender peduncle 3-3.5 cm long, with a bract near the base, from a node low on the secondary stem; floral bract 4 mm long; pedicel 5-6 mm long; ovary green, 3 mm long, subverrucose; sepals dull green, tricarinate along the veins, the carinae dark purple, the dorsal sepal ovate, 25 mm long including the tail, 5 mm wide, connate to the lateral sepals for 3.5 mm to form a short sepaline tube, the free portion triangular, the acute apex attenuated into a slender, antrorse tail, brown, becoming yellow toward the apex, the lateral sepals ovate, 25 mm long including the tails, each 5 mm wide, connate 5 mm to form an elongated, shallow mentum suffused with rose, the apices gradually narrowed into slender, yellowish tails; petals translucent greenish white, marked with purple along the midvein, ovate, 7.5 mm long, 1.5 mm wide, slightly thickened along the labellar margin, both margins cellular-erose, the apex yellow, acuminate, acute, 3 mm long; lip light green, marked with 5 longitudinal stripes of dark purple, elliptical, acute, 7.5 mm long, 2.5 mm wide, the disc with a pair of low, longitudinal carinae, the base cordate, hinged beneath to the column-foot; column green, semiterete, 2.5 mm long, minutely winged at either side of the apex, the foot 2 mm long with a very short, incurved extension.

ETYMOLOGY: Named in honor of Eduardo Sanchez of Cuenca, Ecuador, co-discoverer of this species.

TYPE: ECUADOR: MORONA-SANTIAGO: epiphytic in rain forest near Rio

Calagras, alt. 1600 m, 19 Sept. 1980, C. Luer, J. Luer, A. Andre-
etta et al., 5506 (HOLOTYPE: SEL); same locality, Oct. 1977, A.
Andreetta, M. Portilla & E. Sanchez s.n. (SEL).

DISTRIBUTION: Southeastern Ecuador.

This little species is most remarkable for the long-acuminate apices of the petals, and the elliptical lip with an acute apex. In some plants the apex of the lip is more acuminate and elongated than in others.

Masdevallia sanguinea Luer & Andreetta, sp. nov.

Inter species sectionis Alaticaulium Krzl. species haec pedunculo crasso, floribus successivis grandibus rubiginosis, cauda sepali dorsalis caudis sepalorum lateralium multilongiore, petalis tridentatis, labello sanguineo magno oblongo infra medium plicato dignoscenda.

Plant medium in size, epiphytic, caespitose; roots coarse, flexuous. Secondary stems stout, 1-1.5 cm long, unifoliate, enclosed by 1-2 loose, tubular sheaths. Leaf erect, coriaceous, elliptical, 6-9 cm long, 1.5-1.9 cm wide, the apex acute, tridenticulate, cuneate below into a short petiole 1-1.5 cm long. Inflorescence a congested raceme of single, successive, comparatively large, red flowers borne by a stout, triquetrous peduncle 9-10 cm long, with a bract at the base, from a node low on the secondary stem; floral bracts papery, imbricating, 12 mm long; pedicel 8-9 mm long; ovary 5-6 mm long; sepals glabrous externally, microscopically verrucose within, the dorsal sepal obovate, 15-18 mm long, 10 mm wide, connate to the lateral sepals for 10-13 mm to form a cylindrical sepaline tube, the free portion triangular, the subacute apex contracted into a thick, terete, antrorse tail ca. 3 cm long, red above, yellow below, the lateral sepals connate 27-29 mm into a broad, bifid lamina, the acute apices close, contracted into 1 cm long terete tails, 46 mm long including the tails, 25 mm wide; petals white, suffused with purple, oblong, 11 mm long, 3.5 mm wide, the apex tridenticulate, with a longitudinal callus above the labellar margin, terminating in a rounded callus above the base; lip dark red, oblong, 16 mm long, 6.5 mm wide, the apex obtuse with serrulate margins and a midline callus, the base subcordate, hinged beneath, the disc with a pair of low carinae extending forward from a pair of marginal folds below the middle; column red, semiterete, 10 mm long, with a foot 5 mm long and a short incurved extension.

ETYMOLOGY: From the Latin sanguineus, "blood-red," in reference to the color of the lip and column.

TYPE: ECUADOR: MORONA-SANTIAGO: epiphytic in rain forest near Rio Calagras, alt. 1600 m, A. Andreetta, M. Portilla 1750, cultivated in Cuenca, flowered in cultivation 27 Sept. 1980, C. Luer 5451

(HOLOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

This member of the Alaticaulis section may be recognized by the stout, relatively short peduncle bearing successive, large, reddish flowers characterized by a cylindrical sepaline tube, tridentate petals, and a large, red, oblong lip.

Masdevallia theleura Luer, sp. nov.

Inter species sectionis Alaticaulium Krzl. species haec pedunculo gracili foliis longiore, floribus successivis brevipedicellatis, cupula sepalorum brevi cylindrica, parte libera sepali dorsalis late triangulari cum cauda gracili erecta, sepalis lateralibus profunde connatis late expansis apicibus obtusis approximatis brevissime caudatis distinguitur.

Plant medium in size, epiphytic, caespitose; roots coarse, flexuous. Secondary stems stout, 1.5-2.5 cm long, unifoliate, enclosed by 2 close, imbricating sheaths. Leaf erect, thickly coriaceous, glossy dark green, narrowly obovate, 8-14 cm long, 1.6-2.1 cm wide, the subacute apex tridenticulate, the base gradually narrowed to the channeled, subpetiolate base. Inflorescence a congested, successively several-flowered raceme 2-4 cm long, borne by a slender, triquetrous peduncle 13-23 cm long, with a basal bract, from a node near the base of a secondary stem; floral bracts conduplicate, obtuse, imbricating, 7-10 mm long; pedicel 5 mm long; ovary 4 mm long; dorsal sepal yellow-green, obovate, connate to the lateral sepals for 6 mm to form a short, cylindrical tube, the free portion broadly triangular, 6 mm wide, the obtuse apex contracted into a slender, green, erect tail 15-18 mm long, the total length of the dorsal sepal 22-25 mm; lateral sepals glabrous externally, red-purple and shortly pubescent within, connate 15 mm into an ovate, broadly expanded lamina 17-19 mm long, 16 mm wide, the apices close, obtuse, each contracted into a 2 mm long, green tail; petals ivory, marked with red-purple, oblong, 6 mm long, 2 mm wide, the subtruncate apex apiculate, with a low, longitudinal callus on the lower half ending in a low, rounded callus near the base; lip yellow, flecked with red-brown, oblong, 7 mm long, 2.5 mm wide, with marginal folds near the middle, the apex obtuse, shortly acuminate, apiculate, the base subcordate, hinged to the column-foot; column red, semiterete, 4 mm long, the foot 2 mm long with a short, incurved extension.

ETYMOLOGY: From the Greek thele, "a nipple," and oura, "a tail," in allusion to the short, nipple-like tails of the lateral sepals.

TYPE: ECUADOR: ZAMORA-CHINCHIPE: epiphytic in cloud forest between Loja and Zamora, alt. ca. 1500 m, Janet Kuhn s.n., cultivated in

Easton, Ct., J & L Orchids, flowered in cultivation 8 Nov. 1977, C. Luer 2129 (HOLOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

This species is easily distinguished from the others in the Alaticaulis section by the long, slender peduncle and short-pedicelate flowers with a broadly expanded, deeply connate synsepal terminated by a close pair of minute, nipple-like tails.

Masdevallia virens Luer & Andreetta, sp. nov.

Planta mediocris caespitosa, pedunculo gracili triquetro foliis ellipticis brevipetiolatis subduplongiore, racemo paucifloro congesto, floribus successivis pallido viridibus, cupula sepalorum compressa, caudis latis crassissimis antrorsis, petalis oblongis acutis callo basali rotundati humili, labello oblongo obtuso lateribus plicatis.

Plant medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems stout, unifoliate, 1-1.5 cm long, enclosed by 2 loose, imbricating sheaths. Leaf erect, coriaceous, elliptical, shortly petiolate, 6-9 cm long including the 1.5-2 cm long petiole, 1.3-1.9 cm wide, the subacute apex tridenticulate, the base narrowly cuneate into the channeled petiole. Inflorescence a succession of single flowers in a congested, few-flowered raceme borne by a slender, erect, triquetrous peduncle 12-14 cm long, with a bract near the base, from a node low on the secondary stem; floral bract white, thin, papery, oblique, imbricating, apiculate, 9-10 mm long; pedicel 9-10 mm long; ovary green, 5 mm long; sepals light green, glabrous externally, microscopically glandular-pubescent within, lightly suffused with pale brown toward the center; dorsal sepal obovate, 25 mm long, 7 mm wide, connate to the lateral sepals for 5 mm to form a laterally compressed sepaline tube, the obtuse, free portion contracted into a thick, semiterete, antrorse tail 15 mm long, 2 mm wide, the lateral sepals ovate, oblique, 24 mm long, 8 mm wide, connate 8 mm, the broad apices prolonged into thick, antrorse tails 15 mm long, 3-5 mm wide; petals yellow-white, oblong, 6.5 mm long, 2 mm wide, the apex acute with thickened margins, the labellar margin with a low, longitudinal carina ending in a low, rounded callus above the base; lip light yellow, oblong, 6.5 mm long, 2.25 mm wide, the apex obtuse with a low, midline callus, the margins with low, lateral folds near the middle, the disc shallowly sulcate, the base subcordate, hinged beneath; column yellow, suffused with red-purple below the middle, more or less clavate, 5.5 mm long, the foot purple, 2 mm long, with a short, incurved extension.

ETYMOLOGY: From the Latin virens, "green," in reference to the color of the flower.

TYPE: ECUADOR: ZAMORA-CHINCHIPE: Valle del Zamora, El Pangui, alt. 1200 m, Nov. 1978, A. Andreetta, A. Botta & M. Portilla 1749, cultivated in Cuenca, flowered in cultivation 27 Sept. 1980, C. Luer 5450 (HOLOTYPE: SEL).

DISTRIBUTION: Eastern Ecuador.

This light green-flowered species seems most closely related to M. brenneri Luer, but M. virens may be distinguished by the longer peduncle, laterally instead of transversely compressed flowers, and long, broad, thick sepaline tails.

Pleurothallis abortiva Luer, sp. nov.

Herba parva dense caespitosa, foliis erectis anguste lineari-ovatis caulibus secundariis gracilibus aequilongis, flore virescenti solitario successivo fasciculato, sepalo dorsali synsepaloque anguste ovatis cymbiformibus intus infra medium pubescentibus, petalis attenuatis, labello obovato minimo columna cylindrica grandi apoda appresso.

Plant small, epiphytic, densely caespitose; roots numerous, fine, fasciculate. Secondary stems slender, erect, unifoliate, 7-11 cm long, with a close, tubular sheath below the middle and another sheath at the base. Leaf erect, coriaceous, narrowly linear-ovate, 7-9 cm long, 0.7-1.0 cm wide, the apex acuminate, acute, tridenticulate, the base cuneate, sessile. Inflorescence a dense fascicle of single, successive flowers from a spathe 3 mm long at the base of the leaf; peduncles 4-5 mm long; floral bracts 2.5 mm long; pedicel and ovary each 2 mm long; flowers widespread, yellow-green, lightly suffused with purple; dorsal sepal cymbiform, narrowly triangular, concave, acute, subcarinate, 6 mm long, 1.5 mm wide unspread, shortly pubescent within below the middle; lateral sepals connate into a narrowly ovate, acute synsepal 6 mm long, 2.25 mm wide unspread, convex and pubescent below the middle, concave above; petals thick, narrowly linear-ovate, attenuate, 6 mm long, 0.6 mm wide; lip obovate, subacute, membranous, 1.6 mm long, 0.5 mm wide, appressed to the under surface of the column; column cylindrical, 2.5 mm long, swollen at the apex with a terminal anther and stigma, the base footless.

ETYMOLOGY: From the Latin abortivus, "abortive," in allusion to the vestigial lip.

TYPE: COLOMBIA: NARINO: epiphytic in cloud forest, La Planada above Ricaurte, alt. 1950 m, 2 Nov. 1979, C. Luer, J. Luer, A. Hirtz & K. Walter 4547 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Colombia.

This little species, characterized by narrow leaves borne by equally long, wire-like stems, is most remarkable for the minute, obovate lip that rests along the under surface of a much larger, cylindrical column.

Pleurothallis amplexans Luer, sp. nov.

Planta mediocris, caulibus secundariis gracilibus porliferantibus, foliis ellipticis acuminatis acutis, spatha mediocri, floribus solitariis flavis fasciculatis nutantibus, sepalo dorsali synsepaloque ovatis acutis concavis, petalis anguste linearibus, labello trilobato, lobis lateralibus obtusis columnam amplexantibus antice obtusangulatis, lobo mediano acute reflexo rotundato apice serrulato.

Plant medium in size, epiphytic to terrestrial, caespitose; roots slender, fasciculate from the bases of secondary stems. Secondary stems slender, erect, proliferating, up to 15 cm long below to 2 cm long above, with a tubular sheath below the middle and another at the base. Leaf erect, coriaceous, narrowly ovate, petiolate, 6-9 cm long including the slender petiole 1-1.5 cm long, 1.2-2.0 cm wide, the apex acuminate, acute, tridenticulate, the base cuneate into the petiole. Inflorescence a few-flowered fascicle of solitary, light yellow, gaping, bilabiate flowers from a spathe 8-27 mm long at the base of the leaf-petiole; peduncles 16-20 mm long; floral bract 4-5 mm long; pedicel 5-6 mm long; ovary 4-6 mm long; dorsal sepal narrowly ovate, acute, 13 mm long, 4.25 mm wide, 3-veined; lateral sepals connate into an ovate, concave, acute synsepal 11.5 mm long, 8 mm wide spread out; petals linear-oblong, acute, 10 mm long, 1 mm wide, slightly thickened, 3-veined; lip yellow, 3-lobed, 3.75 mm long, 4 mm wide unspread, the lateral lobes broadly oblong, obtusely angled anteriorly, erect and embracing the column below, the anterior lobe recurved acutely, rounded, apiculate, the margins serrulate, the base decurved to the short, claw-like attachment to the column, the disc thickened between looped lateral veins; column stout, 2 mm long, the base pedestal-like without a foot.

ETYMOLOGY: From the Latin amplexans, "clasping," referring to the lobes of the lip embracing the column.

TYPE: ECUADOR: MORONA-SANTIAGO: terrestrial on the road embankment, alt. 2900 m, east of the pass between Gualaceo and Limon, 17 Sept. 1980, C. Luer & J. Luer 5458 (HOLOTYPE: SEL).

DISTRIBUTION: Eastern Ecuador.

This species of the "secunda" complex is characterized by proliferating secondary stems and single, drooping, yellow flowers from a rather conspicuous spathe. The comparatively large lip is

composed of broad, erect lateral lobes embracing the column, and an acutely recurved, rounded middle lobe.

Pleurothallis arachnion Luer, sp. nov.

Herba parva subtilis caespitosa, caulibus secundariis gracilibus folio elliptico acuminato longioribus, flore solitario successivo grandi patenti flavo, sepalo dorsali synsepaloque similibus anguste ovatis longissimis attenuatissimis, petalis falcatis ciliatis attenuatissimis, labello crasso triangulari eroso apice acuto compresso, lobis basalibus subacutis columnam amplectentibus.

Plant small, delicate, epiphytic, caespitose; roots fine, flexuous. Secondary stems slender, erect to horizontal, unifoliate, 5-8.5 cm long, with a thin, tubular sheath below the middle and another sheath at the base. Leaf suberect to spreading, coriaceous, elliptical, 5-7 cm long, 1.5-2.3 cm wide, the apex acuminate, acute, tridenticulate, the sessile base rounded to cuneate. Inflorescence a solitary, large flower borne successively in a fascicle from a 3 mm long spathe at the base of the leaf; flowers yellow, widespread, resting upon the blade of the leaf; peduncles weak, 15 mm long; floral bract 5 mm long; pedicel 4 mm long; ovary 3.5 mm long; dorsal sepal ovate, concave, acute, the apex extremely long-attenuate, 52 mm long, 6 mm wide spread out; lateral sepals connate into an ovate, acute, similarly long-attenuate synsepal 50 mm long, 6 mm wide; petals elliptical-falcate, acute, with minutely ciliated margins, the apex extremely long-attenuate, 45 mm long, 3 mm wide, 3-veined; lip thick, triangular, 3.5 mm long, 2.5 mm wide, the apex acute, laterally compressed, the margins erose, the basal angles subacute, retrorse, embracing the column, the base deflexed beneath the column; column stout, 1 mm long, with a thick, rounded foot.

ETYMOLOGY: From the Greek arachnion, "a cobweb," in allusion to the extremely long, hair-like apices of the sepals and petals.

TYPE: COLOMBIA: NARINO: epiphytic in cloud forest north of Ricaurte, alt. ca. 1600 m, 3 Nov. 1979, C. Luer, J. Luer, A. Hirtz & K. Walter 4606 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Colombia.

This delicate little species grows in the deep mossy blankets that engulf branches of large trees in the cloud forest. The comparatively large flowers lie upon the leaf with their long, frail, gossamer-like sepals and petals more or less entangled in the surrounding vegetation.

Pleurothallis chlorina Luer, sp. nov.

Herba parva caespitosa, caulibus secundariis gracilibus folio crasso ovato obtuso petiolato longioribus, petiolo torto, flore solitario grandi non-resupinato pallide chloroso, sepallo impari oblongo obtuso, synsepallo oblongo apice rotundato, petalis obovatis subacutis, labello ovato bicarinato serrulato longi-unguiculato.

Plant small, epiphytic, caespitose; roots fine, fasciculate. Secondary stems slender, suberect, unifoliate, 2.5-4.5 cm long, with a close, tubular sheath below the middle and another sheath at the base. Leaf erect, thickly coriaceous, distinctly petiolate, the petiole 4-8 mm long, twisted, the blade ovate, 20-28 mm long, 13-17 mm wide, the obtuse apex notched with an apiculum in the sinus, the base rounded above the petiole. Inflorescence a fascicle of successive, solitary, non-resupinate, large, crystalline yellow-green flowers, from a 3-4 mm long spathe from the apex of a secondary stem; peduncles 8-10 mm long; floral bracts oblique, apiculate, 4 mm long; pedicels curved, 3-4 mm long; ovary pyramidal, 2 mm long; middle sepal oblong, obtuse, 16 mm long, 6.5 mm wide; lateral sepals connate into an oblong synsepal 14 mm long, 8 mm wide, the apex rounded, shortly notched, the base inflated on both sides above the union with the long column-foot and forming a distinct, narrow mentum, the inner veins lightly marked with purple; petals translucent yellow-green, obovate, slightly oblique, subacute, 9.5 mm long, 3.5 mm wide, the 3 veins close and elevated externally; lip yellow-white, ovate, 7 mm long, 2.5 mm wide, the apex narrowly rounded, the base narrowed into a claw 2.75 mm long, the margins of the blade denticulate, the disc with a pair of low, smooth carinae; column greenish white, semiterete 3.5 mm long, broadly longitudinally winged, the anther cellular, the foot 5 mm long.

ETYMOLOGY: From the Latin chlorinus, "green" (from the Greek chloros), referring to the color of the flowers.

TYPE: ECUADOR: LOJA: epiphytic in scrub forest northwest of El Cisne, alt. 2300 m, 24 Sept. 1980, C. Luer et al. 5582 (HOLOTYPE: SEL).

DISTRIBUTION: Southwestern Ecuador.

The slender secondary stems of P. chlorina bear paddle-shaped leaves with a distinct, twisted petiole which causes the large, solitary flower to appear from the back surface. The pedicel and ovary arch backward to bear the crystalline light green flowers with the prominent mentum of the synsepal uppermost. The serrated blade of the lip is supported by a long claw.

Pleurothallis hirtzii Luer, sp. nov.

Species haec P. praegrandis Ames affinis sed statura majore, floribus triplo majoribus et labello peltato acuto lobis basalibus conduplicatis columnam amplectentibus distinguitur.

Plant gigantic, terrestrial, caespitose; roots coarse, flexuous. Secondary stems stout, to over 1 meter tall, unifoliate, with a loose, tubular sheath near the middle and 1-2 other sheaths near the base. Leaf suberect to spreading, coriaceous, broadly ovate, 36-40 cm long, 25-29 cm wide, the apex acuminate, acute, tridenticulate, the base deeply cordate, sessile. Inflorescence racemose, up to 10 subdensely many-flowered racemes 30-38 cm long including a 6-7 cm long peduncle, from a foliaceous spathe 3-4.5 cm long in the axil of the leaf; floral bract 3-4 mm long; pedicel 4-7 mm long; ovary 2.5 mm long; flowers medium in size, glabrous, dull white, spotted with purple, not widespreading; dorsal sepal elliptical, acute, 8 mm long, 4 mm wide, 3-veined; lateral sepals connate into an ovate, concave, subacute synsepal 8 mm long, 5 mm wide unspread; petals cream-colored, clavate-spatulate, 3 mm long, 1.5 mm wide, the apex markedly thickened with rounded margins; lip cream-colored, peltate, ovate-trilobed, 3 mm long, 2.25 mm wide, the apex broadly acuminate, acute, the basal lobes conduplicate, acute, embracing the column, reflexed from a pair of obtuse, conical calli near the base, the base deflexed, hinged to the base of the column; column stout, terete, 1.5 mm long, footless.

ETYMOLOGY: Named in honor of Alexander C. Hirtz of Quito, Ecuador, who discovered this species.

TYPE: COLOMBIA: NARINO: terrestrial in shaded humus of cloud forest north of Ricaurte, alt. ca. 1600 m, 3 Nov. 1979, C. Luer, J. Luer, A. Hirtz & K. Walter 4618 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Colombia.

This immense species, vegetatively the largest pleurothallid known at this time, is closely allied to the small-flowered P. praegrandis. Some of the plants of P. hirtzii stand one and a half meters tall. The thrice larger flowers also differ from those of P. praegrandis in the shape of the lip which is shield-shaped in P. hirtzii instead of transversely elliptical.

Pleurothallis index Luer, sp. nov.

Planta mediocris caespitosa, caulibus secundariis gracilibus folio profunde cordato multilongioribus, spatha magna uberecta, flore solitario longipedicellato atropurpureo, sepalo dorsali synsepaloque anguste ovatis acutis, petalis attenuatis serrulatis, labello triangulari acuto minute papilloso.

Plant medium in size, epiphytic, caespitose; roots numerous, slender, fasciculate. Secondary stems slender, suberect, unifoliate, 8-16 cm long, with a close, tubular sheath below the middle and another 1-2 sheaths at the base. Leaf suberect to spreading, coriaceous, ovate, 5.5-7.5 cm long, 3-3.8 cm wide, the apex acuminate, acute, tridenticulate, the base sessile, deeply cordate, the basal lobes overlapping, ca. 1 cm beyond the junction with the secondary stem. Inflorescence a dense fascicle of single, successive, long-pedicellate, dark purple, widespread, flat flowers, from a suberect spathe 12-18 mm long, 5 mm wide, at the base of the leaf; peduncles 5-8 mm long, and floral bracts 4-5 mm long, enclosed within the spathe; pedicel 20 mm long; ovary 4 mm long; dorsal sepal narrowly ovate, acuminate, acute, 16 mm long, 4 mm wide; lateral sepals connate into a narrowly ovate, acute synsepal 16 mm long, 5.5 mm wide; petals narrowly ovate, oblique, attenuate, acute, 15 mm long, 2.2 mm wide, the margins minutely serrulate; lip ovate-triangular, acute, 4.5 mm long, 2 mm wide, the glenion well-developed, the surface cellular-papillose, the margins serrulate; column stout, 1 mm long, 2 mm wide.

ETYMOLOGY: From the Latin index, "a pointer, a sign," in allusion to the appearance of the flower.

TYPE: COLOMBIA: NARINO: epiphytic in cloud forest, La Planada above Ricaurte, alt. 1950 m, 2 Nov. 1979, C. Luer, J. Luer, A. Hirtz & K. Walter 4582 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Colombia.

This species may be distinguished from its numerous cordate-leaved relatives by the medium-sized, broadly acuminate leaves, the large, suberect spathe, and the widely spread, dark purple, long-pedicellate flowers with narrow floral parts.

Pleurothallis membracidoides Luer, sp. nov.

Planta mediocris caespitosa, caulibus secundariis ancipitiis foliis ovatis longioribus, flore solitario successivo fasciculato flavescenti, sepalo dorsali synsepaloque ovatis anguste obtusis ringentibus, petalis subfalcatis crassis subscabris, labello parvo subquadrato anguloso apice truncato deflexo extus bidentato, lobis lateralibus anguste rotundatis erectis.

Plant medium in size, epiphytic, caespitose; roots numerous, fine, flexuous. Secondary stems slender, terete below, sharply laterally compressed above, unifoliate, 6-12 cm long, with a loose tubular sheath above the base, subtended by a shorter one. Leaf erect, coriaceous, ovate, 4.5-6.5 cm long, 2-3 cm wide, the apex acuminate, acute, tridenticulate, the base cuneate to rounded, shortly decurrent on the secondary stem. Inflorescence a succession of solitary, long-stemmed, gaping, glabrous flowers, yellow,

suffused with brown, borne in a fascicle from a 5 mm long spathe, at the apex of the secondary stem, 5-8 mm above the basal margin of the leaf; peduncles 15 mm long; floral bract 5 mm long; pedicels 12-17 mm long; ovary 2.5-3 mm long; dorsal sepal ovate, narrowly obtuse, 9 mm long, 3.5 mm wide; lateral sepals connate into an ovate, narrowly obtuse synsepal 9 mm long, 4 mm wide; petals thick, yellow, brownish below the middle, elliptical-subfalcate, acute, 7 mm long, 1.5 mm wide, the margins lightly scabrous; lip yellow-white above the middle, dark purple-brown below the middle, thick, subquadrate, 1.3 mm long, 1.25 mm wide, the anterior margin truncate with a deflexed, obtuse apex, with a pair of short, pointed, lateral teeth externally, the lateral margins erect with membranous, narrowly rounded lobes above the middle, the disc with a pair of low, rounded calli above the middle, the base transversely concave to accommodate the column-foot; column yellow-white, semiterete, 2.25 mm long, with a short, rounded foot.

ETYMOLOGY: Named for the resemblance of the lip to a treehopper, from the insect family Membracidae, Order Homoptera.

TYPE: COLOMBIA: NARINO: epiphytic in cloud forest north of Ricaurte, alt. ca. 1600 m, 3 Nov. 1979, C. Luer, J. Luer, A. Hirtz & K. Walter 4580 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Columbia.

This ancipital-stemmed species is noteworthy for the peculiar shape of the minute lip. Tall, erect, lateral lobes flank the thick, subquadrate blade with a deflexed apex, and a pair of short, pointed teeth project externally to either side. The lip resembles some species of treehoppers.

Pleurothallis penicillata Luer, sp. nov.

Species haec habitu P. scoparum Rchb. f. similis, sed floribus minoribus flavis, synsepalo cum mento profunde inflato, petalis late ovatis et labello triangulari apiculato, lobis basalibus obliquis erosus acutis differt.

Plant medium in size, epiphytic, caespitose; roots numerous, fine, fasciculate. Secondary stems slender, erect, 10-19 cm long below the leaf, with a close, tubular sheath below the middle and another sheath at the base. Leaf erect, thinly coriaceous, elliptical, long-decurrent on the secondary stem, 7.5-12 cm long including the 0.5-1 cm long apical portion above the apex of the incorporated stem, 2-3 cm wide, the apex acuminate, acute, tridenticulate, the base cuneate on the secondary stem. Inflorescence a small, yellow, solitary flower produced successively in a dense fascicle 0.5-1 cm from the apex of the leaf, the spathe ca. 5 mm long, fugacious; peduncles 7-8 mm long, occasionally producing a second flower; floral bract 3-4 mm long; pedicel 11-12 mm long;

ovary 2 mm long; sepals glabrous, not widespreading, the dorsal sepal ovate, concave, subacute, 3 mm long, 2.25 mm wide, the lateral sepals connate into an ovate, obtuse synsepal 3.5 mm long, 2.5 mm wide unspread, deeply concave below the middle producing an inflated mentum; petals broadly ovate, subcarinate externally, narrowed in the distal third to an oblique, subacute apex, 3.5 mm long, 2 mm wide; lip trilobed-triangular, 1.3 mm long, 1.1 mm wide, the middle lobe thickened and shallowly cleft, shortly acuminate, acute, the basal lobes oblique, incurved, erose, acute, the base concave, hinged to the base of the column; column stout, terete, 1 mm long, footless.

ETYMOLOGY: From the Latin penicillus, "a painter's brush," in allusion to the appearance of the fascicle of peduncles at the apex of the leaf. Penicillatus, "like a painter's brush."

TYPE: COLOMBIA: NARINO: epiphytic in cloud forest north of Ricaurte, alt. 1600 m, 3 Nov. 1979, C. Luer, J. Luer, A. Hirtz & K. Walter 4610 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Colombia.

Similar in habit to P. scoparum, the dense tuft of peduncles, like a brush, is borne near the apex of the leaf, most of which is long-decurrent on the secondary stem. The small, yellow flower has a deep, inflated mentum, broad petals, and a triangular lip with oblique, acute, basal lobes.

Pleurothallis ruscaria Luer, sp. nov.

Species haec habitu P. scoparum Rchb. f. similis, sed floribus minoribus purpureis, petalis obovatis abrupte acutis et labello integro anguste obovato cymbiformi differt.

Plant medium in size, epiphytic, caespitose; roots fine, flexuous, fasciculate. Secondary stems slender, 10-16 cm long below the leaf, with a close, tubular sheath below the middle and another sheath at the base. Leaf erect, thinly coriaceous, narrowly elliptical, long-decurrent on the secondary stem, 8-9.5 cm long including the 2-2.5 cm long apical portion above the apex of the incorporated stem, 1.2-1.5 cm wide, the apex acuminate, acute, tridenticulate, the base cuneate on the secondary stem. Inflorescence a small, purple, solitary flower produced successively in a dense fascicle 2-2.5 cm from the apex of the leaf, from a fugacious spathe ca. 5 mm long; peduncles 2-2.5 mm long; floral bract 3-4 mm long; pedicel 5-7 mm long; ovary 1.5 mm long; sepals glabrous, not widely spread, the dorsal sepal broadly ovate, concave, obtuse, 3.5 mm long, 3.5 mm wide spread out, the lateral sepals connate into a broadly ovate, concave, obtuse synsepal 3.5 mm long, 2.75 mm wide; petals oblong-obovate, curved, 3.75 mm long, 1.5 mm wide, abruptly acuminate, acute in the distal third; lip entire, narrowly obovate,

acute, lightly incurved, cymbiform, 2.25 mm long, 0.75 mm wide, the truncate base hinged to the base of the column; column stout, terete, 1 mm long, footless.

ETYMOLOGY: From the Latin ruscarius, "like a broom" (ruscum, a shrub from which brushes were made) in allusion to the tufted inflorescences.

TYPE: COLOMBIA: NARINO: epiphytic in cloud forest above Ricaurte, alt. ca. 1600 m, 3 Nov. 1979, C. Luer, J. Luer, A. Hirtz & K. Walter 4611 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Colombia.

This species is similar in habit to P. scoparum and its relatives, but the tuft of peduncles is produced a little farther from the apex of a narrower leaf, most of which is decurrent on the secondary stem. The lip of the small, purple flower is entire, narrowly obovate and boat-shaped.

Pleurothallis taurus Luer, sp. nov.

Planta mediocris scandens caulibus secundariis proliferantibus, racemo multifloro folio elliptico acuminato duplolongiore, floribus illis P. brachiatae Luer similis sed majoribus et lobis basalibus labelli anguste longissimis incurvatis.

Plant medium in size, epiphytic, scandent, 20-50 cm or more tall; roots slender, flexuous, from the bases of superposed stems. Secondary stems terete, unifoliate, proliferating, 4-13 cm long or longer, with a tubular sheath below the middle and another sheath at the base. Leaf erect, coriaceous, narrowly elliptical, 5-8 cm long, 1.5-3 cm wide, the apex acuminate, acute, tridenticulate, connate below into the sessile base. Inflorescence a single (always?), erect, densely many-flowered raceme 10-16 cm long including the peduncle ca. 3 cm long, from a spathe 1.5 cm long at the base of the leaf; floral bract 5 mm long; pedicel 3-4 mm long; ovary 3 mm long; flowers widespread, glabrous, yellow-green, with or without red dots; dorsal sepal ovate, acuminate, acute, 9 mm long, 3.75 mm wide; lateral sepals connate into a concave, ovate, acuminate, acute synsepal 9.5 mm long, 5 mm wide unspread; petals narrowly linear acute, thickened, 8 mm long, 0.4 mm wide; lip 3-lobed, the blade ovate to suborbicular, 2 mm long, 1.8 mm wide, the apex rounded, shortly apiculate, the basal lobes incurved, each 3 mm long, 0.5 mm wide, the base deflexed, fixed to the base of the column-foot; column stout, 1 mm long, the foot obsolescent.

ETYMOLOGY: From the Latin taurus, "a bull," in allusion to the appearance of the long-horned lip.

TYPE: COLOMBIA: PUTUMAYO: epiphytic in cloud forest between La Cocha and Sibundoy, alt. ca. 2700 m, 29 July 1978, C. Luer, J. Luer, J. Kuhn, R. Escobar et al. 3077 (HOLOTYPE: SEL); CAUCA: Paramo de Barbillas, alt. 3070 m, 27 July 1978, C. Luer, J. Luer, J. Kuhn, R. Escobar et al. 3043 (SEL).

DISTRIBUTION: Southern Colombia.

The large flowers of this species, with the long, incurved, basal lobes of the lip, are most similar to those of P. brachiata, but the scandent habit of P. taurus immediately separates it.

Porroglossum portillae Luer & Andreetta, sp. nov.

Inter species generis Porroglossi Schltr. planta mediocris foliis ellipticis longipetiolatis reticulatis, pedunculo erecto gracili glabro, floribus successivis non-resupinatis dense purpureo guttatis, caudis crassis deflexis, petalis angustis apice dilatatis margine inferiore unidentato, labello cuneato truncato trilobato ciliato callo basali breviter pubescenti distinguitur.

Plant medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems slender, black, unifoliate, 10-15 mm long, with 1-2 loose, tubular sheaths. Leaf erect, coriaceous, light green, reticulated in dark green, lightly verrucose, elliptical, long-petiolate, 4.5-6 cm long including the slender, blackish petiol 1-2 cm long, 1.2-1.5 cm wide, the apex obtuse, tridenticulate, cuneate below into the petiole. Inflorescence a congested raceme of 3-4 successive, non-resupinate flowers borne by an erect, slender, glabrous peduncle 8-11 cm long, with 3 widely spaced bracts, from a node low on the secondary stem; floral bracts thin, imbricating, 4-5 mm long; pedicel 5-6 mm long; ovary dark green subverrucose, pitted, 5 mm long; sepals yellow, diffusely spotted with purple-brown, suffused with rose centrally, the veins prominent externally, the middle sepal obovate, 7 mm long, 6 mm wide, connate to the lateral sepals for 4 mm to form a gaping sepaline cup, the rounded free portion contracted into a thick, spotted tail 5 mm long, the lateral sepals oblique, transversely ovate, 6 mm long, 8 mm wide, connate for 3 mm behind the column-foot, the obtuse apices contracted into thick, decurved tails 7 mm long; petals translucent light green with a purple midvein and spots, narrowly oblong, curved, 5 mm long, 1.25 mm wide, the apex dilated, rounded, the labellar margin with an acute tooth below the middle (a similar tooth is sometimes present on the opposite margin); lip yellow, lightly spotted with purple, the blade cuneate, shortly pubescent beneath, glabrous above, the truncate apex 3-lobed with ciliate margins, the midlobe concave and pubescent, the base with a shortly pubescent, cuneate callus above the curved, strap-like claw flexed around the apex of the column-foot, the blade 5 mm long, 4.5 mm wide, the claw 1.5 mm long; column green, marked with purple, broadly longitudinally winged, semiterete, 2.5 mm long, the stigma

with a short tooth on each side, the foot 5 mm long.

ETYMOLOGY: Named in honor of Mario Portilla of Cuenca, Ecuador, co-discoverer of this species.

TYPE: ECUADOR: MORONA-SANTIAGO: epiphytic in wet forest near Rio Calagras, alt. 1500 m, April 1979, A. Andreetta & M. Portilla 3401, cultivated in Cuenca, flowered in cultivation 29 Sept. 1980 C. Luer 5447 (HOLOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

Porroglossum portillae is characterized by the reticulated, long-petiolate leaves and an erect inflorescence of non-resupinate, successive flowers. The sepals are yellowish, flushed with rose, and diffusely spotted with purple-brown. The tails of all three sepals are thick and turned downward, so that when the flower is viewed from the accustomed position, the tails of the lateral sepals seem abruptly upturned.

Trisetella abbreviata Luer, sp. nov.

Planta pusilla pro genere pedunculo gracili minute subscabroso foliis brevibus anguste linearibus semiteretibus caespitosis duplo-longiore, sepalo dorsali ovatis longicaudatis, synsepalo oblongo plano caudis supra apicem brevibus, petalis labelloque perparvulis.

Plant very small, epiphytic, caespitose; roots fine, fasciculate. Secondary stems abbreviated, 1-2 mm long, unifoliate, enclosed by 1-2 thin, tubular sheaths. Leaf erect to suberect, narrowly linear, semiterete, acute, 10-20 mm long, 1.5-2 mm wide, green, mottled with purple beneath. Inflorescence a solitary (always ?) flower borne by an erect, filiform, lightly scabrous peduncle 3-4 cm long, with a close bract below the middle, from a node on the secondary stem; floral bract 2-3 mm long; pedicel 5-6 mm long; ovary 1.5 mm long, scabrous; dorsal sepal yellow with 3 thin, red veins, the dorsal vein verrucose externally, transversely ovate, 4 mm long, 5 mm wide, connate to the lateral sepals for 2 mm, the obtuse, free portion conduplicate into an erect, slender, yellow tail 12 mm long, slightly thickened toward the apex; lateral sepals purple, connate to the rounded apex into an oblong lamina 16 mm long, 4 mm wide, more or less flat without forming a chin or ventral dilatation, the slender tails purple, 4 mm long, from the lateral margins 3 mm below the apex; petals translucent yellow, marked with purple, oblong, 2 mm long, 0.6 mm wide, the truncate apex with an abrupt, central tooth; lip red, ovate, 2 mm long, 1 mm wide, the apex obtuse to rounded, the deeply cordate base hinged to the column-foot; column yellow, suffused with red, semiterete, 2 mm long, the foot 1 mm long.

ETYMOLOGY: From the Latin abbreviatus, "shortened," referring to the short vegetative and floral parts.

TYPE: ECUADOR: ZAMORA-CHINCHIPE: epiphytic in cloud forest between Loja and Zamora, alt. ca. 1500 m, J. Kuhn, cultivated at J & L Orchids, Easton, Ct., flowered in cultivation 16 Nov. 1977, C. Luer 2209 (HOLOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

This species is notable for the very small, narrowly terete leaves; a twice taller, subscabrous peduncle; a short dorsal sepal with an erect tail; a flat, non-gibbous, non-ventricose synsepal with short tails above the apex; and minute petals and lip.

Trisetella scobina Luer, sp. nov.

Inter species Trisetellae Luer planta mediocris foliis semiteretibus maculatis, pedunculo longissimo verrucosissimo, flore grandi, petalis serrulatis et labello quadricarinato distinguitur.

Plant medium in size, epiphytic, caespitose; roots fine, fasciculate. Secondary stems 3-4 mm long, unifoliate, enclosed by 1-2 thin, tubular sheaths. Leaf erect to suberect, thick, narrowly linear, semiterete, acute, 2-4 cm long, 2.5-3 mm wide, dark green, spotted with purple. Inflorescence a succession of comparatively large flowers borne in a congested raceme by an ascending, blackish, slender, densely scabrous peduncle 9-13 cm long, with a bract below the middle, from a node on the secondary stem; floral bract thin, imbricating, 5 mm long; pedicel 5-7 mm long; ovary verrucose, 3.5 mm long; dorsal sepal brown with yellow, entire margins, ovate, 5 mm long, 4 mm wide, connate to the lateral sepals for 1 mm, subverrucose externally, the subacute apex contracted into an erect, slender tail 25 mm long; lateral sepals purple-brown with yellow margins, minutely pubescent within, connate into an oblong lamina 24 mm long, 8 mm wide, shallowly gibbous at the base, the slender, yellow tails 12 mm long, from the margins 4 mm below the obtusely bilobed apex; petals translucent yellow-white, oblong, 4 mm long, 1.5 mm wide, the subacute apex minutely serrulate; lip purple, ovate, obtuse, 4.5 mm long, 1.5 mm wide, the disc with a pair of longitudinal carinae plus a second shorter pair in the middle above the base, the deeply cordate base hinged to the column-foot; column light green, semiterete, 3.75 mm long, the foot 1.5 mm long.

ETYMOLOGY: From the Latin scobina, "a file, or rasp," referring to the file-like peduncle.

TYPE: ECUADOR: MORONA-SANTIAGO: epiphytic in cloud forest east of Paute, alt. ca. 2000 m, B. Malo, cultivated near Cuenca, flowered in cult. 27 Sept. 1980, C. Luer 5569 (HOLOTYPE: SEL).

DISTRIBUTION: Eastern Ecuador.

This species may be recognized by the narrow, semiterete, purple-spotted leaves; a very long, markedly scabrous peduncle, and large flowers with serrulate petals and a lip with two pairs of longitudinal carinae.

DUDLEYA PACHYPHYTUM (CRASSULACEAE),
A NEW SPECIES FROM ISLA CEDROS, MEXICO

Reid Moran and Michael Benedict

Lau (1980) told of finding an unknown *Dudleya* at the north end of Isla Cedros and showed four handsome color photographs of it. We have had this plant under study for over nine years; and since Lau has expressed the hope that it will be published soon, we hasten to oblige.

Dudleya pachyphytum Moran and Benedict, species nova

Rosulae laxae aggregatae vulgo 12-22 cm latae 12-25-foliatae, foliis crassissimis farinosis ovatis ad oblongis apice rotundatis lateve obtusis apiculatis 5-13 cm longis 3-7 cm latis. Rami floriferi 2-7 dm alti, 20-50 foliis cordato-ovatis instructi. Inflorescentia compacta ex 3-6 ramis confertis 1-2-plo bifurcatis constans, pedicellis 3-6 mm longis. Corolla alba tubularis 8-11 mm longa. Holotypus: Moran et Benedict 29036 (SD 105549). Species insignis foliis suis percrassis obtusissimis ab aliis speciebus Dudleyae recedens generemque Pachyphytum primo adspectu admonens, floribus suis D. albiflora similis quae autem statura multo parviore foliisque angustis acuminatis differt.

Plants to 7 dm or more wide, of 10-20 or sometimes 50 or more rosettes. Caudex to 4 dm or more long, in age decumbent, 2-5 cm thick, densely clothed below with persistent dried leaves and with these ca. 10 cm thick. Rosettes compact, 12-22 (-33) cm wide, of 12-25 (-35) leaves or to 55 in cultivated plants. Rosette leaves farinose, often pale orange in age, massive and turgid but drying tough and leathery, ovate to oblong, broadest near base, rounded to broadly obtuse, apiculate, 5-10 (-13) cm long, 3-5 (-7) cm wide, 1.5-2.5 cm thick, ventrally flattish with conspicuous pattern of low ridges corresponding to edges of leaves adjacent in bud, dorsally rounded and asymmetrically low-keeled, the margins obtuse near base to rounded above. Floral stems 1-4, erect or mostly spreading, 2-5 (-7) dm long, 5-12 mm thick and to 18 mm wide at base, farinose, pale pink becoming red especially below, with 20-35 (-50) spreading leaves; these cordate-ovate, clasping, broadly acute, 1-2.5 cm long and wide, 3-13 mm thick. Inflorescence nodding in bud, later erect, rather dense, 8-14 cm wide, of 3-6 close-set 1-2x bifurcate branches or sometimes with a few more scattered below; cincinni circinate, in age

spreading, 2-5 cm long, with 5-12 flowers; pedicels erect, 2-6 mm long, 1-2.5 mm thick at base, thickened upward. Calyx rounded below, 5-9 mm long, 4.5-7 mm wide, the segments appressed, triangular-lanceolate, acute, 4-7 mm long, 2.5-4 mm wide. Corolla white, 8-11 mm long, 4-5 mm thick, the petals connate 2-3 mm, erect or with tips slightly outcurved, elliptic-oblong, acute, 2-3 mm wide. Filaments white, the epipetalous 5-8 mm long, adnate 2.5-3.5 mm, the antesepalous 6.5-9 mm long, adnate 1.5-2 mm; anthers before dehiscence red, 1.2-1.4 mm long. Nectar glands white, 0.9-1.2 mm wide. Gynoecium 7-10 mm high, 2-3 mm thick, the pistils erect, appressed, connate ca. 2 mm ventrally, tapering into styles ca. 1.5-2 mm long; ovules 25-45, 0.4-0.5 mm long. Seeds ca. 0.6 mm long, with ca. 15 longitudinal striations. Chromosome number: $n=17$.

Type collection: Abundant on upper west slope of the island at 450 m, ca. 1 km northwest of the old mine area of Cañada de la Mina, north end of Isla Cedros, Baja California Norte, México (near 28°21½'N, 115°14'W), 18 July 1980, Moran & Benedict 29036: holotype SD 105549; isotypes SBBG and to go.

Distribution: Known only from the north end of Isla Cedros at ca. 100-550 m elevation, occasional in pine forest and abundant on cliffs and steep rocky slopes in the fog zone, especially with north to northwest exposure: from Punta Norte at least 3 km south on the west flank of the island, apparently down to ca. 100 m; around the upper watershed of Arroyo Valdez (south to SE of Punta Norte) and to the crest of the divide with Cañada de la Mina to the south; very scarce in upper Cañada de la Mina, down to ca. 300 m. The few solitary young rosettes seen on the upper slopes of Cañada de la Mina, where none were noted before, raise the question whether the range could be expanding southward.

The erect petals and pistils place D. pachyphytum in the sub-genus Dudleya. From buds of the type collection Dr. Charles H. Uhl reports some irregularity in meiosis, with extra and undersized microspores. He was unable to get an exact chromosome count but guessed $n=17$. However, from a plant collected by Benedict in 1977 Dr. Uhl reports a definite count of $n=17$, with no irregularity. This is the basic number for the genus (Uhl & Moran 1953): thus this species is a diploid.

In its habit, with clusters of rosettes on elongate stems, *D. pachyphytum* recalls such other maritime species as the diploid *D. candida* Britt. and *D. farinosa* (Lindl.) Britt. & Rose and the polyploid *D. caespitosa* (Haw.) Britt. & Rose and *D. greenei* Rose--which often likewise have farinose leaves. However, it differs from these, and seems unique in the genus, in its blunt and very thick leaves. The rosettes thus recall those of some members of the Mexican genus *Pachyphytum*, for which we name it. The undistinguished white flowers are rather similar to those of the variable polyploid *D. albiflora* Rose, which also occurs on Isla Cedros (and southward). That plant is much smaller, with smaller and especially narrower leaves, which are acuminate to slender-acute.

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NOTES ON NEW AND NOTEWORTHY PLANTS. CXLII

Harold N. Moldenke

GHINIA CURASSAVICA var. *MINOR* (Schlecht. & Cham.) Mold., comb. nov.

Tamonea scabra var. *minor* Schlecht. & Cham., *Linnaea* 6: 373.
1831.

LIPPIA VERNONIOIDES f. *SUBTRUNCATA* Mold., f. nov.

Haec forma a forma typica speciei recedit laminis foliorum majoribus ovate-subrotundis usque ad 10 cm. latis basaliter latis-sime rotundis vel subtruncatis.

This form differs from the typical form and all other named forms of the species in having its principal larger leaves with their blades ovate-subrotund, 8--15 cm. long, 6.5--10 cm. wide, apically rounded, marginally regularly serrate, and basally broadly rounded or subtruncate, with a very small acumination into the petiole at the central base.

The type of this form was collected by H. F. Leitão Filho & al. (no. 7372) in the cerrado at Fazenda, "campininha em reserva de Instituto de Botânica", in the Municipality of Mogi-Guaçu, São Paulo, Brazil, in February of 1978 and is deposited in the United States National Herbarium in Washington.

LIPPIA ASPERRIMA f. *ANGUSTIFOLIA* Mold., f. nov.

Haec forma a forma typica speciei laminis foliorum angustioribus plerumque 1 cm. latis recedit.

This form differs from the typical form of the species in having its mature leaf-blades uniformly narrower, usually only about 1 cm. wide, occasionally as much as 1.5 cm. wide.

The form is based on *Ismael Morel* 4353 from Pueblo Laguna Blanca, dept. Pilcomayo, Formosa, Argentina, collected on January 7, 1948, and deposited in the Britton Herbarium at the New York Botanical Garden.

LANTANA BALANSAE var. *HATSCHBACHII* Mold., var. nov.

Haec varietas a forma typica speciei foliorum laminis anguste ellipticis vel sub lanceolatis subtus minutissime puberulis differt.

This variety differs from the typical form of the species in having its leaf-blades uniformly narrowly elliptic or almost lanceolate, 2--4 cm. long, 0.8--1.3 cm. wide, very minutely puberulent beneath.

The variety is based on *Gert Hatschbach* 30581 from orla capao, Johanisdorf, Munic. Lapa. Parana, Brazil, collected on October 31, 1972, and deposited in my personal herbarium.

REPRODUCTIVE BIOLOGY OF THE CANADIAN LABIATAE*

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INTROOUCION

The Canadian Labiatae comprise 68 species belonging to 29 genera. About half of these species have been introduced into North America since European settlement of the continent. Few studies of reproductive biology in the Labiatae have been undertaken. Information on the reproductive biology comes chiefly from some European Floras e.g., Clapham, Tutin and Warburg (1962), Hegi (1964) and from detailed studies of individual genera or small groups of species, e.g., Chambers (1961), on Pycnanthemum. A cyto-taxonomic survey of the West African species has been published by Morton (1962) in which chromosome numbers, reproductive biology, variation and taxonomy are considered. However, no comparable work has been done on the Canadian Labiatae. Hence a survey of pollination mechanisms and compatibility in the Canadian species was considered desirable, particularly in view of the importance of such information in an interpretation of variational pattern and evolutionary mechanisms.

MATERIAL AND METHOOS

Living material of all the known Canadian Labiatae was brought into cultivation at Waterloo either by transplanting rootstocks or by raising plants from seeds. Prior to the opening of the flower of each species, the inflorescence, or in most cases, the whole plant, was bagged. The bags were made from Terylene cloth of Imm. square mesh which facilitates the free exchange of air and moisture but prevents the entry of pollinating insects. Normally five to ten plants were bagged,

* Adapted from a paper prepared for the International Symposium on Reproduction in Flowering Plants, Christchurch NZ, 5-10 February, 1979.

but in some cases due to scarcity of material only one to two plants could be used. The bags were left in tact until the last corolla had withered. They were then removed and the seed allowed to mature. For purpose of comparison, unbagged specimens of the same plant were grown alongside the bagged ones and were left to be open-pollinated. Seeds from both bagged and open-pollinated plants were examined under a dissecting microscope. About 50 fruiting calyces were examined in each case and the numbers of well formed and apparently viable seeds were recorded.

RESULTS AND DISCUSSION

Reproductive biology and longevity (i.e., annual or perennial habit) have an important effect on the evolution of plants and on the pattern of variation which develops. Darlington and Mather (1949) state that obligate in-breeding is an evolutionary dead end. The genetic implication of inbreeding on the reproductive system is to promote homozygosity. An example of this is to be found in the rye-grass (Breese, 1966). Two species - Lolium remotum and L. temulentum were at one time common weeds of flax and cereals respectively, and the inbreeding system evolved to match that of their companion crop, giving them high fitness for the arable conditions which they exploited. However, with improved cultural conditions, they have now been virtually eliminated as weeds in these crops, thus paying the penalty for lost variability. Baker (1965) claims that for any taxon to be a successful colonizer, a high frequency of self-compatibility, coupled with an "all purpose gnotype", is the ideal breeding system. However, success as a colonizer does not necessarily imply long term evolutionary success.

The present results from the Canadian Labiatae can be discussed under three categories:

1. Species that are annuals:- The majority of Labiatae are perennials but the family contains a few annuals. All of these are either weeds of disturbed land or plants of open habitats such as the lime stone pavements. All these annual species are self compatible (Table 1),

(though not necessarily always self pollinated), and most are diploid, Galeopsis tetrahit and Satureja hortensis being the only two exceptions out of the 10 annual species occurring in Canada.

2. Species which are caespitose perennials -

Of the 25 species of caespitose perennials which occur in Canada (Table 2), 18 are self-compatible and able to self pollinate. The remaining seven species either require an outside pollinating agent or are self-incompatible. Most of these caespitose perennials (16 out of 25) are diploid - the incidence of polyploidy being 36%. Stebbins (1965) obtained similar results on a wide range of caespitose perennials from California.

3. Rhizomatous or stoloniferous perennials:-

This group contains 22 species (Table 3). Of these 10 are outbreeders, and one Pycnanthemum virginianum, is apomictic. All the outbreeders have large conspicuous flowers (except in Mentha where the flowers are arranged in tight conspicuous groups) - a character which is frequently associated with outbreeders.

Among the rhizomatous perennial *Labiatae*, the frequency of polyploidy is 63.6%. Stebbins (1965) obtained 50% polyploidy in the native Californian rhizomatous perennial species belonging to a wide range of families. The percentage of polyploidy in the native perennial *Labiatae* of Canada is 51.6%. Mulligan (1960) working on Canadian weed flora gives a figure of 46% polyploidy in the weed flora and as a whole 55% polyploidy in the perennial species. He further states that the incidence of polyploidy is nearly the same in both the introduced and native species. This is in line with the present results in *Labiatae* where 50% of the introduced species are polyploid compared with 51.6% of the native species.

So it is clear from these results on the Canadian Labiatae that they follow the general rules relating to polyploidy, longevity and reproductive biology which apply to most groups of plants. Polyploidy and outbreeders are at a minimum in annuals and highest in rhizomatous perennials. The annuals are normally species which inhabit open environments where competition is at minimum and hence establishment of the plant is not impeded; whereas most of the perennials, particularly the rhizomatous species are plants of closed communities where, once established, they are able to compete successfully by means of their vigorous rootstocks.

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SUMMARY:

Reproductive biology of the Canadian Labiatae has been studied. All the annual species have been found to be self-compatible and mostly diploid. The 18 species of caespitose perennials are self-compatible and seven species are self-incompatible. The incidence of ploidy in caespitose perennials is 36%. From the 22 rhizomatous perennials 10 are outbreeders and one Pycnanthemum virginianum is apomictic. The frequency of ploidy in this group is 63.6%.

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Annual Species

Table 1

Species	Native	Introduced	Reproductive System	Base	Ploidy
<u>Isanthus brachiatus</u>	+		inbreeder	7	2x
<u>Hedeoma hispida</u>	+		inbreeder	19	Dibasic polyploidy
<u>Hedeoma pulegoides</u>	+		inbreeder	19	Dibasic polyploidy
<u>Galeopsis tetrahit</u>		+	inbreeder	8	4x
<u>Lamium amplexicaule</u>		+	inbreeder	9	2x
<u>L. purpureum</u>		+	inbreeder	9	2x
<u>Moldavica parviflora</u>	+		inbreeder	7	2x
<u>Salvia pratense</u>		+	inbreeder	9	2x
<u>Satureja acinos</u>		+	inbreeder	10	2x
<u>S. hortensis</u>		+	inbreeder	8	6x

Table 2
Caespitose perennials

Species	Native	Introduced	Reproductive System	Base	Ploidy
<u>Agastache foeniculum</u>	+		inbreeder	9	2x
<u>A. nepatoides</u>	+		inbreeder	9	2x
<u>A. urticifolia</u>	+		outbreeder	9	2x
<u>Ballota nigra</u>		+	inbreeder	11	2x
<u>Hyssopus officinalis</u>		+	outbreeder	6	2x
<u>Lamium album</u>		+	inbreeder	9	2x
<u>L. maculatum</u>		+	inbreeder	9	2x
<u>Leonurus cardiaca</u>		+	outbreeder	9	2x
<u>Marrubium vulgare</u>		+	inbreeder	17	2x
<u>Melissa officinalis</u>		+	inbreeder	8	4x
<u>M. thymiflora</u>		+	inbreeder	7	2x
<u>Monarda didyma</u>	+		outbreeder	9	4x
<u>M. fistulosa</u>	+		inbreeder	9	4x
<u>M. punctata</u>	+		inbreeder	11	2x
<u>Nepeta cataria</u>			inbreeder	$x_2=17$	4x
<u>Oniganum vulgare</u>		+	outbreeder	15	2x
<u>Prunella vulgaris</u>	+		inbreeder	7	4x
<u>Salvia nemorosa</u>		+	outbreeder	7	2x
<u>Satureja glabella</u>	+		inbreeder	10	2x
<u>S. douglasii</u>	+		inbreeder	10	2x
<u>S. vulgaris</u>	+		inbreeder	10	2x
<u>Stachys germanica</u>		+	inbreeder	5	6x
<u>S. olympica</u>		+	inbreeder	5	6x
<u>Thymus serpyllum</u>		+	inbreeder	6	4x
<u>T. pulegioides</u>		+	inbreeder	7	4x

Rhizomatous perennials

Table 3

Species	Native	Introduced	Reproductive Biology	Base	Ploidy
<i>Ajuga reptans</i>		+	outbreeder	8	4x
<i>Collinsonia canadensis</i>	+		inbreeder (partial)	13	4x
<i>Glechoma hederacea</i>		+	outbreeder	9	4x
<i>Lycopodium asper</i>	+		inbreeder	11	2x
<i>L. europaeus</i>		+	inbreeder	11	2x
<i>L. americanus</i>	+		inbreeder	11	2x
<i>L. rubellus</i>	+		inbreeder	11	2x
<i>L. uniflorus</i>	+		inbreeder	11	2x
<i>Mentha arvensis</i>	+		outbreeder	8	12x
<i>M. spicata</i>		+	outbreeder	6	6x
<i>Physostegia virginiana</i>	+		outbreeder	19	2x
<i>Pycnanthemum tenuifolium</i>	+		inbreeder	10	4x
<i>P. virginianum</i>	+		apomictic	10	8x
<i>Scutellaria galericulata</i>	+		inbreeder	8	4x
<i>S. lateriflora</i>	+		inbreeder	11	4x
<i>S. leorardi</i>	+		inbreeder	10	2x
<i>S. parvula</i>	+		inbreeder	10	2x
<i>Stachys cooleyae</i>	+		outbreeder	17	4x
<i>S. mexicana</i>	+		outbreeder	8	8x
<i>S. tenuifolia</i>	+		outbreeder	8	8x
<i>S. palustris</i>	+		outbreeder	8	8x
<i>Teucrium canadense</i>	+		outbreeder	8	4x

NEW SPECIES OF APOCYNACEAE, BIGNONIACEAE
PASSIFLORACEAE, AND PIPERACEAE FROM
COASTAL COLOMBIA AND ECUADOR

Alwyn H. Gentry¹
Missouri Botanical Garden

Recent collections of plants from the rich and still poorly explored coastal lowlands of Colombia and Ecuador have included many new taxa. This paper describes nine of them, five from the Chocó Department of Colombia and four from western Ecuador. Eight of the novelties are lianas and the other a large canopy tree. The new species are Allomarkgrafia foreroi A. Gentry, Aspidosperma jauchense A. Gentry, Macropharynx renteriae A. Gentry, Distictella chocoensis A. Gentry, Schlegelia chocoensis A. Gentry, Passiflora caudata A. Gentry, Piper foreroi A. Gentry, Piper fallenii A. Gentry, and Piper schuppianii A. Gentry.

ALLOMARKGRAFIA FOREROI A. Gentry, sp. nov.

Frutex scandens, glaber. Folia lanceolata, acuminata, subcoriacea, prope basin supra glandibus. Inflorescentia laxa. Flores calycibus 5-lobatis, corollis tubulo-campanulatis supra basin tubulosam, glabris, antheris sagittatis. Fructus ignotus.

Vine, stems terete, glabrous, the cortex becoming reddish and splitting and peeling with age. Leaves lanceolate to narrowly lanceolate-elliptic, acuminate, obtuse at base, 6-12 cm long, 1.5-2.4 cm wide, subcoriaceous, completely glabrous above and below, glandular at base of midvein above; petiole 0.4-0.8 cm long. Inflorescence an axillary, open, dichotomously branched cincinnus, glabrous, the dichotomies subtended by minute triangular bracts. Calyx 5-lobed, the lobes round-tipped, 2-3 mm long; corolla green in upper half and red in lower half, the lobes white, tubular-campanulate above a narrowly tubular base, glabrous, the base and upper tube each 2 cm long, the basal tube 2 mm wide, the upper tube 8 mm wide at throat, the lobes round, ca. 5 mm long; anthers sagittate, 4-4.5 mm long, the thick basal auricles blunt and less than 1 mm long, the apex thin, abruptly acuminate, ca. 0.5 mm long; stigma with pronounced basal projections. Fruit unknown.

1. Supported by NSF Grant INT-7920783.

Type: COLOMBIA: Chocó: Carretera Tutunendo-El Carmen, 200-350 m alt., 26 Apr 1979, Forero, Jaramillo, Bernal, León, and Pulido 5854 (holotype, COL; isotype, MO).

Like so many Chocó endemics, Allomarkgrafia foreroi is strikingly distinct from its congeners. It is most like A. brenesii Woods. of Costa Rica which also has rather narrow leaves, but differs in such features as a broader much more infundibuliform upper corolla tube, much larger corolla lobes, long-pointed bud apices, and more acute calyx lobes. Allomarkgrafia foreroi is somewhat intermediate between Mesechites and Allomarkgrafia which were separated by Woodson on the basis of corolla and stigma shape. The tubular campanulate upper corolla of A. foreroi does not match either the salverform corolla of Mesechites or the infundibuliform corolla of Allomarkgrafia, although one other Allomarkgrafia species also has a more or less tubular corolla. The stigma of A. foreroi is somewhat umbraculiform as in Mesechites and the greenish flower color is also more like several species of that genus than like the pure white or yellow flowers of other species of Allomarkgrafia. Perhaps the critical feature supporting placement in Allomarkgrafia is that the large corolla of the new species is much larger than that of any species of Mesechites despite its somewhat intermediate shape.

ASPIDOSPERMA JAUNECHENSE A. Gentry, sp. nov.

Arbor elata, trunco sulcato. Folia elliptica, acuta, basi obtusa, membranacea, infra costa sparse puberula. Inflorescentia axillaris, cymosa, floribus paucis, corollis hypocrateriformibus, antheris sagittatis, 1 mm longis. Fructus orbicularis, glaber, minute exasperatus.

Tree ca. 20 m tall, the trunk conspicuously fenestrated or sulcate, inner bark reddish. Branchlets terete, densely minutely lenticellate, minutely appressed puberulous with whitish trichomes when young. Leaves elliptic to oblong-elliptic, acute at apex, obtuse to very abruptly and broadly cuneate at base, 5-12 cm long, 1.8-5 cm wide, membranaceous, the margin almost serrulate, sparsely and inconspicuously puberulous along midvein below, otherwise glabrous, the surface smooth and shiny when dried, secondary veins almost plane above, prominulous below, separated by 0.5-1 cm; petiole 0.3-0.6 cm long. Inflorescence axillary, few-flowered, dichasially cymose, ebracteate, puberulous. Flowers with the calyx lobes 5, equal, 2 mm long, rounded at tip, puberulous; corolla white or cream, 1.3 cm long in bud, salverform, the tube cylindric, 5-6 mm long, the narrow lobes ca. 6 mm long, mostly glabrous, pubescent inside

below anther insertion; anthers sagittate, 1 mm long, inserted 3-4 mm from base of tube; ovary ovoid, 1 mm long, glabrous. Fruits almost orbicular (very broadly dolabriform and rotated 300° according to Woodson's terminology), short stipitate, 5.5-6.5 cm in diameter, the acumen (morphological apex) 3-3.5 cm from point of attachment and strongly apiculate, the surface glabrous, macroscopically smooth with a texture like fine sand paper, under a lens distinctly roughened and with small inconspicuous lenticellate flecks; seeds round, ca. 5 cm in diameter, the round seed body 1.8-2 cm in diameter, and completely surrounded by the thin brownish-hyaline wing.

Type: ECUADOR: Los Ríos: Jauneche Forest, Jauneche, Quevedo-Palénque via Mocachi, Canton Vinces, 100 m alt.; tree 20 m, flowers cream, 26 Mar 1980, Dodson and Gentry 9920 (holotype, MO; isotypes ECU, SEL).

Additional collection examined: ECUADOR: Los Ríos: Jauneche Forest, Canton Vinces between Mocachi and Palénque on Estero Peñafiel, 70 m alt.; tree 18 m tall, trunk fenestrated, inner bark reddish, fruit green, turning brown, fruits paired, 4 Oct 1979, Dodson, Gentry, and Valverde 8836 (ECU, MO, SEL).

N.v.: "Naranjillo de monte"

This species keys out with series *Macrocarpa* in Woodson's (Annals of Missouri Bot. Gard. 38:119-204. 1951.) treatment, on account of its spreading corolla lobes, ebracteate pedunculate inflorescences, and relatively large corolla. It is completely unlike the other two species of series *Macrocarpa* in its much smaller, more strongly rotate fruit. In general aspect and the strongly rotated placenta the new species looks more like A. rigidum Rusby (series *Rigida*). The conspicuously sulcate trunk is reminiscent of series *Nitida*, but the species of that series have the corolla densely sericeous outside. It is completely unlike its sympatric congener A. myristicifolium although the trunks of both species are similarly sulcate and the two are confounded by local woodsmen.

MACROPHARYNX RENTERIAE A. Gentry, sp. nov.

Frutex scandens, ramulis puberulis. Folia late elliptica vel ovato-elliptica, caudato-acuminata, basi rotundata, rufo-puberula. Inflorescentia axillaris flore singulare vel floribus duobus, bracteata, calycis lobis foliaceis, anguste ovatis, corollis albis, tubulo-infundibuliformibus, plerumque glabris. Fructus ignotus.

Vine, the stems terete, puberulous. Leaves broadly elliptic to ovate-elliptic, caudate acuminate, the base rounded, 18-22 cm long, 11.5-12.5 cm wide, above reddish puberulous along veins and sparsely and glabrescently over surface, below reddish puberulous along veins and over surface, the trichomes forming an irregular tangled mat; petiole 3-6 cm long, reddish puberulous. Inflorescence a single flower or two flowers from a very short shared peduncle, axillary, the ca. 2 cm long pedicel conspicuously bracteate with 6 or 8 narrow foliaceous bracteoles 1-1.5 cm long and 1-4 mm wide. Flowers fragrant, the 5 calyx lobes foliaceous, narrowly ovate, 1.5-1.8 cm long, 5-8 mm wide, inconspicuously puberulous at least at tip and base; corolla white, tubular-infundibuliform, the tube and throat together 3.5-4 cm long, 1-1.3 cm wide at mouth, the lobes ca. 1 cm long, mostly glabrous, sparsely pubescent with crisped trichomes near base of lobes inside; stamens inserted ca. 2.2 cm from base of tube, the anthers 9-10 mm long, narrowly sagittate with long-tapering 3 mm long acuminate basal lobes; stigma 2 mm long, the apex subglobose, the base slightly flared and forming skirt around style. Fruit unknown.

Type: COLOMBIA: Chocó: Ca. 37 km W of Las Animas on new PanAmerican Highway, alt. 180 m, disturbed roadside forest, 10 Jan 1979, Gentry and Renteria 23955 (holotype, COL; isotypes, MO, HUA, to be distributed).

In general aspect, M. renteriae is quite like M. spectabilis (Stadelm.) Woods. of Amazonia. Its most striking difference from M. spectabilis is in having 5 broadly foliaceous calyx lobes instead of 7-9 linear ones. The second species of Macropharynx, M. anomala Woods. of western Ecuador, which was recognized by Woodson (Annals Missouri Bot. Gard. 23: 270. 1936.) has been known only from the destroyed type at Berlin. That species, characterized especially by small salverform corollas, is very different from M. renteriae. It has recently been recollected (Dodson and Gentry 9704 (MO, ECU, SEL)) at an altitude of 1000-1400 m between km. 94 and km. 96 of the old Quito-Santo Domingo road in Pichincha Province. The fruits, previously unknown, are paired, linear, 33-35 cm long, finely and glabrescently rufous tomentose.

DISTICTELLA CHOCOENSIS A. Gentry, sp. nov.

Frutex scandens, ramulis puberulis, sine consociebus glandularum in nodis inter petioles. Folia 2-foliolata, interdum cirrho trifido, foliolis ovatis vel oblongo-ellipticis, infra puberulis. Inflorescentia floribus in panicula racemosa dispositis. Flores calycibus cupulatis, truncatis, puberulis,

corollis albis, tubulo-campanulatis, dense puberulis, ovario oblongo-ellipsoideo, dense puberulo. Capsula ignota.

Liana; stem terete, longitudinally striate, finely puberulous with stiff trichomes, these banded brown and tannish, without interpetiolar glandular fields, pseudostipules sub-foliaceous, ca. 6 mm long. Leaves 2-foliolate, sometimes with a trifid tendril, the leaflets ovate to oblong-elliptic, apex obtuse or minutely cuspidate, the base rounded or obtuse, subcoriaceous, 6-15 cm long, 3.5-10 cm wide, puberulous below with erect trichomes with bent tips, mostly glabrescent above except along midvein, the main veins impressed above and raised below, the tertiary venation plane above and distinctly prominulous below; petiole 3-4 cm long, reddish puberulous with the same striped trichomes as the twigs, the petiolules 1-1.5 cm long. Inflorescence a few-branched racemose panicle, reddish tomentose. Flowers with the calyx cupular, truncate, 7-8 mm long, 7-8 mm wide, appressed puberulous, with plate-shaped glands near margin; corolla white, tubular-campanulate, bent forward above base, ca. 4 cm long, ca. 1.5 cm wide at mouth of tube, the tube ca. 3 cm long, the lobes 0.5-0.8 cm long, tube and lobes densely puberulous outside and inside; stamens didynamous, the thecae divaricate; ovary oblong-ellipsoid, 3 mm long, 1.5 mm wide, densely appressed puberulous; disk patelliform, 1.5 mm long, 4-5 mm wide. Capsule unknown.

Type: COLOMBIA: Chocó: Ca. 10 km W of Istmo de San Pablo on PanAmerican Highway (under construction) west of Las Animas, 110 m alt.; vine, flowers white, 12 Jan 1979, Gentry and Renteria 24089 (holotype, COL; isotypes, MO(2)).

Endemic to the lowland Chocó region of western Colombia.

Additional collections examined. COLOMBIA: Chocó: Sin. loc., Apr 1833, Triana 4124-10 (COL). El Valle: Río Yuruman-guí, vernal, bosques, 5-50 m alt, 30 Jan 1944, Cuatrecasas 15775 (COL). El Forge, near Buenaventura, near sea level, woody vine, close to ground in grass, corolla cream, 5-8 Jun 1944, Killip and Cuatrecasas 38828 (COL).

All species of Distictella have very similar flowers and are distinguished primarily by type of pubescence of the vegetative parts and to a lesser extent by fruits. While pubescence characters are notoriously intraspecifically plastic in many genera of Bignoniaceae, in Distictella they are highly constant and correlated with distinctive ecologically and geographically defined entities. Distictella choensis is related to D. parkeri (DC.) Sprague and Sandw. of lowland Guayana and D. elongata (Vahl) Urb., which is widespread in the

Brazilian cerrado and occasional north into the Guianas and southern Venezuela. Distictella parkeri has a closely appressed almost canescent tomentum of minute trichomes on the leaf undersurface; D. elongata has the leaf undersurface softly pubescent with long erect trichomes. The new species is intermediate; the erect trichomes with bent tips of its leaf undersurface tomentum are longer than those of D. parkeri and shorter than those of D. elongata. Distictella chocoensis differs from both D. parkeri and D. elongata in the distinctly prominulous tertiary venation of the leaf undersurfaces. The Cuatrecasas collections were identified by Sandwith as D. parkeri but the constancy of the vegetative differences illustrated by the additional Chocó material now available coupled with the long range disjunction, argues for specific recognition.

There are two unaccounted for collections of unattached Distictella fruit valves from eastern Panama which might belong to this species. The only Distictella reported from Panama is D. magnoliifolia which has strongly tomentose fruits in Amazonia but whose fruits have not been collected in Central America nor Chocó. The Panamanian fruits (Duke 14733 (MO), mixed with Strychnos leaves) and Gentry 4125 (MO) (mounted with sterile leaves of D. magnoliifolia collected from the same area) are much more finely and glabrescently appressed puberulous than any South American material of that species. Whether these represent geographical variation in D. magnoliifolia or a range extension of D. chocoensis cannot be determined on the basis of the available evidence.

SCHLEGELIA CHOCOENSIS A. Gentry, sp. nov.

Frutex scandens hemiepiphyticus, ramulis teretis, glabris, lenticellatis. Folia oblongo-ovata vel oblongo-elliptica, coriacea, basim truncata vel abrupte subcordata, infra minute lepidoto-punctata. Inflorescentia axillaris, pauciflora. Flores calycibus cupulatis, truncatis, glabratis, corollis albis, anguste infundibuliformibus, glabris. Fructus ignotus.

Hemiepiphytic liana; branchlets terete to somewhat flattened at nodes, glabrous, distinctly lenticellate with round raised whitish lenticels, pseudostipules subulate. Leaves opposite, simple, oblong-obovate to oblong-elliptic, acute to abruptly short acuminate, tapering toward base, the ultimate base more or less truncate to indistinctly subcordate, 21-30 cm long, 7-14 cm wide, coriaceous, secondary veins 9-12 on a side, glabrous, minutely lepidote punctate beneath, with occasional plate-shaped glands in axils of lower secondary veins and a well-developed gland field near base of midvein, drying grayish olive above and olive below; petiole 0.5-1.3 cm

long, 3-6 mm thick, terete and woody. Inflorescence axillary, few-flowered. Flowers with the calyx cupular, truncate, 4 mm long, 4 mm wide, essentially glabrous, drying brownish; corolla white, narrowly hypocrateriform, 1.2-1.3 cm long, 0.5 cm wide at mouth of tube, the tube 8-9 mm long, the lobes 3 mm long, completely glabrous except for some inconspicuous lepidote scales inside at base of corolla lobes; stamens and ovary not examined. Fruit not seen.

Type: COLOMBIA. Chocó: Quebrada Peña Negra, 8 km W of Quibdó-Istmina road on new PanAmerican Highway, alt. 90 m, hemiepiphytic vine, flowers pure white, funnel-shaped, 10 Jan 1979, Gentry and Renteria 23935 (holotype COL; isotypes HUA, MO(2)).

Endemic to the lowland pluvial forest of central Choco Department.

Additional collection examined: COLOMBIA. Chocó: 10 km W of Las Animas, PanAmerican Highway (under construction), alt. 100 m, sterile vine, 12 Jan 1979, Gentry and Renteria 24072A (COL, MO).

This new species belongs to the taxonomically difficult S. parviflora complex. It is distinct from S. parviflora (Oerst.) Monachino as it occurs in Chocó and Central America in having flowers which are larger, more openly funnel-form and pure white rather than white with pink markings. The leaves of S. chocoensis are larger than those of any collection of S. parviflora from this region, though equally large leaves occur in an Amazonian member of the complex which was reduced to S. parviflora (s.l.) by Sandwith. The abruptly truncate or subcordate leaf bases and short thick petioles are quite unlike S. parviflora and the conspicuous round-raised lenticels make even the twigs distinguishable.

PASSIFLORA CAUDATA A. Gentry, sp. nov.

Planta scandens, ramulis puberulis. Folia ovata, caudato-acuminata, basim truncata, membranacea, plus minusve integra, sparsim puberula, petiolis duobus paribus glandularum. Flos bracteis tribus foliaceis ovatis subtentus, calycis tubo campanulato, sepalis aristatis, petalis lineari-lanceolatis, 3-3.5 cm longis, corona fasciata lavandula atque alba, 4-seriata, ovario ellipsoideo, puberulo. Fructus globosus.

Vine; stem persistently puberulous, terete or slightly angular, finely longitudinally striate; stipules absent or

linear and 5 mm long. Leaves ovate, caudate-acuminate, truncate at base, 11-27 cm long, 6.5-11 cm wide, subentire to subserrulate, membranaceous, puberulous below along main veins and scattered over surface, above puberulous along main veins; petiole 4-5 mm long, puberulous, with 2 pairs of large (1-2 mm diameter) glands, these near apex and about 1.5 cm from base. Peduncle 5-6.5 cm long, crisped puberulous, the 3 bracts foliaceous, broadly ovate, acuminate, entire, 4-5.5 cm long, 2.5-3.2 cm wide, fused for basal 1 cm; calyx tube campanulate, ca. 1 cm long and 1.4 cm wide, sepals ca. 4 cm long and 1 cm wide, the apex narrowed to a ca. 2 mm long awn; petals light green with maroon spots, linear-lanceolate, 3-3.5 cm long, 5 mm wide; corona 4-seriate, lavender striped with white, outer series ca. 0.8 cm long, second series ca. 1.5 cm long; inner two series reduced to rings of tubercles, operculum erect, annular, the margin thickened, the outer border minutely toothed; limen cupuliform 6-7 mm long; ovary ellipsoid, densely puberulous, 5 mm long, the style branches 7-8 mm long. Fruit globose, ca. 5 cm in diameter, green; seeds elliptic, 3 by 4 mm, the surface foveolate-pitted.

Restricted to the narrow band of wet forest along the western base of the Andean Cordillera from the Colombian border to Santo Domingo de los Colorados.

Additional collections examined: ECUADOR: Carchi: Vicinity of Chical, west of Maldonado on trail to Peñas Blancas, wet premontane forest and adjacent second growth, 1200-1350 m, 23 Sept 1979, Gentry and Schupp 26384 (MO, QCA, SEL). Pichincha: Santo Domingo bypass approximately 3 km S of Santo Domingo, 530 m, 8 Apr 1980, Dodson and Gentry 10367 (MO, SEL).

Passiflora caudata belongs to series Tiliaefolia of subgenus Granadilla where its apical pair of petiole glands, non-filamentose operculum, and linear stipules key it to P. seemannii Griseb. which is very different in deeply cordate, usually round-tipped leaves and lack of an indumentum. If stipules are ignored, the non-tuberculate calyx tube (except above the operculum) and essentially entire leaves key it out to P. tiliaefolia L., the only other species of series Tiliaefolia in northwestern Ecuador. That species has a thicker, much more cordate leaf, glabrous ovary, bracts united a third of their length, and 5-ranked corona.

Probably P. caudata is related more closely to P. maliformis L. than to any of the other species of series Tiliaefolia, resembling that species especially in the truncate leaf base. However P. maliformis has the petioles only biglandular with a pair of glands near the middle, and a different-shaped more

narrowly oblong-ovate leaf which lacks the caudate tip of P. caudata.

This is apparently another of the many endemic species which are restricted to the strip of wet forest along the base of the Andes in northwestern Ecuador. It is especially noteworthy in that campesinos at Chical consider it an important wild and semi-cultivated fruit.

PIPER FOREROI A. Gentry, sp. nov.

Planta scandens, ramulis gracilibus, glabris vel subpuberulis. Folia oblongo-elliptica, longi-acuminata, peltata, glabra. Spica 1-2 cm longa, 1-2 mm lata.

Vine, the branchlets slender, striate, subterete or somewhat angulate, glabrous to subpuberulous with scattered minute appressed trichomes. Leaves oblong-elliptic, long acuminate with an acumen 1-2 (-2.5) cm long, peltate 3-8 mm from base, the base rounded, 8.5-15(-16) cm long (without the acumen), 3.3-6.8 cm wide, with 3-5 lateral nerves on each side, usually 2-3 pairs of strongly arched nerves from lower 1/3 of leaf and the additional pairs arising in upper 1/3 to 1/2 of leaf, the venation prominulous above and below, completely glabrous, glandular-punctate below; petiole ca. 1 cm long, glabrous. Spike 1-2 cm long, 1-2 mm wide, the peduncle 2-10 mm long, glabrous, the bracts much broader than long, marginally pubescent, the anthers ca. 0.3 mm long, laterally dehiscent, stigmas sessile.

Type: COLOMBIA: Chocó: Hoya del Río San Juan, alrededores de Palestina, 5 mm alt., 4° 10' N, 77° 10' W, enredadora epífita, inflorescencia verde claro, 26 Mar 1979, E. Forero, R. Jaramillo, L. E. Forero, and N. Hernández 4044 (holotype, COL; isotype, MO).

Endemic to lowland Chocó Department.

Additional collection examined: COLOMBIA: Chocó: Región del Río Pichimá, comunidad indígena Waunana, 100 m alt., 4° 25' N, 77° 17' W, enredadera, 15 Nov 1976, L. E. Forero 665 (COL, MO).

This is one of the very few peltate-leaved species of Piper. In Trelease and Yuncker's treatment it keys out with P. scutilimbum C. DC. which is a tree and has a very different leaf shape and elongate inflorescences.

PIPER FALLENII A. Gentry, sp. nov.

Planta scandens, ramulis puberulis. Folia oblongo-ovata vel oblongo-elliptica, caudato-acuminata, basim rotundata vel subcordata, infra atropurpurea, venis puberulis. Spica immatura 2 cm longa, 2 mm lata.

Vine, the branchlets striate, puberulous. Leaves oblong-ovate to oblong-elliptic, caudate acuminate with an acumen to 2.5 cm long, rounded to very shallowly subcordate at base, 7-15 cm long (without the acumen), 3.5-7.5 cm wide, with 3-5 lateral nerves originating from lower third of midvein on each side, plane or slightly impressed above, prominent below, glabrous or inconspicuously minutely puberulous above, minutely puberulous along veins below, conspicuously lepidote below, the margins minutely ciliate, strikingly dark purple on underside both when fresh and when dry; petiole 0.3-1.2 cm long, puberulous. Spike (only immature seen) 2 cm long, 2 mm wide, the peduncle 18 mm long, with a few scattered trichomes.

Type: ECUADOR. Pichincha: El Centinela, crest of Montanas de Ila, km. 12 of road from Patricia Pilar to 24 de Mayo, 600 m, vine with purple leaf backs, spikes purple, 2 Oct 1979, Dodson, Gentry, and Schupp 8678 (holotype, MO; isotypes, ECU, SEL, Río Palenque).

Known only from the El Centinela ridge top, where locally common.

Additional collections examined: ECUADOR: Pichincha: Loc. cit., 15 Jul 1979, M. Fallen and C. Dodson 850 (MO, SEL), Dodson, Fallen, and P. Morgan 8403 (MO, SEL).

This striking species is characterized by the deep purple leaf undersides. It keys out with P. novogranatense in Trelease and Yuncker's key but is not obviously related to that species. It is perhaps closer to P. ottoniaefolium C.DC. and its allies which are vines with more or less similar leaf shapes and venation but longer spikes. No other species of Piper has conspicuously deep purple leaf undersides; P. bicolor Yuncker of Peru, which has redviolet leaf undersides, is a totally different succulent herb.

PIPER SCHUPPII A. Gentry, sp. nov.

Planta scandens, ramulis teretibus, glabris. Folia oblongo-elliptica, acuminata, basim rotundata vel subcordata,

bullata, supra sparsim puberula, infra pilosa. Spica 10-11 cm longa, 3-4 mm lata.

Vine, the branchlets terete, striate, glabrous. Leaves oblong-elliptic, short-acuminate, rounded to very shallowly subcordata at base, 17-26 cm long, 7-11 cm wide, with about 6 lateral nerves originating from lower third of midvein on each side, above strongly bullate, with all veins impressed, sparsely short puberulous, especially in the grooves over the veins, below with the venation rigidly prominent, scattered pilose over surface, petiole 0.8-1 cm long, very minutely appressed puberulous. Spike 10-11 cm long, 3-4 mm thick, styles not elongate, the bracts fringed puberulous, the peduncle 1.8 cm long, glabrous.

Type: ECUADOR: Carchi: 12 km E of Maldonado on road to Tulcan, 2230 m, 27 Sept 1979, Gentry and Schupp 26650 (holotype, MO; isotypes, QCA, SEL).

This species keys to P. dryadum var. bullatilimum C. DC. in Trelease and Yuncker's monograph on account of its large bullate leaves. I have seen no material of that taxon which is described as "pubescent throughout". Piper schuppianum is certainly not conspecific with typical P. dryadum C. DC. of Costa Rica and Panama which is a densely pilose erect shrub with distinct style and stigma. It is actually closer to P. cavendishioides Trel. and Yuncker, P. ottoniaefolia C. DC. and their allies, but differs in the conspicuously bullate coriaceous leaves which are distinctly puberulous along the veins beneath.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CXCIIL.

A NEW GENUS *TEIXEIRANTHUS*.

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One of the many new genera of Eupatorieae from Brasil is based on a species that was described over 130 years ago but which is known from only a few collections from the last century. The species has been treated most commonly under the name *Alomia foliosa* (Gardn.) Benth, but has also been placed in the genera *Isocarpha* and *Piqueria*. The type photographs of the plant and various described features indicated that a distinctive entity was involved, and a study has been made of the type material from Minas Gerais and of a Blanchet collection from Bahia through the kindness of the British Museum.

Studies in this series (King & Robinson, 1972a, 1972b) have shown that many of the species that have been placed in *Alomia* in the past are actually epappose members of the genus *Ageratum*. The conical receptacle, paleae, and slightly carnose glandular-punctate leaves of *Alomia foliosa* could all be accommodated in the latter genus, and close relationship seems possible. However, initial difficulties for inclusion in that genus arise in the ornate expanded tips of the involucre bracts and paleae, a feature not found in any member of the genus *Ageratum*. Further examination shows a unique and interesting peculiarity of the florets that causes us to place the species in a separate monotypic genus. The flowers in both specimens examined show a consistent fusion of the corolla base with the top of the achene. There is a constriction, but there is no callous or abscission zone. To a greater degree than in any other member of the tribe, the pappus is lacking, and the basal structure from which it could arise is absent. The corolla which is usually inset from the edge of the top of the achene is here continuous with its outer layer. An older floret shows that the corolla loss is by abrasion and that the corolla base remnant persists on the achene.

The new genus seems to be associated with the Rio São Francisco system in Minas Gerais and Bahia, and by appearances may be subaquatic. The genus is named here in honor of Dr. Alcides Ribeiro Teixeira, Coordenador do Programa Flora CNPq in Brasília.

TEIXEIRANTHUS R. M. King & H. Robinson, gen. nov. Asteracearum (Eupatorieae).

Plantae herbaceae annuae vel breviter perennes decumbentes

vel juveniles erectae pauce ramosae. Caules teretes hirsuti. Folia opposita sessilia elliptica trinervata utrinque glandulopunctata sparse hirsuta subtus leniter carnosae. Inflorescentiae in caulibus et ramis terminales simpliciter corymboso-cymosae, ramis brevibus hirsutis. Capitula campanulata 4-5-mm alta et 3-4 mm lata; squamae involucri ca. 10 eximbricatae aequales ellipticae vel anguste obovatae irregulariter 3-4-costatae sparse hirsutae superne saepe violaceae apice late scariosae et dense hirsuto-fimbriatae; receptacula conica paleacea, paleis oblanceolatis apice scariosae dense hirsuto-fimbriatae; flores ca. 30 in capitulo; corollae pallide rubrae ad ovariis coalescentes extus sparse glanduliferae, tubis base campanulatis brevibus; faucibus cylindraceis, cellulis elongatis in parietibus sinuosis, nervis superne latioribus, lobis ovato-triangularibus leniter longioribus quam latioribus extus sublaevibus intus dense valde papillois; filamenta in parte superiore elongata, cellulis breviter vel longe oblongis in parietibus dense annulate ornatis; thecae elongatae; appendices antherarum late oblongae vix latioribus quam longioribus; basi stylorum glabri non noduliferi; rami stylorum filiformes distaliter leniter latiores dense valde papillois. Achaenia prismatica vel subfusiformia leniter 5-costata superne distincte constricta in corollis confluentia base acuminata anguste leniter flexuosa; carpodia nulla vel obsoleta; micropunctae in zonis transversalibus distinctae; pappus et callus superior nullus. Grana pollinis in diametro 20-22 μ m.

Type species: *Isocarpha foliosa* Gardn.

The genus contains only the following one species.

TEIXEIRANTHUS FOLIOSUS (Gardn.) R.M.King & H.Robinson, comb. nov.

Isocarpha foliosa Gardn., Lond. Jour. Bot. 5: 455. 1846.

Piqueria foliosa (Gardn.) Gardn., Lond. Jour. Bot. 6: 432. 1847.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CXCIV.

A NEW GENUS *PARAPIQUERIA*.

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Traditionally, the Eupatorieae with reduced anther appendages and no pappus have been placed in the genus *Piqueria* in the subtribe Piqueriinae. Both the subtribe and the genus have been interpreted too broadly in the past, and have proven somewhat artificial. Most of the truly diminutive members of the tribe, nevertheless, seem to be related to the *Piqueria-Ageratum* series that is presently placed in the subtribe Ageratinae. One striking exception is now known, however. A new genus from the interior of Brasil represents a similar, diminutive, epappose, unappendaged member of the totally separate evolutionally series in the subtribe Ayapaninae.

The new genus most closely resembles members of the Ageratinae in the *Ferreyrella-Piqueriopsis-Piqueriella* series, particularly the first of these which has paleaceous receptacles. There are four characters, however, that indicate a different relationship in the Ayapaninae rather than the Ageratinae. The carpopodium is greatly broadened with a distinct upper margin and very thick-walled cells; the corolla lobes are smooth on both surfaces, in contrast to the papillose surfaces found in most Ageratinae; the style appendages are short and tapered reminiscent of *Ayapana*, *Lepidesmia* and *Isocarpha* rather than clavate with blunt tips as in the diminutive Ageratinae; and finally, the base of the style has a distinct tuft of hairs such as are found in some Ayapaninae, but unlike any relatives of *Piqueria*.

The new genus is more reduced than any previously known in the Ayapaninae, but the nearest approach is *Monogereion* Barroso & King, also from the Serra dos Carajás, in southern Para, Brasil. The two genera differ in leaf form, corolla shape, anther form, style base, and pappus, and they do not seem to be immediate relatives of each other. The relationship of the new genus is probably best sought in the other paleaceous members of the Ayapaninae, *Lepidesmia* Klatt and *Isocarpha* Klatt. The new genus has extremely small unappendaged anthers, with only 8-10 pollen grains per theca, matched elsewhere in the tribe in only *Piqueriopsis* R.M.King of Mexico. The small glands on the corolla lobes are also distinctive in having uniseriate stalks.

The generic name derives from *Piqueria*, the name previously applied to all such reduced forms in the tribe, and from the name of the state of Pará in Brasil which happens to be the same as the common greek prefix meaning near or beside.

PARAPIQUERIA CAVALCANTEI R. M. King & H. Robinson, gen. et sp.
nov. (Eupatorieae) Asteracearum.

Plantae herbaceae erectae ca. 20 cm altae annuae? delicatae multo ramosae. Caules flavo-rufescentes subteretes striati glabri. Folia inferiora opposita superiora subopposita vel alterna, petiolis angustis ad 4 mm longis; laminae membranaceae lineares ad 9 mm longae et 1 mm latae base attenuatae margine integrae vel sub-integrae apice acutae supra et subtus glabrae. Inflorescentiae in planta omnis diffusae profuse capituliferae in ramis thyrsoido-paniculatae, pedicellis tenuis 1.5-4.0 mm longis glabris. Capitula 2 mm alta et 1.5-1.8 mm lata; squamae involucris persistentes ca. 10 late scariosae plerumque subaequales eximbricatae oblongae ca. 1.8 mm longae et 0.5 mm latae anguste bi-costatae apice rotundatae 1-2 exteriores minores lineares ad 0.5 mm longae; receptacula conica paleacea; paleae squamis involucris similes. Flores ca. 12 in capitulo; corollae breves 5-lobatae, tubis ca. 0.25 mm longis in nervis late scleroideis glabris; limbia late campanulatis; faucibus perbrevis ca. 0.1 mm longis; lobis oblongo-ovatis ca. 0.3 mm longis et 0.2 mm latis utrinque laevibus extus superne 1-2-glanduliferis, glandulis breviter clavatis inferne uniseriatis, cellulis loborum elongatis in parietibus sinuosis; filamenta in parte superiore angusta, cellulis plerumque elongatis in parietibus distincte annulate ornatis; thecae antherarum minute sub-globosae ca. 0.1 mm longae; appendices antherarum nullae; basi stylorum vix noduliferi distincte piliferi; appendices stylorum breves subulatae breviter papillosae. Achaenia subfusiformia ca. 1.2 mm longa 5-costata glabra in parietibus dense micro-punctata; carpodia late minute discoidea breviter anguste stipitata distincte leniter asymmetrica, cellulis marginalibus in superficie subquadratis in diametro 15-17 μ m in parietibus valde incrassatis; pappus nullus. Grana pollinis in diametro 18-20 μ m ca. 8-10 in theca.

TYPE: BRASIL: Pará: Marabá, Serra dos Carajás. 6°00'S-50°18' W, platô a 700 m da alt., rocha de minerio de ferro, numa escarpa abrupta. Erva delicada, frutificação brancacenta; rara. 24-5-1969. *P. Cavalcante 2162* (Holotype, MG; isotype, RB).



MUSEU PARAENSE EMILIO GOELDI		M. G. N.º	367
HERBARIUM AMAZONICUM			
BELEM - PARA		Fern	
Esp.			
Var.			
N.º			
Proc.	Parí, Marubá, arr. do arajá, 600 m. alt.		
	até a base do altitude, rocha de min.		
Hab.	frio, muito úmido, abru ta.		
C.º	2162	Data	14-5-50
Det.			
Obs.	Frutificação branca translúcida.		

Parapiqueria cavalcantei R. M. King & H. Robinson, with enlargement of heads, Holotype, Museu Goeldi, Belem. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CXCv.

A NEW GENUS *CAVALCANTIA*.

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Botanical exploration has been very limited in the outlying savanna areas along the southern fringe of the Amazon Basin in Brasil. Nevertheless, two endemic genera of the Eupatorieae are already known from these areas, *Monogereion* Barroso and King (1971) and *Parapiqueria* King and Robinson (1980). A third genus is now evident which contains two species from two different areas in southern Pará, the Serra dos Carajás and the Serra do Cachimbo, two areas separated by nearly 500 km. The genus provides the first evidence of an endemic floristic element in the Asteraceae shared by two such areas.

The Serra dos Carajás species was first described as an *Ageratum* (Barroso & King, 1971) on the basis of a broader interpretation of that genus. The discovery of a second species clearly indicates that a separate element is involved in the region of southern Pará. The second species is particularly instructive in lacking a conical receptacle, a feature characteristic of all members of the genus *Ageratum*. The pair of species also differs from *Ageratum* in the broad blunt rather than lanceolate involucre bracts and the small symmetrical carpodia with small, quadrate, thick-walled cells. The Piquarian nature of the involucre bracts was noted by the original authors (Barroso & King, 1971). The two species of the new genus also have a dense pubescence on the basal tube of the corolla, the lack of any apical shield of thicker-walled cells on the outer surface of the corolla lobes, and a tendency for sclerids along the veins and in the lobes of the corolla. In addition to the carpodial structure, the two species share an area above the carpodium of small, somewhat colored, thinner-walled cells that appear expanded in one achene. These are possibly elaiosomal in nature. Such a structure is not seen in *Ageratum*. In the one species where they are available, the leaves of the new genus show a shallow lobing and abrupt acuminate tip unlike anything seen in *Ageratum*.

The new genus is named after Paulo Cavalcante, the collector of the type species and the collector of members of two other endemic Eupatorian genera from the Serra dos Carajás area of southern Pará.

CAVALCANTIA R. M. King & H. Robinson, gen. nov. Asteracearum (Eupatorieae).

Plantae herbaceae annuae vel breviter perennes erectae. Folia inferne opposita superne alterna anguste petiolata; laminae ovatae vel deltoideae distincte leniter lobatae abrupte acuminatae subtus glandulo-punctatae fere ad basem trinervatae. Inflorescentiae cymosae vel in glomerulis aggregatae. Capitula minuta; squamae involucri eximbricatae oblongae apice late rotundatae; receptacula plana vel conica glabra epaleacea. Flores 6-30 in capitulo disciformes; corollae albae 5-lobatae, tubis base latis dense pubescentibus superne constrictis: faucibus campanulatis glabris vel subglabris, cellulis elongatis in parietibus sinuosis, lobis intus papillosis extus leniter mamillosis sparse glanduliferis vel unisetiferis interne interdum scleroideis; filamenta inferne brevis replicata, cellulis collis oblongis in parietibus distincte annulate ornatis; thecae elongatae, appendices antherarum ovatae; basi stylorum glabri non noduliferi, rami stylorum filiformes dense papilloosi. Achaenia prismatica 5-costata glabra, cellulis supra-basilaribus minutis subtenuibus; carpopodia minuta annuliformia, cellulis minutis subquadratis ca. 3-4-seriatis in parietibus incrassatis; pappus nullus. Grana pollinis in diametro ca. 18 μ m.

Type species: *Ageratum glomeratum* Barroso & King

The genus contains the following two species.

1. Heads aggregated into glomerules, sessile or subsessile, subtended by short, broad bracts; most nodes of inflorescence with small foliose bracts; heads with 25-30 flowers; receptacle conical; hairs on base of corolla uniseriate, non-glandular *C. glomerata*
1. Heads in short rather racemose clusters, with short pedicels, without subtending bracts; without or with small linear bracts at nodes of inflorescence; heads with ca. 6 flowers; receptacle flat; hairs on base of corolla biseriate, glandular *C. peracymosa*

CAVALCANTIA GLOMERATA (Barroso & King) R.M.King & H.Robinson, comb. nov. *Ageratum glomeratum* G.M.Barroso & R.M.King, Brittonia 23: 121. 1971.

CAVALCANTIA PERCYMOSA R.M.King & H.Robinson, sp. nov.

Plantae ca. 0.5 m altae superne ramosae. Caules fulvescentes teretes striati puberuli et sparse glandulo-punctatae. Folia inferne opposita, petiolis angustis; laminae ignota. Inflorescentiae laxae valde cymosae in ramis penultimis dense subracemosae in ramis ultimis ca. 1 mm longis, bracteis nullis vel linearibus. Capitula anguste campanulata ca. 3 mm longa et 1.5 mm lata; squamae subinvolucrales nullae; squamae involucri ca. 8 eximbricatae 1-2-seriatae subaequales anguste obovatae ca. 2.5 mm longae et 1 mm latae apice late rotundatae margin superne et

apice dense puberulo-fimbriatae extus superne puberulae; receptacula plana. Flores ca. 6 in capitulo; corollae ca. 1.5 mm longae, tubis ca. 0.4 mm longis base valde latioribus pilosis, pilis biseriatis glanduliferis; faucibus anguste campanulatis ca. 0.8 mm longis extus sparse glandulo-punctatis, lobis triangularibus ca. 0.35 mm longis et latis extus sparse glandulo-punctatis; filamenta in parte superiore ca. 0.10-0.14 mm longa inferne ca. 0.08 mm lata; thecae ca. 0.6 mm longae; appendices antherarum late rotundatae ca. 0.11 mm longae et 0.16 mm latae. Achaenia ca. 1.7 mm longa glabra; carpopodia ca. 0.05 mm longa et 0.15 mm lata, cellulis plerumque 10-15 μ m longis et latis.

TYPE: BRASIL: Pará: Sul do Estado, Serra do Cachimbo. VI-1955. *Moacir Alvarenga* Herb. No. 90537 (Holotype, RB; isotype, US).

The two species of *Cavalcantia* are close in the generic sense, but they differ in many significant details at the species level. The new species has a flat rather than conical receptacle, perhaps partially the result of the comparatively few flowers in the head. The hairs on the bases of the corollas are biseriate and gland-tipped rather than uniseriate and non-glandular. The involucre has no broad subtending bract and the nodes of the inflorescence have either no bracts or small linear bracts rather than petiolate foliose bracts as in *C. glomerata*. The elongate bare internodes of the inflorescence are evident in both species, but the branching of the new species is divaricately cymose and its capitular organization more subracemose, while that of *C. glomerata* has more erect branching with extremely dense glomerules. The branches at the lower nodes of the new species have a very short basal internode followed by an immediate branching which gives the initial impression of a verticil of four branches. Such branching is present at only the lower of the two nodes showing opposite branching. Such branching is not present in material seen of *C. glomerata*.

Literature Cited

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- King, R. M. and H. Robinson 1980. Studies in the Eupatorieae (Asteraceae). CXClV. A new genus *Parapiqueria*. *Phytologia* 47: 110-112.



JAROIM BOTÂNICO DO RIO DE JANEIRO

Herb. N.
fam.

Proced.

Obs.

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Nota
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UNITED STATES

2553677

NATIONAL HERBARIUM

Cavalcantia percyymosa R. M. King & H. Robinson, with enlargement of heads, isotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CXCVI.

A NEW GENUS *JARAMILLOA*.

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The members of the Eupatorieae that remain without revised generic placement include those elements from northern Colombia that have been treated under the name *Eupatorium hylibates* B.L. Robins. The material proves to include two species which have the general lack of specializations commonly associated with the subtribe Critoniinae, but details indicate that the species are members of the subtribe Oxylobinae.

The two species belong to a group of related forms in South America which have long anther collars, well-developed carpodia, and rather large thin-walled carpodial cells as in other genera of the Oxylobinae such as *Ageratina*, but there is only slight mammosity or none on the inner surfaces of the corolla lobes, and there is no node at the base of the style. The Colombian species are distinct within the larger South American series by the campanulate throats of the corollas and by the granular pilosity of the stems and leaves.

The two Colombian species have hairs that superficially resemble those of *Corethamnium* (King & Robinson, 1978), also of Colombia. One of the species also has longer corolla lobes as in the latter genus, and the cells of the corolla are broadly oblong in both groups. The hairs of *Corethamnium* are very different in detail, however, being partly biseriate and having thick walls. Also, *Corethamnium* has a corolla of a unique shape with the throat having no external differentiation from the narrow basal tube, and its achene has a persistent pappus and a carpodium with small firm cells as in many Critoniinae such as *Aristeguietia*. We do not consider the two genera closely related, and they are placed here in separate subtribes.

The new genus is named for R. Jaramillo Mejia of the staff at the Instituto de Cinecias Naturales in Bogotá.

JARAMILLOA R. M. King & H. Robinson, gen. nov. Asteracearum
(Eupatorieae).

Plantae frutescentes vel subarborescentes laxae ramosae. Caules interdum incrassati fistulosi vel non fistulosi superne dense granulate ochraceo-pilosae, pilis moniliformibus in partibus basilaribus incrassatis superne attenuatis. Folia opposita distincte petiolata; laminae late oblongae base saepe truncatae vel cordatae apice breviter acutae supra glandulo-punctatae

subtus sparse vel dense granulato-pilosae, nervis secundariis pinnatis late vel recte divaricatis basilaribus interdum congestis. Inflorescentiae late corymboso-paniculatae. Capitula breviter pedicellata vel in glomerulis aggregata; squamae involucri 12-23 subimbricatae inaequilongae persistentes demum patentes; receptacula leniter convexa glabra epaleacea, Flores 14-20 in capitulo; corollae albae, tubis distinctis anguste cylindraceis, faucibus anguste campanulatis, lobis 5 oblongis vix vel distincte longioribus quam latioribus extus glanduliferis intus leniter mammosis, cellulis oblongis in parietibus laxe sinuosis; filamenta in parte superiore elongata, cellulis inferioribus quadratis numerosis superioribus elongatis in parietibus leniter vel non noduliferis; appendices antherarum subquadratae vel breviter oblongo-ovatae; basi stylorum glabri non noduliferi scapi stylorum leniter incrassati; appendices stylorum anguste lineares valde prorulosae. Achaenia prismatica 5-angulata; carpodia breviter cylindracea latioribus quam longioribus superne leniter vel distincte demarcata, cellulis ca. 5 seriatis breviter oblongae plerumque 20-25 μ m latae in parietibus non incrassatis; pappus 1-2-seriatus capillaceus facile deciduus, setis 25-50 interdum submarginalibus scabridis, cellulis apicalibus acutis. Grana pollinis in diametro ca. 25 μ m.

Type species: *Eupatorium hylibates* B.L.Robins.

The genus contains two species, both from northern Colombia.

1. Stems with solid pith; leaves with extensive granular pubescence below; corolla lobes scarcely longer than wide; achenes with short, non-glandular setae; pappus uniseriate, of ca. 25 setae borne below the edge of the callous; heads on distinct short pedicels

J. hylibates

1. Stems fistulose; leaves with granular pubescence nearly restricted to veins below; corolla lobes almost twice as long as wide; achenes with short-stalked capitate glands; pappus biseriate, of ca. 50 setae borne on margin of callous; heads sessile in groups of 2 or 3

J. sanctae-martae

JARAMILLOA HYLIBATES (B.L.Robins.) R.M.King & H.Robinson, comb. nov. *Eupatorium hylibates* B.L.Robins., Proc. Amer. Acad. 54: 246. 1918.

The species proves to have an interesting and seemingly unique specialization of the pappus. The single series of setae is inserted below the margin on the outer surface of the apical callous of the achene. The callous seems to be produced upward and even slightly outward with its smooth margin very obvious behind the bases of the setae.

JARAMILLOA SANCTAE-MARTAE R.M.King & H. Robinson, sp. nov.

Plantae frutescentes erectae 2-3 m altae laxae ramosae. Caules lati fistulosi leniter hexagonales superne dense granulate pilosi. Folia opposita, petiolis plerumque 3.0-4.5 cm longis; laminae oblongo-ovatae 7-16 cm longae et 3-8 cm latae base late cuneatae vel subtruncatae margine subintegrae vel crenato-dentatae apice breviter acutae vix vel non acuminatae supra et subtus glandulo-punctatae supra atro-virides in nervis primariis dense puberulae subtus pallidiores sparse plerumque in nervis glanulate pilosulae. Inflorescentiae ca. 16 cm altae et 20 cm latae, bracteis basilaribus foliiformibus in petiolis ad 1.5 cm longis in laminis ad 7.5 cm longis, bracteis superioribus linearibus ad 1 cm longis, ramis sparse granulate pilosulis. Capitula sessilia vel subsessilia in glomerulis 2-3-capitatis aggregata late campanulata ca. 5 mm alta et 4-5 mm lata; squamae involucri ca. 20-23 subimbricatae inaequales oblongae vel anguste oblongae 2.0-4.5 mm longae et 0.8-1.5 mm latae apice rotundatae margine scariosae puberulo-fimbriatae extus base sparse granulate pilosulae superne subglabrae subapice glandulo-punctatae. Flores ca. 20 in capitulo; corollae albae ca. 3.3 mm longae, tubis 1 mm longis extus sparse glandulo-punctatis, faucibus leniter campanulatis ca. 1.5 mm longis extus glabris, lobis oblongo-ovatis ca. 1.0 mm longis et 0.40-0.45 mm latis extus superne dense glandulo-punctatis intus inferne sublaevibus superne leniter mamillosis; filamenta in parte superiore ca. 0.35 mm longa; thecae antherarum ca. 1 mm longae; appendices antherarum oblongo-ovatae ca. 0.2 mm longae et latae. Achaenia 2.0-2.2 mm longa sparse glandulo-punctata ad marginem carpodiorum interdum pauca minute setulifera; setae pappi biseriatae ca. 50 plerumque 2-3 mm longae, cellulis apicalibus acutis.

TYPE: COLOMBIA: Magdalena: Sierra Navada de Santa Marta, southeastern slopes. Hoya del Rio Donachui: Cancunua, fields and forest, 2400-2650 m. alt. Undershrub with erect, 2-3 m high stems and ochraceous branches. Involucre green. Corollas white. Oct. 11, 1959. *J. Cuatrecasas & R. Romero Castaneda 24720* (Holotype, US).

The two species of *Jaramilloa* are very similar in habit, pubescence, leaf form, general corolla shape, cellular structure in the corolla, and prurulose style appendages, and they seem unquestionably closely related. Nevertheless, the differences in detail are remarkable, the new species having fistulose stems, heads in sessile clusters, corolla lobes more deeply cut, glands rather than short setae on the achene, and an apical biseriate pappus.

Literature Cited

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Jaramilloa sanctae-martae 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). CXCVII.

THREE ADDITIONS TO *BARTLETTINA*.

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The South American species of the genus *Bartlettina* have shown great diversity, differing in many ways from the more uniform typical element of the genus in Central America. The South American species lack the higher chromosome base number of 16 seen in the typical group. Also, in an increasing number of cases, the South American species show cordate leaf bases which were once thought to be lacking in the genus. New material from Venezuela and Colombia has proven to represent two additional undescribed species of this latter type. One of the new species has a habit that has led to reconsideration of the generic placement of *Eupatorium perezioides* B.L.Robins. which we have previously placed as an anomalous element in *Aristeguietia* (King & Robinson, 1975). The new combination and two new species are as follows.

BARTLETTINA PEREZIOIDES (B.L.Robins.) R.M.King & H.Robins., comb. nov. *Eupatorium perezioides* B.L.Robins., Proc. Amer. Acad. 54: 255. 1918. *Aristeguietia perezioides* (B.L.Robins.) King & Robinson, Phytologia 30 (3): 220. 1975.

At the time of the earlier transfer of this Colombian species, it was thought to be related to species of *Aristeguietia* in spite of the anomalous narrow style branches.

BARTLETTINA LIESNERI R.M.King & H.Robinson, sp. nov.

Plantae herbaceae 0.8-1.0 m altae plus minusve ramosae. Caules atro-brunnescentes teretes densissime pilosi. Folia opposita, petiolis 3-14 mm longis; laminae ovatae 2-8 cm longae et 1.5-5.5 cm latae base rotundatae vel leniter cordatae margine multo argute mucronato-dentatae apice breviter acutae supra dense pilosae subtus plerumque in nervis et nervulis perdense pilosae sparse minute stipitato-glanduliferae fere as basem trinervatae vel subtrinervatae. Inflorescentiae laxae thyrsosideo-paniculatae inferne in internodiis elongatae, ramis dense minute stipitato-glanduliferis, ramis ultimis 4-12 mm longis. Capitula late campanulata ca. 6 mm alta et 6-7 mm lata; squamae involucri ca. 35-40 leniter subimbricatae inaequilongae lanceolatae 2.5-4.5 mm longae ca. 0.8-1.0 mm latae 2-4-costatae apice anguste acutae margine perdense setulifero-fimbriatae exteriores base sparse minute stipitato-glanduliferae interiores aliquantum deciduae; receptacula convex glabra. Flores ca. 40 in capitulo; corollae

lavandulae ca. 4 mm longae, tubis ca. 2 mm longis glabris; faucibus anguste infundibularibus ca. 1.7 mm longis superne interdum vix constrictis glabris vel subglabris, lobis triangularibus ca. 0.4 mm longis et latis extus dense glandulo-punctatis; filamenta in parte superiore ca. 0.25 mm longa, thecae ca. 1 mm longae; appendices antherarum oblongo-ovatae 0.20-0.23 mm longae et 0.2 mm latae; rami stylorum abaxialiter inferne sparse piliferi; appendices stylorum leniter apiculate mamillosae. Achaenia 1.6-1.8 mm longa supra medio plerumque in costis pauce setulifera; carpodia ca. 0.1 mm longa et 0.3 mm lata; setae pappi ca. 35 plerumque 3.3-3.8 mm longae apice tenuiores anguste acutae. Grana pollinis in diametro 23-25 μ m.

TYPE: VENEZUELA: Tachira: Cerro Las Minas, bordering Quebrada Las Minas, 18-20 km SE of Santa Ana, Lat. $7^{\circ}36'N$, Long. $72^{\circ}13'W$. Primary forest over sandstone substrate. alt. 1150-1250 m. Herbaceous, 1 m tall; flowers dull white. 29 July 1979. J.A.Steyermark & R.Liesner 119027 (Holotype, MO). PARATYPE: VENEZUELA: Tachira: Vicinity of Las Minas, north of La Laguna, 16 km SE of Santa Ana, Lat. $7^{\circ}36'N$, Long. $72^{\circ}13'W$. Primary wet forest, sandy soil. alt. 1150-1250 m. Herbaceous, 0.8-1.0 m tall; flowers lavender; leaves rugose both sides, pale green above, gray green below. 28 July 1979. J.A.Steyermark & R.Liesner 118902 (MO).

Bartlettina liesneri is named for the second collector of the two specimens. Ronald Liesner, of the Missouri Botanical Garden. The species is distinct from all others in the genus by the hairs on the backs of the style branches. Closest relationship is probably with *B. perezioides* of adjacent Colombia, but latter lacks the styler hairs and has densely setiferous ribs on the achenes.

The two specimens of the new species have a superficially different appearance. The type is more branched with small non-cordate leaves, the only larger leaf with a slightly cordate base being in the packet. The paratype has a single more elongate branch with larger cordate leaves. Both specimens have leaves with mucronate-dentate margins and have the hairs on the backs of the lower part of the style branches.

BARTLETTINA CLEEFII R.M.King & H.Robinson, sp. nov.

Plantae volubiles lignosae mediocriter ramosae. Caules fulvescentes teretes striati dense minute puberuli. Folia opposita, petiolis 1.3-3.2 cm longis; laminae ovatae 5-9 cm longae et 3.5-6.0 cm latae base cordatae margine crenato-serratae apice breviter leniter acuminatae supra dense pilosulae subtus perdense atro-glandulo-punctatae plerumque in nervis et nervulis dense puberulae vel subtomentellae ad basem distincte trinervatae. Inflorescentiae dense pyramidaliter paniculatae in ramis corymbosae, ramis ultimis 1-3 mm longis dense puberulis. Capitula campanulata ca. 8 mm altae ca. 4-5 mm latae; squamae involucri ca. 20 subimbricatae inaequilongae oblong-ovatae vel lanceo-

latae 2-5 mm longae et ad 1.4 mm latae apice breviter acutae margine puberulo-fimbriatae extus exteriores dense puberulae interiores sparse puberulae vel subglabrae leniter ca. 4-costatae; receptacula leniter convexa glabra. Flores ca. 25 in capitulo; corollae purpureae anguste infundibulares 4.5 mm longae extus glabrae, tubis 1.8 mm longis; faucibus ca. 2 mm longis, lobis ovatis 0.6 mm longis et 0.4 mm latis; filamenta in parte superiore 0.3-0.4 mm longa, cellulis in parietibus minute multo noduliferis; thecae ca. 1.5 mm longae; appendices antherarum ovatae ca. 0.35 mm longae et 0.25 mm latae; rami stylorum leniter mamillosi. Achaenia submatura ca. 2 mm longa superne et in costis setulifera; carpopodia ca. 0.2 mm longa et 0.35 mm lata; setae pappi ca. 40 plerumque 3.5-4.0 mm longae apice tenuiores anguste acutae. Grana pollinis in diametro 23-25 μ m.

TYPE: COLOMBIA: Magdalena: Sierra Nevada de Santa Marta. Alto Buritaca. alt. 2.880 m. Enredadera bejucosa. Capítulos morados. 13-Agosto-1977. *O. Rangel & A.M. Cleef* 925 (Holotype, U).

The new species has a denser inflorescence and basally trinervate leaf blades unlike the previous species and more like *B. tenorae* (Aristeg.) K. & R. of Venezuela. The latter species differs by the longer narrowly acuminate leaves, the more pilosulous and less glandular-punctate lower leaf surface, the less unequal involucre bracts, the more conical and minutely hirtellous receptacle, the 80-100 flowers in the head, and the less tenuous tips of the pappus setae.

Literature Cited

- King, R. M. and H. Robinson 1975. Studies in the Eupatorieae (Asteraceae). CXXXIX. A new genus, *Aristeguietia*. Phytologia 30 (3): 217-220.



Bartlettina liesneri R. M. King & H. Robinson, with enlargement of head, Holotype, Missouri Botanical Garden. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.



Bartlettina cleefii R. M. King & H. Robinson, with enlargement of heads, Holotype, Botanical Museum and Herbarium, Utrecht.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CXCVIII.

REDUCTION OF THE GENUS *KANIMIA*.

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The genus *Kanimia* was established by Gardner (1847) for two Brazilian species in the relationship of *Mikania* which had erect habits, a double pappus, and 10 ribs on the achene. The pappus character was emphasized by Gardner, and the ribbing of the achene was not mentioned. The erect habit, though differing from that of typical *Mikania*, was not considered distinctive since erect species of the latter genus were known. More recently, the genus *Kanimia* has been maintained on the basis of the achene character, and scandent Andean species have been included. The genus has been viewed with increasing suspicion as all the basic characters have proven subject to parallelism. We see no benefit in keeping the unnatural and undefinable *Kanimia* separate from the natural and definable *Mikania*.

The present paper provides new combinations that are needed for various Brazilian species. The lectotype species of the genus, *K. strobilifera* Gardn., needs no combination since it is the same as *Mikania oblongifolia* DC. The scandent Andean species await more detailed studies of their specific limits.

MIKANIA BAKERI R.M.King & H.Robinson, nom. nov. *Kanimia gracilis* Baker in Martius, Fl. Bras. 6 (2): 371. 1876, non *Mikania gracilis* Sch.Bip. ex Baker.

MIKANIA GOYAZENSIS (B.L.Robins.) R.M.King & H.Robinson, comb. nov. *Kanimia goyazensis* B.L.Robins., Contr. Gray Herb. n.s. 75: 14. 1925.

MIKANIA NITIDA (DC.) R.M.King & H.Robinson, comb. nov. *Eupatorium nitidum* DC., Prodr. 5: 180. 1836. *Mikania erithalina* DC., Prodr. 5: 193. 1836. The priority of the name was established by Baker (1876).

MIKANIA PALUSTRIS (Gardn.) R.M.King & H.Robinson, comb. nov. *Kanimia palustris* Gardn., Lond. Jour. Bot. 6: 447. 1847.

MIKANIA POHLII (Baker) R.M.King & H.Robinson, comb. nov. *Kanimia pohlii* Baker in Martius, Fl. Bras. 6 (2): 370. 1876.

MIKANIA PURPURASCENS (Baker) R.M.King & H.Robinson, comb. nov. *Kanimia purpurascens* Baker in Martius, Fl. Bras. 6 (2): 371.

1876.

Literature Cited

Baker, J. G. 1876. Compositae II. Eupatoriaceae *in* Martius, Flora Brasiliensis. 6 (2): 181-374.

Gardner, G. 1847. Contributions towards a flora of Brazil, being the characters of several new species of Compositae, belonging to the tribes Vernoniaceae and Eupatoriaceae, from the Province of Goyaz. Lond. Jour. Bot. 6L 417-463.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XXVI.

NEW SPECIES OF *ICHTHYOTHERE*.

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Three new species of *Ichthyothere* are described from various collections that have been sent for determination. The three species seem to represent distinctive and diverse elements in the genus, but all share certain features including broad multi-costate outer involucre bracts, paleae with a central pair of very broad costae, thickened veins in the throat and lobes of the disk corolla, and presence of glands on the abaxial surface of the style branches in the female flowers. It is notable that all three species can be distinguished from each other by the form of pubescence on the corollas of the female flowers.

ICHTHYOTHERE GARCIA-BARRIGAE H. Robinson, sp. nov.

Plantae herbaceae erectae ad 2.5 m altae pauce ramosae. Caules sordido-virides subteretes striati facile collabentes perminute rufescentiter puberuli. Folia oppositae, petiolis 2-7 cm longis distincte interdum late alatis ad nodis auriculatis; laminae late ovatae plerumque 12-25 cm longae et 5-17 cm latae base acuminatae margine minute mucronulato-serrulatae apice abrupte anguste acuminatae supra et subtus plerumque in nervis et nervulis minute appresse puberulae subtus minute glandulo-punctatae inferne ascendentiter subpalmate 5-nervatae, nervis tertialibus transversalibus numerosis. Inflorescentiae late cymoso-paniculatae, bracteis inferioribus foliiformibus in petiolis ca. 3 mm longis in laminis lanceolatis 3.5-5.0 cm longis et ca. 1 cm latis apice anguste acuminatis; ramis ultimis ad 6-7 mm longis dense minute puberulis. Capitula ca. 3.0-3.5 mm alta et 3-5 mm lata; squamae involucri basillares ca. 5 minute lanceolatae ca. 1.5 mm longae; squamae majores exteriores 2 obovatae 3.0-3.5 mm longae valde convexae extus glabrae obscure striati, interiores 2 orbiculares ca. 2 mm longae et latae extus ca. 10-costatae; paleae obovatae ca. 3 mm longae et superne ad 1.5 mm latae. Flores feminei 2 in capitulo; corollae ca. 0.7 mm longae superne perdense pilosae, pilis uniseriatis argute acutis; achaenia 3.5 mm longa et 2.5 mm lata ca. 8-striata. Flores masculi ca. 30 in capitulo; corollae ca. 2.5 mm longae anguste infundibulares, tubis ca. 0.8 mm longis; faucibus ca. 1.4 mm longis, lobis late triangularibus ca. 0.4 mm longis et latis intus ad marginem distincte breviter papillosis extus pauce glandulo-punctatis; thecae antherarum ca. 1 mm longae; appendices antherarum tri-

angulares ca. 0.15 mm longae et 0.18 mm latae extus pauce glandulo-punctatae. Grana pollinis in diametro 30-33 μ m.

TYPE: COLOMBIA: Santander: carretera a Pamplona. Km 12 Alto de Los Padres. alt. 1700-1800 m. Yerba alta erecta 2.5 m alta. Hojas opustae grandes. Inflorescencia blanca; estambres carmelitos. 18-Julio-1974. *H. Garcia-Barriga & R. Jaramillo M. 20550* (Holotype, US).

Ichthyothere garcia-barrigae is related to the distinctive *I. scandens* Blake of Costa Rica, Panama, and the northern Andes. Both have nearly identical paniculate inflorescences, bilateral heads with two female flowers, minute bracts at the bases of the heads, and weaker veins in the throats and lobes of the disk corollas. In both species the female corollas bear a dense distal tuft of uniseriate hairs and lack glands. The two species seem to form a distinct subgenus within *Ichthyothere*. The new species is distinct in the petioles which are distinctly winged to the base, and in the much larger and broader leaf blades with diverging rather than subparallel secondary veins.

ICHTHYOTHERE ELLIPTICA H. Robinson, sp. nov.

Plantae herbaceae decumbentes ad 30 cm altae base lignosae perennes. Caules tenues pauce striati in parte rubescentes puberuli. Folia opposita, petiolis brevibus 1-3 mm longis; laminae ellipticae 3-6 cm longae et 1-2 cm latae base et apice obtusae vel breviter acutae margine integrae supra glabrae vel subglabrae subnitidae subtus leniter pallidiores non nitidae in nervis et nervulis sparse puberulae supra basem valde trinervatae, nervis secundariis valde ascendentibus plerumque ad marginem parallelis. Inflorescentiae in ramis terminales pauci-capitatae. Capitula subsessilia aggregata ca. 7 mm alta et lata; squamae exteriores orbiculares ad 7 mm longae et latae apice obtusae extus glabrae ad 17-costatae; paleae ca. 4.5 mm longae superne ad 2.5 mm latae, costis 4, binis interioribus latioribus. Flores feminei plerumque 2 in capitulo; corolla breviter cylindratae 0.7-1.5 mm longae superne puberulae, pilis triformibus intermixtis, pilis uniseriatis apice argute acutis, pilis biseriatis apice non glandulosis bilobatis, pilis biseriatis apice glandulosis; achaenia fertilia ca. 4 mm longa et 3 mm lata ca. 18-striata. Flores masculi ca. 40 in capitulo; corollae albae 4.0-4.5 mm longae anguste infundibulares, tubis ca. 1.5 mm longis; faucibus ca. 2 mm longis, lobis oblongo-ovatis ca. 0.7 mm longis et 0.55 mm latis margine intus valde papilloso-fimbriatis extus dense pauce glandulo-punctatis; thecae antherarum 1.5-2.0 mm longae; appendices antherarum ovato-triangulares ca. 0.27 mm longae et latae extus et in connectivis superioribus glandulo-punctatae. Grana pollinis in diametro 30-37 μ m.

TYPE: BRASIL: Goiás: Serra dos Cristais. Grassy hillside campo on southern edge of Cristalina; elev. 1250 m; sandy soil. Stems decumbent from woody underground base; heads white. 4 April 1973. *W.R. Anderson 8126* (Holotype, UB; isotypes, NY, US).

PARATYPE: BRASIL: Goiás: Serra dos Cristais. Cerrado, 3 km West of Cristalina. Elev. 1175 m. Frequent. Stems 2-5, diverging or prostrate, to 30 cm long. Inflorescence ascending; heads white. 3 Nov. 1965. *H.S.Irwin, R.Souza & R.Reis dos Santos 9825* (UB, NY, US).

Ichthyothere elliptica has entire leaves, and the type specimen was initially determined as *I. integrifolia* Baker. The latter species is a less branching, more erect plant with very reduced leaves at the basal nodes and with leaves sessile. The new species seems distinctive in the complex pubescence of the female corollas, including uniseriate hairs and both glandular and non-glandular biseriate hairs.

ICHTHYOTHERE PETIOLATA H. Robinson, sp. nov.

Plantae herbaceae erectae 1 m altae? multo ramosae. Caules sordidovirides subteretes distincte striati facile collabentes sparse erecte pilosae. Folia opposita, petiolis 5-13 mm longis; laminae ovatae 4-9 cm longae et 1.0-4.5 cm latae base breviter anguste acuminatae margine serrulatae apice anguste saepe longe acuminatae supra pilosae subtus subcarnosae sparse glandulo-punctatae in nervis et nervulis pilosae supra basem valde trinervatae, nervis secundariis plerumque ab marginis vix divaricatis. Inflorescentiae in ramis terminales pauci-capitatae. Capitula sessilia vel subsessilia aggregata 5-6 mm longa et 4-5 mm lata; squamae exteriores orbiculares ca. 4.0 mm longae et 3.5 mm latae apice obtusae extus in parte puberulae aliter glabrae ad 17-costatae; paleae ca. 4 mm longae superne ad 1 mm latae, costis binis latis. Flores feminei 1 in capitulo; corollae anguste cylindraceae ca. 0.5 mm longae apice pauce capitat-glanduliferae, capitulis glandularum multi-cellularibus; achaenia fertilia ca. 3.5 mm longa et 2 mm lata vix striata. Flores masculi ca. 55-60 in capitulo; corollae albae ca. 3 mm longae anguste infundibulares, tubis ca. 1 mm longis; faucibus ca. 1.5 mm longis; lobis triangularibus ca. 0.4 mm longis et latis intus ad marginem vix papillosis extus pauce glandulo-punctatis; thecae antherarum ca. 1 mm longae; appendices antherarum ovato-triangularis ca. 0.1 mm longae et 0.11 mm latae extus et in connectivis superioribus pauce glandulo-punctatae. Grana pollinis in diametro 23-25 μ m.

TYPE: BRASIL: Rondônia: Mineração Campo Novo (ca. 100 km SW of Ariquemes), forest on terra firma, 10° 34' S - 63° 37' W. Roadside weed; flowers white. 16 Oct. 1979. *J.L.Zarucchi, M.G.Viera, R.H.Petersen, C.D.Mota & J.F.Ramos 2727* (Holotype, INPA; isotypes, NY, US).

Ichthyothere petiolata is the only long-petiolate species that has been seen from Brazil. The heads with single female flowers are also rather distinctive. The corollas of the female flowers are notable for the multi-cellular capitate apical glands and the lack of other trichomes. Rondônia is rather isolated from other regions where *Ichthyothere* is known in Brasil.



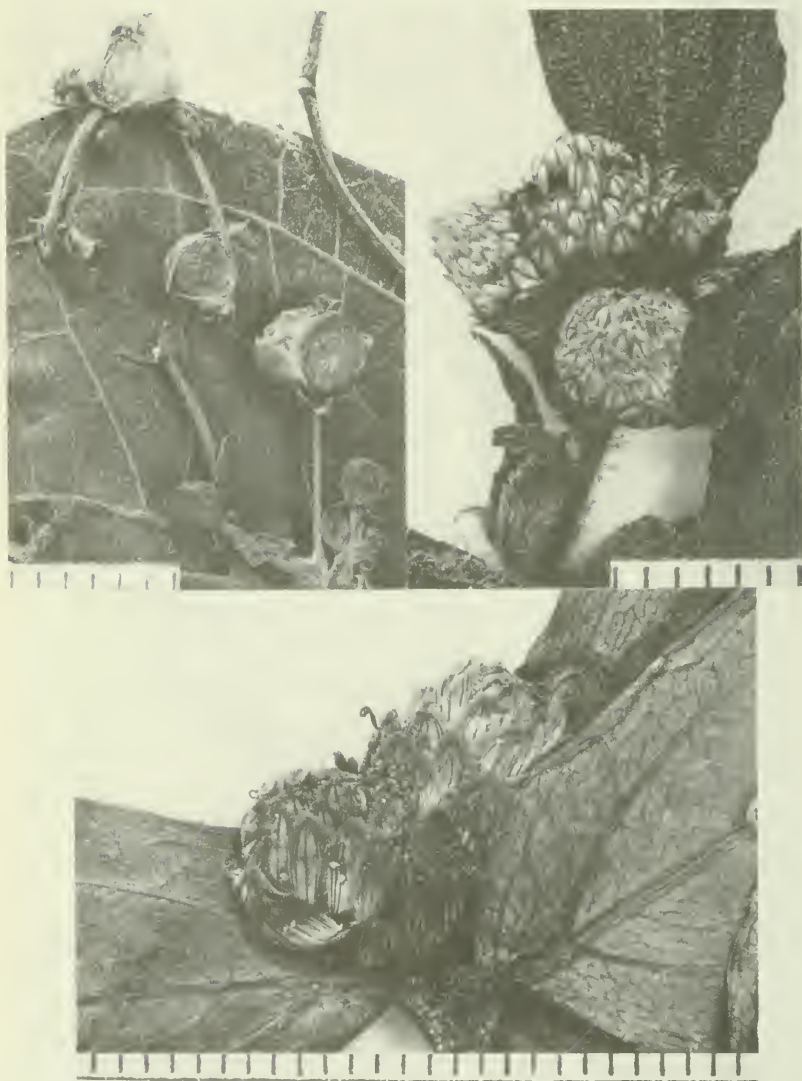
Ichthyothere garcia-barrigae H. Robinson, Holotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.



Ichthyothere petiolata H. Robinson, Isotype, United States National Herbarium.



Ichthyothere elliptica H. Robinson, Isotype, United States National Herbarium.



Enlargments of heads of *Ichthyothere*. Top left: *I. garciabarrigae*. Top right: *I. petiolata*. Bottom: *I. elliptica*.

ADDITIONAL NOTES ON THE GENUS *AEGIPHILA*. XXIX

Harold N. Moldenke

AEGIPHILA CORDATA Poepp.

Additional bibliography: Mold., *Phytologia* 47: 44. 1980.

Recent collectors have encountered this plant "soga con yemas florales y/o frutos verdes pequeños", at 200 m. altitude, flowering and fruiting in December.

Additional citations: PERU: Loreto: *Díaz, Aronson, Osorez, & Jaramillo* 817(Ld).

AEGIPHILA FENDLERI Mold.

Additional bibliography: Mold., *Phytologia* 46: 324. 1980.

Steiermark & Espinoza describe this species as having elongated vining stems with ferruginous spreading pubescence, the leaves dull-green above, gray-green and with dull-brown hairs beneath, the calyx green, and the corollas white. They have found it growing at altitudes of 1550--1575 meters, flowering in May.

Additional citations: VENEZUELA: Aragua: *Steiermark & Espinoza* 105893 (N).

AEGIPHILA GLANDULIFERA Mold.

Additional bibliography: Mold., *Phytologia* 47: 46. 1980.

Prance and his associates describe this plant as a liana, with orange-colored fruit in December, and encountered it in terra firme forests, incorrectly distributed as *Boraginaceae*.

Additional citations: RORAIMA: *Prance, Dobzhansky, & Ramos* 19943 (Ld).

AEGIPHILA HAUGHTII Mold.

Additional bibliography: Mold., *Phytologia* 46: 327. 1980.

Schunke describes this plant as a treelet, 1--2 m. tall, the fruiting pedicels and fruiting calyx "color verde pardo rijizo", and the fruit bluish-green when immature in January.

It should be pointed out that this taxon, in its general habit and appearance, reminds one very strongly of *Clerodendrum tessmanni* Mold., from the same general region, but may be distinguished by its generally thinner-textured leaf-blades and its much smaller flowers with very noticeably shorter corolla-tubes.

Additional citations: PERU: San Martín: *Schunke Vigo* 4648 (W--2862418).

AEGIPHILA INTEGRIFOLIA (Jacq.) Jacq.

Additional bibliography: Mold., *Phytologia* 47: 47. 1980.

Recent collectors describe this common plant as a shrub or tree, 1--7 m. tall, the leaves membranous, rich-green above, paler beneath, the sepals yellowish-green, and the flowers slightly fragrant, and have found it growing in forests and secondary

forests, at 400--800 m. altitude, flowering in April, May, and July. They report the vernacular name, "tabaco caspi", from Peru. The corollas are said to have been "white" on *Schunke Vigo 10103*, "whitish" on *Steyermark 106350*, and "cream" on *Prance & al. 12325*.

Additional citations: VENEZUELA: Bolivar: *J. A. Steyermark 106350* (N). PERU: Huánuco: *Schunke Vigo 10103* (Ld). BRAZIL: Acre: *Prance, Maas, Kubitzki, Steward, Ramos, Pinheiro, & Lima 12325* (N).

AEGIPHILA SELLOWIANA Cham.

Additional bibliography: Mold., *Phytologia* 47: 50. 1980.

Gibbs & Leitão Filho found this plant growing in cerrado.

Additional citations: BRAZIL: São Paulo: Gibbs & Leitão Filho 3551 (W--2883585).

AEGIPHILA SMITHII Mold.

Additional bibliography: Mold., *Phytologia* 47: 50. 1980.

Ramirez describes this plant as a tree, 25 m. tall, with orange fruit, and found it growing at 130 m. altitude.

Additional citations: PERU: Loreto: *R. Ramirez 56* (Ld).

AEGIPHILA VELUTINOSA Mold.

Additional bibliography: H. N. & A. L. Mold., *Pl. Life* 2: 45. 1948; Mold., *Phytologia* 40: 400. 1978.

AEGIPHILA VENEZUELENSIS Mold.

Additional bibliography: Mold., *Phytologia* 40: 400. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 15. 1979.

Steyermark describes this plant as a common tree, 4--6 m. tall, the leaves firmly membranous, deep-green above, dull-green beneath, and the fruit dull-orange in color. He found it growing on "long ridges with undulating topography underlain by igneous rock", at 1200--1300 m. altitude, flowering and fruiting in May. The corollas are said to have been "white" on his no. 105992.

Additional citations: VENEZUELA: Amazonas: *J. A. Steyermark 105992* (N).

AEGIPHILA VENEZUELENSIS var. *SERRATA* Mold.

Additional bibliography: Mold., *Phytologia* 40: 400. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 15. 1979.

AEGIPHILA VERTICILLATA Vell.

Additional bibliography: Mold., *Phytologia* 40: 400--401. 1978.

Illustrations: Vell., *Fl. Flum. Icon.* 1: pl. 91. 1827.

Hatschbach describes this plant as a shrub, 1 m. tall, with white corollas, and found it growing in campo sujo, flowering in December.

Additional citations: BRAZIL: Paraná: *Hatschbach 41838* (Ld).

AEGIPHILA VILLOSA (Aubl.) Gmel.

Additional bibliography: Mold., *Phytologia* 40: 401. 1978.

Recent collectors describe this species as a tree, 2--7 m. tall,

the "ecorce gris foncé, avec des poils blancs, bois creux ou blanc, spongieux, très mou", the bark green, the stems and leaves "velutinous" [actually they are long-villous!], the inflorescence in bud white or cream-color "and satiny", the leaf-blades lighter in color beneath. They have encountered it growing in secondary vegetation, flowering in February and May. The Oldeman collection, cited below, is accompanied by an excellent line-drawing of the plant and its flower-parts.

Additional citations: FRENCH GUIANA: *Deward* 230 (N, Z); *Oldeman* B.4290 (N).

AEGIPHILA VITELLINIFLORA Klotzsch

Additional synonymy: *Aegiphylla vitelliniflora* Klotzsch ex Carauta, Araujo, Vianna, & Oliveira, *Bradea* 2: 302. 1978. *Aegiphilla cuspidata* Mart., in herb.

Additional bibliography: Carauta, Araujo, Vianna, & Oliveira, *Bradea* 2: 302. 1978; Mold., *Phytologia* 40: 401 (1978) and 46: 326. 1980.

Recent collectors describe this plant as a scandent or semi-scandent shrub, sun-loving, with vermilion or orange-vermilion fruit, and have found it growing in white sandy soil of roadsides, in flower in October, in fruit in May and November. The inflorescences are said to have been "greenish-yellow" on *Vieira & al.* 694.

The *Rosa* 2412, distributed as *A. vitelliniflora*, actually is *A. glandulifera* Mold.

Additional citations: BRAZIL: Mato Grosso: *Hatschbach* 40614 (N, W--2850776). Rio de Janeiro: *Araujo* 1681 [Herb. FEEMA 13105] (Fe), 1940 (Fe--13735). Rondônia: *Vieira, Zarucchi, Petersen, Ramos, & Mota* 694 (Ld).

AEGIPHILA WIGANDIOIDES Lundell

Additional bibliography: Mold., *Phytologia* 40: 401. 1978; Hocking, *Excerpt. Bot. A.33*: 89. 1979.

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ADDITIONAL NOTES ON THE GENUS *AMASONIA*. VIII

Harold N. Moldenke

For a detailed explanation of the herbarium acronyms used in this and all others in my series of papers on this genus and other genera in this journal, see my Fifth Summary (1971), pages 795 to 801.

AMASONIA L. f.

Additional & emended bibliography: Vahl, *Eclog. Amer.* 2: 51, pl. 20. 1798; Steud., *Nom. Bot. Phan.*, ed. 1, 37. 1821; Spreng. in L., *Syst. Veg.*, ed. 16, 2: 765. 1825; Meisn., *Pl. Vasc. Gen.* 2: 200 & 290--291. 1840; A. L. Juss. in *Orbigny, Dict. Univ. Hist. Nat.* 13:

185. 1849; Pfeiffer, Nom. Bot. 1 (1): 64, 135, & 340 (1873) and 2 (2): 1569, 1570, & 1593. 1874; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 144 & 156--157 (1894) and ed. 1, 4 (3a): [381]. 1897; Briq. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. zu 4 (3a): 290. 1897; J. C. Willis, Dict. Flow. Pl., ed. 2, 233. 1903; Dalla Torre & Harms, Gen. Siphonog., imp. 1, 43; 1904; J. C. Willis, Dict. Flow. Pl., ed. 3, 232. 1908; Nienburg, Justs Bot. Jahresber. 39 (2): 1051. 1916; J. C. Willis, Dict. Flow. Pl., ed. 5, 31. 1925; Knuth, Feddes Repert. Spec. Nov. 43: [Init. Fl. Venez.] 605. 1927; H. N. & A. L. Mold., Pl. Life 2: 20, 21, 23, 4, 31, 48, & 84. 1948; J. C. Willis, Dict. Flow. Pl., ed. 6, 31. 1951; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 431 (1958) and imp. 3, 431. 1963; Rouleau, Guide Ind. Kew. 11 & 352. 1970; Mukhopadhyay, Pollen Morph. Verb. [thesis]. 1971; Thanikaimoni, Inst. Franç. Pond. Trav. Sect. Scient. Tech. 12 (2): 8. 1973; Napp-Zinn, Anat. Blatt. A (1): 418. 1974; Thanikaimoni, Inst. Franç. Pond. Trav. Sect. Scient. Tech. 13: 14 & 328. 1976; Anon., Roy. Bot. Gard. Kew Lib. Curr. Awaren. 11: 20. 1978; Mold., Phytologia 40: 402--406, 504, 507, & 511. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 40, 41, 47, 50, 51, & 57. 1978; Hocking, Excerpt. Bot. A.33: 89. 1979; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 21. 1979; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 17. 1979; Rogerson, Becker, & Prince, Bull. Torrey Bot. Club 106: 62. 1979; Mold., Phytologia 45: 40 & 503 (1980) and 46: 403, 504, & 511. 1980; Mold. & Bromley in Harley & Mayo, Towards Checklist Fl. Bahia 188. 1980.

AMASONIA ANGUSTIFOLIA Mart. & Schau.

Additional bibliography: Mold., Phytologia 40: 402. 1978; Hocking, Excerpt. Bot. A.33: 89. 1979.

AMASONIA ARBOREA H.B.K.

Additional synonymy: *Amasonia arborea* Humb. & Bonpl. apud Steud., Nom. Bot. Phan., ed. 1, 37. 1821. *Amasonia arborea* Humb. ex Spreng. in L., Syst. Veg., ed. 16, 2: 765. 1825.

Additional bibliography: Steud., Nom. Bot. Phan., ed. 1, 37. 1821; Mold., Phytologia 40: 402--403. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 17. 1979.

Recent collectors describe this plant as an herb with a woody base, 0.4--1.25 m. tall, generally one-stemmed, with a cluster of leaves at the summit, the inflorescence terminal, the bracts and calyx red, the fruit "yellow" or "green", surrounded by the persistent and patent fruiting-calyx, and have found it growing on "top plateaus", at 500--850 m. altitude, flowering in November and in fruit in July and November. García-Barriga reports the "bracts and flowers [calyx?] red" and asserts that the leaves are employed "to combat falling hair". The corollas are said to have been "pale greenish-yellow" on Maas & Westra 4455.

The Gentry & Berry 14534 and Gentry, Tillett, Ferrigni, & al. 10939, distributed as *A. arborea*, actually are *A. lasiocaulos* Mart. & Schau.

The *Sastre 4518*, distributed as *A. arborea*, actually is *A. campestris* (Aubl.) Mold.

Additional citations: TRINIDAD AND TOBAGO: Trinidad: *Philcox 8112* (N). COLOMBIA: Guainia: *Garcia-Barriga 20808* (W--2844120). GUYANA: *Maas & Westra 4455* (Ld). SURINAM: *Sastre 1465* (N).

AMASONIA CAMPESTRIS (Aubl.) Mold.

Additional synonymy: *Amasonia campestris* (Aubl.) Mold. ex Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 21, sphalm. 1979. *Amasonia campestris* (L.) Mold., in herb.

Additional & emended bibliography: Vahl, Eclog. Amer. 2: 51, pl. 20. 1798; Meehan, Gard. Month. Hort. 27: 300--301. 1885; Anon., Handelsbl. Tuinh. Sempervirens 14: 201 & 204. 1885; W. Robinson, Garden 27: 130--131, pl. 479. 1885; Regel, Gartenfl. 35: 337. 1886; Beck von Managetta & Abel, Wien. Illustr. Gartenzeit. 15: 68--69, fig. 9. 1890; Seghers, Rev. Hort. Belg. 20: 13--15. 1894; Veitch, Hort. Veitch. 226. 1906; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 605. 1927; Mold., Phytologia 40: 403--404. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 50. 1978; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 21. 1979; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 17. 1979; Mold. & Bromley in Harley & Mayo, Towards Checklist Fl. Bahia 188. 1980.

Recent collectors describe this plant as a large herb or spindly, erect, little-branched shrub or "woody-based herb", 0.4--1 m. tall, the stems purplish, the leaves soft, green or dark-green above, often reddish or flushed with dull-purple beneath, the "inflorescence-bearing stem" [peduncle?] reddish-purple, the bracts scarlet or "bright deep crimson-purple", the calyx also "bright deep crimson-purple" (or the "sepals green"), at least when the plant is in fruit, or the bracts "yellow-green beneath, bright-red above", and the fruit black. They have found it growing in sandy soil on savannas and in mata on terra firme, at altitudes of 500--700 m., flowering in February, March, and May, and in fruit in February. The corollas are said to have been "yellow-ochre with dark reddish veins on the limb" on *Harley 18903*, "pale-yellow" on *Philcox 7785*, "cream" on *Silva 2056*, and "yellow" on *Philcox 8112* and *Sastre 4518*.

Lescure describes the lower leaf-surface as "lie-de-vin (EX 34)", the bracts red "(EX 26)", the calyx red "(EX 26)", and the corollas yellow "Ex 4)".

Knuth (1927) cites from Venezuela *Humboldt & Bonpland s.n.* and *Moritz 623*, the former from Bolívar.

Additional citations: TRINIDAD AND TOBAGO: Trinidad: *Philcox 7785* (N). FRENCH GUIANA: *Lescure 40* (N): *Sastre 4518* (N). BRAZIL: Amazonas: *N. T. Silva 2056* (Ld). Bahia: *Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18903* (Ld, N).

AMASONIA HIRTA Benth.

Additional bibliography: Mold., Phytologia 40: 404--405. 1978.

Recent collectors describe this plant as "botão floral amarelo, final da antese, bracteas roseas, inflorescencias avermelhada"

and "calyx and some leaves vermillion". They have encountered it at 190--290 m. altitude, flowering in March. The corollas are said to have been "yellow" on *Héringer & al.* 3127.

Additional citations: BRAZIL: Distrito Federal: *Héringer, Elias de Pailo, Cunha de Mendonca, & Héringer Salles* 357 (N); *Héringer, Figueiras, Mendonca, Pereira, Héringer Salles, & Chagas e Silva* 3127 (N). Mato Grosso: *Kirkbride & Lleras* 3020 (W--2849772), 3047 (W--2849773). Pará: *Eiten* 239 (N). State undetermined: *Burle Merz & Laneirão s.n.* [Herb. Brad. 67268] (Ld).

AMASONIA LASIOCAULOS Mart. & Schau.

Additional bibliography: Mold., *Phytologia* 40: 403 & 405. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 17. 1979.

Recent collectors have described this plant as an herb or shrub, 0.5--1 m. tall, the leaves violet beneath, the bracts red or vermillion, the [flower-] buds yellow, and the fruit green (in June). They have found it growing in woods and primary forests on terra firme, often in sandy soil, at 150 m. altitude, flowering in March, May, and June, and fruiting in June. The corollas are said to have been "cream" color on *Gentry & al.* 10939, "vermillion" [? probably the bracts] on *Alencar* 440, and "yellow" on *Silva & Bahia* 3521. *Alencar* notes that "folha avermelhada na parte de baixo e verde na de cima". A vernacular name recorded for the plant is "candela".

Additional citations: VENEZUELA: Amazonas: *Gentry & Berry* 14534 (W--2798716); *Gentry, Tillett, Ferrigni, & al.* 10939 (W--2798736). BRAZIL: Amazonas: *Alencar* 440 (N). Pará: *Campbell, Ongley, Ramos, Monteiro, & Nelson* P.22458 (N, W--2851433); *Silva & Bahia* 3521 (N).

AMASONIA OBOVATA Gleason

Synonymy: *Amasonia obovato* Gleason ex López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 17, sphalm. 1979.

Additional bibliography: Mold., *Phytologia* 40: 405--406. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 17. 1979.

AMASONIA SPRUCEANA Mold.

Additional bibliography: Mold., *Phytologia* 40: 406. 1978; Hocking, *Excerpt. Bot. A.33*: 89. 1979; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 17. 1979.

Liesner describes this plant as 0.4 m. tall, the base of the stem woody, the bracts red, and the corollas "whitish". He found it growing at 120 m. altitude and records the vernacular name, "rabo de zorro".

Material has been misidentified and distributed as *Acanthaceae*.

Additional citations: VENEZUELA: Amazonas: *Liesner* 7312 (Z).

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ADDITIONAL NOTES ON THE GENUS *CITHAREXYLUM*. XV

Harold N. Moldenke

For a detailed explanation of the herbarium acronyms employed in this paper and in all previous papers by me on this or other genera in this journal since 1932, see my Sixth Summary (1980), pages 463 to 468.

CITHAREXYLUM B. Juss.

Additional & emended bibliography: P. Br. in Sloane, Civil Nat. Hist. Jamaic., ed. 2, imp. 1, 264--265, pl. 28, fig. 2. 1789; D. Dietr., Syn. Pl. 3: 371, 372, & 614--615. 1843; Gay, Hist. Fisc. Chile Bot. 5: 21 & 33--35. 1849; A. L. Juss. in Orbigny, Dict. Univ. Hist. Nat. 13: 185. 1849; Pfeiffer, Nom. Bot. 1 (2): 1860 (1874), 2 (1): 25 (1874), and 2 (2): 1569, 1570, & 1583. 1874; F. Phil., Cat. Pl. Vasc. Chil. 219. 1881; Balf. f., Proc. Roy. Soc. Edinb. 12: 91. 1884; F. Phil., Journ. Bot. Lond. 32: 202--211. 1884; Balf. f., Trans. Roy. Soc. Edinb. 31: [Bot. Socotra] 234 & 417. 1888; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): [381]. 1897; Engl., Syllab. Pflanzenfam., ed. 2, 178 & 201 (1898) abd ed. 3, 187 & 219. 1903; J. C. Willis, Dict. Flow. Pl., ed. 2, 307 & 604. 1903; Engl., Syllab. Pflanzenfam., ed. 4, 189 & 222 (1904) and ed. 5, 192 & 228. 1907; J. C. Willis, Dict. Flow. Pl., ed. 3, 315 & 621. 1908; Engl., Syllab. Pflanzenfam., ed. 6, 198 & 234. 1909; Reiche, Estud. Crit. Fl. Chile 5: 282 & 306. 1907; Gilg in Engl., Syllab. Pflanzenfam., ed. 7, 314 & 364. 1912; C. K. Schneid., Illustr. Handb. Laubholz. 2: 590. 1912; Fedde & Schust., Justs Bot. Jahresber. 39 (2): 319 (1913) and 40 (2): 334. 1915; Fedde, Justs Bot. Jahresber. 39 (2): 1346. 1916; Nienburg. Justs Bot. Jahresber. 39 (2): 1051. 1916; Rivera, atte, Estud. Fl. Bosque Fray Jorge 17. 1917; H. Hallier, Meded. Rijks Herb. Leid. 37: 22--23. 1918; Gilg in Engl., Syllab. Pflanzenfam., ed. 8, 318 & 371. 1919; Haines, Bot. Bihar Orissa, ed. 1, 4: 704 & 708. 1922; Gilg in Engl., Syllab. Pflanzenfam., ed. 9 & 10, 339 & 395. 1924; J. C. Willis, Dict. Flow. Pl., ed. 5, 147 & 678. 1925; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 605. 1927; A. W. Hill, Ind. Kew. Suppl. 7: 50, 60, & 80. 1929; F. Phil., Bol. Mus. Nac. Chile 13: 105. 1930; Diels in Engl., Syllab. Pflanzenfam., ed. 11, 339 & 393. 1936; Savage, Cat. Linn. Herb. Lond. 107 & 222. 1945; Metcalfe & Chalk, Anat. Dicot. 2: 1031--1033, 1035--1037, 1040, & 1041. 1950; Lawrence, Taxon. Vasc. Pl., imp. 1, 687. 1951; J. C. Willis, Dict. Flow. Pl., ed. 6, 147 & 678. 1951; Perez-Arbelaes, Pl. Util. Colomb., ed. 2, 741. 1956; Sorauer, Handb. Pflanzenkrank. 5 (2): 337. 1956; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 280, 298--301, & 530--531, fig. 129. 1957; Mold., Phytologia 5: 24, 95, & 509. 1957; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 431. 1958; Haines, Bot. Bihar Orissa, ed. 2, 2: 738 & 742--743. 1961; Dalla Torre & Harms, Gen. Siphonog., imp. 3, 431. 1963; Neal, In Gard.

Hawaii, ed. 2, 720, 721, & 725--726. 1965; Gonzalez Quintero, Palaeoecolog. 3: 1--185. 1969; Rouleau, Guide Ind. Kew. 44 & 352. 1970; Lawrence, Taxon. Vasc. Pl., imp. 2, 687. 1971; Mukhopadhyay, Pollen Morph. Verb. [thesis]. 1971; Pierre-Noel, Nom. Polyglot. Pl. Hait. 470. 1971; P. Br. in Sloane, Civil Nat. Hist. Jamaic., ed. 2, imp. 2, 264--265, pl. 28, fig. 2. 1972; D. Powell, Bull. Inst. Jam. Sci. 15 (2): 417, 419, & 422. 1973; Thanikaimoni, Inst. Franç. Pond. Trav. Sect. Scient. Tech. 12 (2): 32. 1973; Napp-Zinn, Anat. Blatt. A (1): 233, 383, & 418. 1974; L. H. & E. Z. Bailey, Hortus Third 275, 1149, & 1150. 1976; Dumont, Phytologia 68: 250. 1976; Little, Rare Trop. Trees S. Fla. [U. S. Dept. Agr. Conserv. Res. Rep. 20]: 19. 1976; Little, Atl. U. S. Trees 3: 3, 6, 9, & 12, maps 45 N & 45 SW. 1976; Mold., Biol. Abstr. 61: 4888. 1976; Thanikaimoni, Inst. Franç. Pond. Trav. Sect. Scient. Tech. 13:60 & 328. 1976; Woodbury & Little, U. S. Dept. Agr. For. Serv. Res. Paper ITF-19: 9 & 23. 1976; Batson, Gen. East. Pl. 146, 147, & 189. 1977; Clay & Hubbard, Haw. Gard. Trop. Shrubs 185 & 288. 1977; Anon., Roy. Bot. Gard. Kew Lib. Curr. Awaren. 9: 23. 1978; Carauta, Araujo, Vianna, & Oliveira, Bradea 2: 305. 1978; Fournet, Fl. Illust. Phan. Guad. Mart. 1391 & 1404--1406, fig. 668 & 669. 1978; Heathcote in Haywood, Flow. Pl. World 237. 1978; Little, Atlas U. S. Trees 5 [U. S. Dept. Agr. For. Serv. Misc. Publ. 1361]: 12, map 182. 1978; Mold., Phytologia 40: 486--492 & 506 (1978) and 41: 62--74 & 105--122. 1978; Mound & Halsey, Whitefly World 78, 229, 242, 244, 305, & 308. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 40, 41, 45, 47, 50--52, & 57. 1978; Reitz, Klein, & Reis, Proj. Madeira S. Catar. 42 & 267--272, pl. 83--85. 1978; R. F. Sm., Act. Bot. Venez. 13: 193, 205, & 264, fig. 153. 1978; Steyerma. & Huber, Fl. Avila 111, 864, [865], & 868, fig. 301C. 1978; Anon., Roy. Bot. Gard. Kew Lib. Curr. A-waren. 2: 29. 1979; Dombrowski & Neto, Inform. Pesq. 3 (21): 80 & 81. 1979; Hocking, Excerpt. Bot. A.33: 88, 90, & 91. 1979; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 89. 1979; Kummrow, Bol. Mus. Bot. Munic. 38: 14. 1979; Lewalle & Lakhmiri, Arb. Ornament. Maroc. 1: [13]. 1979; López-Palacios, Re-vist. Fac. Farm. Univ. Andes 20: 18. 1979; Milz & Rimpler, Zeit-schr. Naturforsch. Wiesb. 34C: [319] & 323--325. 1979; Mold., Phytologia 41: 505 (1979), 43: 275, 303, 304, 311, 312, 316--318, 321, 502, & 510 (1979), and 44: 124, 136, & 507. 1979; Rizzini, Trat. Fitogeog. Bras. 2: 258. 1979; Rogerson, Becker, Long, & Prince, Bull. Torrey Bot. Club 106: 62 & 154. 1979; Troncoso in Burkart, Fl. Ilustr. Entre Rios 5: 230, 231, & 288--291, fig. 137. 1979; Avery & Loope, S. Fla. Res. Cent. Rep. T.574: 33. 1980; Byrne, Atoll Res. Bull. 240: 199. 1980; Mold., Phytologia 45: 40, 43, & 505 (1980) and 46: 27, 42, & 506. 1980; Øllgaard & Balslev, Rep. Bot. Inst. Univ. Aarhus 4: 130. 1980.

Mound & Halsey (1978) report members of this genus as host to the whiteflies, *Aleurodiscus capiangae* Bondar, *Aleurotrachelus trachoides* (Back) Quaint. & Bak., *Hexaleurodicus* sp., and *Paralyrodes urichii* Quaint. & Bak.

The Baileys (1976) assert that species of *Citharexylum* are

"Planted out of door in the South [of the U.S.A.] and California. They have the appearance of wild cherry trees, and are seen frequently in warm countries.

The *Madison*, *Plowman*, *Kennedy*, & *Besse* 4816, distributed as a species of *Citharexylum*, actually is *Cornutia microcalycina* Pavon & Mold.

CITHAREXYLUM AFFINE D. Don

Additional & emended bibliography: H. N. & A. L. Mold., Pl. Life 2: 14 & 58. 1948; Mold., Phytologia 40: 488 (1978) and 41: 69. 1978; Hocking, Excerpt. Bot. A.33: 90. 1979.

Recent collectors have encountered this plant in matorral and on hillsides, referring to it as a shrub, 4 m. tall. Ventura refers to it both as "rare" and "abundant" (in different localities) and records the vernacular name, "palo pegativo". The corollas on his no. 1015 are said to have been "whitish", while those on his no. 12752 were "yellowish".

Material of *C. affine* has been misidentified and distributed in some herbaria as *C. hidalgense* Mold. On the other hand, it is quite possible that the two collections cited below may prove on further examination to represent the very closely related *C. mexicanum* Mold.

Additional citations: MEXICO: Veracruz: Ventura A. 1015 (N), 12752 (N).

CITHAREXYLUM ALBICAULE Turcz.

Additional & emended bibliography: Alain in León & Alain, Fl. Cuba, imp. 1, 4: 299. 1957; Mold., Phytologia 40: 488. 1978.

CITHAREXYLUM ALTAMIRANUM Greenm.

Additional bibliography: Mold., Phytologia 40: 488 (1978) and 41: 114. 1978.

CITHAREXYLUM AMAZONICUM Mold.

Additional bibliography: Mold., Phytologia 31: 338. 1975; Rizzini, Trat. Fitogeog. Bras. 2: 258. 1979.

CITHAREXYLUM ARGUTEDENTATUM Mold.

Additional & emended bibliography: H. N. & A. L. Mold., Pl. Life 2: 32 & 43--44. 1948; Mold., Phytologia 40: 489. 1978.

CITHAREXYLUM BERLANDIERI B. L. Robinson

Additional bibliography: L. H. & E. Z. Bailey, Hortus Third 275. 1976; Little, Atl. U. S. Trees 3: 6 & 9, maps 45 45 N & 45 SW. 1976; Mold., Phytologia 40: 489 (1978) and 41: 68. 1978.

The Baileys (1976) describe this species as a "Shrub or tree, to 30 ft.; lvs. oblong to ovate or rhombic, to 3 in. long, mostly entire, rarely coarsely toothed; racemes short; fls. white". Recent collectors describe it as a shrub, 2--6 m. tall, the stems square, the fruit red, turning brownish-blue or black, and have found it growing in "woods of various trees", in "matorral en cañada", and in potreros, at altitudes of 115--200 m., flowering in March, June, and September.

[to be continued]

BOOK REVIEWS

Alma L. Moldenke

"FLORA AMERICAЕ SEPTENTRIONALIS" by Frederick Pursh (1814) edited & introduced by Joseph Ewan as *Historiae Naturalis Classica Tomus CIV*, 117 & 751 pp. & 24 b/w plates. J. Cramer, Fl-9490 Vaduz, Lichtenstein and Lubrecht & Cramer, Box 227, Monticello, New York 12701. 1979. Reprint \$60.00.

Because this Flora "is fundamental for hundreds of taxonomic decisions for North American plants" it is certainly fortunate that this reprinting not only makes this 1814 work more readily available but also that it is accompanied by the valuable introductory comments and collected information of the botanical historian Ewan. This introduction includes the role of Pursh's writings, plant collections, and other plant sources, details of the Flora publication and responses to it, Pursh's chronology, *Sertum Purshianum*, and references. Now botanical libraries can buy this "working" copy for botanists' needs and save their original (if any) in a safer rare book collection.

"FLORA OF WEST VIRGINIA" Second Edition by P. D. Strausbaugh & Earl L. Core, xl & 1079 pp., 463 b/w plates, 3 photos, 3 maps, & 3 tab. Seneca Books distributed by Ruth E. Robinson Books, Morgantown, Route 7, West Virginia 26505. 1979. \$25.00.

As most botanists at all familiar with the United States flora know, this excellent work first appeared in paperbound sections in 1952, 1953, 1958 and 1964 and then again serially for another edition after the death of the senior author. "This treatise of the vascular flora of West Virginia presents descriptions, illustrations, geographical data and other information, particularly of local interest, for the approximately 2,200 species found growing without cultivation in the State. A comprehensive bibliographic treatment.....[deals] with species having their type localities within the present boundaries of West Virginia." The keys work well; the many line drawings are very helpful. With its several minor additions and binding all under one secure cover, why is this not called the third edition?

The distributor of this book also handles Nelle Ammons' "Shrubs of West Virginia" (1950) which has long been out of print but with its few remaining copies much cherished. It has recently been reissued for \$6.95 and is sold in a set with the "Flora of West Virginia" for the advantageous price of \$29.95 for both.

"MODES OF SPECIATION" by Michael J. D. White, iii & 455 pp., 31 b/w fig., 14 maps, & 19 tab. W. H. Freeman & Company, San Francisco, California 94104. 1977. \$27.50.

This thought-provoking book presents an important study very effectively for genic and chromosomal differences between species, for allopatric, clinal and area-effect speciation, for chromosomal and sympatric models of speciation, and for speciation by polyploidy and asexual methods. "One great difficulty in speciation studies and theory is that they now require expertise in a wide range of fields -- enzyme and protein-biochemistry, molecular cytogenetics, population genetics, ecology, ethology and biometry at least -- and the most elaborate and sophisticated laboratory studies. They also require the kind of detailed knowledge of organisms in the field more commonly found among the naturalists of former generations than in the molecular biologists of today."

"SEEDLINGS OF DICOTYLEDONS -- Structure, Development, Types, Descriptions of 150 Woody Malesian Taxa" by E. F. de Vogel, iv & 465 pp., 20 color plates, 178 b/w draw., 25 fig., 10 tab., 3 photos, & 1 map. Centre for Agricultural Publishing and Documentation, Wageningen, Netherlands and Unipub, New York 10010 as exclusive U.S.A. distributor. 1980. \$125.00.

This is a very beautifully prepared text, virtually unique in its field today and terribly expensive considering botanists' purses and governmental forestry department budgets, but perhaps -- and hopefully -- less so for the forestry industry. The color plates are exquisitely executed and the many line-drawings are very well done by a Mr. Toha. The collecting of seeds and fruits for germination and as voucher specimens, as well as to produce mature voucher specimens, was done under careful scientific supervision in north, south and west Sumatra, west Java, southeast Borneo, north Celebes and norther Moluccas and eventually deposited in the Bogor Botanical Gardens.

"FLORA DE CUBA" Volumes 1 (parts 1 & 2) and 2 (parts 3 & 4) by Hermano Leon (J. S. Sauget) & Hermano Alain (E. E. Liogier) and Volume 5 [=3 part 5] by Hermano Alain (E. E. Liogier), I: 441 pp., 165 b/w fig. & photo, II: 456 pp., 172 fig. & photo, III: 502 pp., 202 fig. & photo, IV: 556 pp., 230 fig. & photo, V: 362 pp., 35 fig. Reprint by Otto Koeltz Science Publishers, D-624 Koenigstein, Germany. 1974. DM 650.

This carefully prepared study was first published serially in the now little accessible "Contribuciones Occasionales del Museo de Historia Natural del Colegio de La Salle", nos. 8 (1946), 10 (1953), 13 (1957), 18 (1963) and for the last part and volume by

the Universidad de Puerto Rico (1962). It is therefore fortunate to have this neatly bound three volume replication now available since it represents the basic botanical survey of this island. It begins with an historical report on the work of the early botanical collectors and then treats by means of clear-cut keys and taxonomic descriptions the spermatophytes of this varied area.

"GEOGRAPHICAL GUIDE TO THE FLORAS OF THE WORLD -- An Annotated List with Special Reference to Useful Plants and Common Plant Names" Part I by S. F. Blake & Alice C. Atwood, 336 pp. and Part II by S. F. Blake, 742 pp. Reprint (2nd) Publication by Otto Koeltz Science Publisher, D-624 Koenigstein-Taunus, P.O. 129, West Germany. 1974.

Long into the foreseeable future there will be a need for these publications. They are very carefully compiled, evaluated, referenced, and indexed by highly skilled botanist-bibliographers. Part I includes "Africa, Australia, North America, South America, and Islands of the Atlantic, Pacific and Indian Oceans". It was originally published in United States Department of Agriculture Miscellaneous Publications No. 401, part 1, 1--336 pp (1942) with the first reprint by Hafner Publishing Company in 1963. Part II includes Western Europe and was originally published in the same journal as No. 797 (1961) and was also reprinted before this present edition.

"THE AUDUBON SOCIETY FIELD GUIDE TO NORTH AMERICAN BIRDS -- Western Region" by Miklos D. F. Udvardy, 852 pp., 627 color photo, 1 b/w map, 136 drawings & the Rayfield w/b Visual Key of 71 fig. Alfred A. Knopf, Inc., of Random House, New York, N. Y. 10022. 1977. -- \$8.95 flexible leatherette cover.

"Most birdwatchers are simply urbanized men and women [including an increasing number of new retirees] with a desire to return to nature and enjoy the beauty, song, grace and charm of birds. This book is meant for such enthusiasts." From the eastern foothills of the Rockies to the Pacific Ocean, from Alaska to the Mexican border it treats 508 species beautifully color-photographed in characteristic pose and typical setting, and describes them as to size, color, flight, voice, habitat, range, nesting and certain special interest items. Appendices list accidental species, bird family characters and birdwatching tips. If one's "birding" days started before this publication, one should be thankful that almost all field or sports jackets have two main pockets -- one for the Peterson field guide with its beautifully accurate paintings of birds and the other for this guide. Each is wonderfully and complementarily different from the other: choosing is only self-inflicted punishment.

"THE AUDUBON SOCIETY FIELD GUIDE TO NORTH AMERICAN BIRDS -- Eastern Region" by John Bull & John Farrand Jr., 775 pp, 584 color photo, 1 b/w map, 115 draw., & the Rayfield w/b Visual Key of 107 fig. Alfred A. Knopf, Inc., New York, N. Y. 10022. 1977. \$8.95 flexible leatherette cover.

As in the companion volume on the western region, the photographs in this guide have been key-organized on visual principles according to a bird's shape, color, size and habitat, which should save the user some page-shuffling time. Also, as in the western volume, suggestions for use, the key and the color plates all precede the quite detailed text that provides common and scientific names, family, description, voice, habitat, range, nesting and special notes. Likewise the appendices list accidental species, bird family characteristics, etc. The area covered is from the Atlantic coast to the eastern slopes of the Rockies. "One ornithologist has predicted that by the year 2000 all the species in the United States will have reached California." Since both of these newer guides and the Peterson ones complement each other so well and are reasonable enough in price, they both should be carried together into the out-of-doors. Such fine material for a gift to give or to receive!

"A REVISED HANDBOOK TO THE FLORA OF CEYLON" Volume I edited by M. D. Dassanayake & F. R. Fosberg, viii & 508 pp., published for the Smithsonian Institution and the National Science Foundation, Washington, D. C., by the Amerind Publishing Company, Pvt., Ltd., New Delhi 110001. India; U.S.A. distribution from U. S. Dept. of Commerce, National Technical Information Service, Springfield, Virginia 22161. 1980.

In addition to the above-named institutions, this project to update Trimen's first edition of 1893-1900 is also sponsored by the University of Peradeniya and the Sri Lankan Department of Agriculture in Peradeniya. Dr. Fosberg's Foreword explains specific plant family specialists who have visited Sri Lanka to study the Trimen and Worthington collections and to collect field specimens with the gracious and helpful assistance of native young people. Future volumes are scheduled to appear as finished manuscripts arrive. An index will be issued separately at the end. Volume I includes the *Amaranthaceae* by C. C. Townsend, *Bombacaceae* by A. G. Robyns, *Clusiaceae* and *Mimosaceae* by A. J. G. H. Kostermans, *Compositae* by A. Grierson, *Connaraceae* by D. D. Tirvengadam, *Convolvulaceae* by D. F. Austin, *Dipterocarpaceae* by P. S. Ashton, *Elatinaceae* by S. H. Sohmer and *Fabaceae* (pars) by V. E. Rudd.

"PROMETHEAN ETHICS - Living with Death, Competition and Triage" by Garrett Hardin, vii & 84 pp., University of Washington Press, Seattle, Washington 98105. 1980. \$7.95.

In contrast to the Epimethean, the true Promethean knows "danger vicariously and to take forethought to avoid it,..... [and knows] ahead of time what is too much of each good thing so that we do not make the mistake of striving for the bad of too much good." Hardin considers logically, philosophically and ecologically the personal and worldwide effects of too much death and of its contrast of too much life, of too much competition or struggle for existence and of its contrast of too much cooperation, and of triage selection for any kind of treatment and of its contrast of compassion as the choice. All these concepts are very effectively surveyed by Hardin in the J. & J. Danz lectures at the university and in the present book for a wider audience.

"FLORA AND VEGETATION OF THE WADDEN SEA - Final Report of the Section 'Marine Botany' of the Wadden Sea Working Group" Report 3 edited by W. J. Wolff, 206 pp., 45 b/w fig., 34 tab., 10 maps & 2 photo. A. A. Balkema, NL 3000 BR Rotterdam, Netherlands or A. A. Balkema-Merrimack Book Service, Salem, New Hampshire 03079. 1979. \$8.70 paperbound.

This shallow coastal sea along the western and northern coasts of Denmark, the Federal Republic of Germany and the Netherlands is separated from the North Sea by a chain of barrier islands and at low tides exposes vast tidal flats often bordered by salt marshes, sea walls and some Pleistocene cliffs. The text covers the (1) role of algae and seagrasses in the ecosystem, (2) epilithic algae and lichens, (3) salt marsh algae, (4) functional aspects of salt marshes, their use and management and (5) a chart of about 1,000 organisms, their area,, salinity and authors.

"KOSCIUSKO ALPINE FLORA" by A. B. Costin, M. Gray, C. J. Tetterdell & D. J. Wimbush, 408 pp., 351 color & 15 b/w photo., 2 color & 4 b/w maps, 4 b/w fig. & 5 tab. Wm. Collins Pty. Ltd., Sydney, Australia 3000 with International Scholarly Book Services, Inc. as exclusive distributor, Forest Grove, Oregon 97116. 1979. \$35.00.

This beautiful book will delight folks who like to enjoy very fine picturization of this mountainous southeastern tip of Australia, scenes of its plant associations and close-up natural portraits of its alpine floral members as well as interesting descriptions of its geological, geographical and exploratory history. It will also delight the student or professional botanist and ecologist for its clearcut keys and species descriptions.

"OPUS 200" by Isaac Asimov, xiii & 329 pp. Houghton Mifflin, Boston, Massachusetts 02107. 1979. \$10.95.

Here are annotated selections from the author's favorites from his second hundred books covering his very wide range of topics in his chatty, analytically sharp and humorous style, in which he often makes his point through the derivation of words and the profound seem obvious and simple. Among the fifteen topics there are such scientific or scientifically-related ones as astronomy, robots, mathematics, physics, chemistry and biology. The multitude of Asimov aficionados can have a field day; new prospects can easily join their ranks now because of this handy publication.

"FRAGILE ECOSYSTEMS - Evaluation of Research and Applications in the Neotropics" edited by Edward G. Farnsworth & Frank B. Colley, xxvi & 258 pp., 11 b/w fig. & 5 tab. Springer-Verlag, New York, N. Y. 10010. 1974. \$7.80 paperbound.

According to the sponsoring Institute of Ecology this really useful study, applicable pantropically, should interest "government officials, scientists, students of ecology, and others" and is therefor printed in this English and also in a Spanish edition. The workshop teams report on such topics as population ecology, ecosystem structure and function, recovery of tropical ecosystems, etc.

"TOXICANTS OCCURRING NATURALLY IN FOODS" Second Edition by E. M. Foster, Chairman of Committee on Food Protection, vii & 624 pp., 4 b/w fig. & 26 tab. National Academy of Sciences, Washington, D. C. 20418. 1973. \$14.30.

Twenty-six papers by different authors cover a wide range of topics such as (1) Nitrates and Nitrites, (11) Toxicity of the Vitamins, (15) Plant Phenolics, (23) Naturally Occurring Substances that Can Induce Tumors, and (24) Estrogens in Foods. "This book is addressed primarily to public health workers, nurses, nutritionists, medical and paramedical personnel, members of governmental regulatory agencies, international bodies concerned with food supply, food technologists, and members of the food industry." Almost all of this information has been further validated by additional research since the time of printing.

"BIRDS OF THE WEST COAST - Paintings, Drawings and Text" Volume 2, by J. F. Lansdowne, 168 pp., 48 color plates, & 48 b/w drawing plates. Houghton Mifflin Company, Boston, Massachusetts 02107. 1980. \$40.00 oversize.

Magnificently beautiful for such plates as the great blue

heron, the trumpeter swan, the great egret! Fascinatingly beautiful and alive for such plates as the shoveller, the great horned owl, the bluebird! Charmingly and sensitively beautiful for such plates as the Anna's hummingbird, the house finch, the black-throated gray warbler! The accompanying descriptive text appears opposite each color plate. All the birds are very naturally reproduced, as is also any included plant material. All the birds can be seen alive along the west coast from Vancouver to Baja California.

"ALLGEMEINE GEOBOTANIK - Eine Kurze Einführung" by Heinrich Walter, 260 pp., 135 b/w photo., fig. & maps, & 26 tab. Eugen Ulmer Verlag, 7000 Stuttgart, Germany. 1979. DM 19,80 paperback.

This Uni-Taschenbücher, Volume 284, is a very well presented text for use in German-language university and technical school classes and for reference in advanced Gymnasium classes, as well as in colleges and universities of other countries.

"PFLANZENSYSTEMATIK -- Einführung in die Systematische Botanik Grundzüge des Pflanzensystems" by Focko Weberling & Hans Otto Schwantes, 395 pp., 116 b/w fig. & 3 maps. Eugen Ulmer Verlag, 7000 Stuttgart - 1. Germany. 1979. DM 26,80 paperbound.

This somewhat classical systematic survey of the whole of the plant kingdom, including fungi, is presented as Volume 62 in the Uni-Taschenbücher series. The many illustrations are neatly detailed. It will probably be much used as a phyto-systematics or plant taxonomy text in German-language university and technical school classes and elsewhere as an enriching reference source.

"SCHADSCHNECKEN UND IHRE BEKÄMPFUNG" by Dora Godum, 467 pp., 72 color photo, 128 b/w photo fig., 51 tab. & 7 maps. Eugen Ulmer Verlag, 7000 Stuttgart - 1, Germany. 1979. DM 118.

This thoroughly prepared virtually monographic study on the slugs and snails economically harmful to crops particularly, to man himself and to his domesticated animals also gives modern experimental and practical means for their control. The book is very well illustrated and supplied with a very helpful bibliography. The illustrative material is of outstanding quality.

"ENVIRONMENTAL SCIENCE" by Amos Turk, Jonathan Turk, Janet T. Wittes & Robert Wittes, xiii & 563 pp., 26 color & 124 b/w photo., 176 fig., 41 tab., & 5 maps. W. B. Saunders Company, Toronto, London & Philadelphia, Pennsylvania 19105. 1974. \$13.95.

It is good that this text seems still to be "going strong" mainly because its language is simple, yet scientifically accurate; its ecological concepts are effectively presented, as well as are the involved social, economic and political issues; its illustrations are copious and pertinent, including several eye-catching cartoons; its end-of-chapter questions and problems are particularly well thought out and teacher-adaptable in several ways. This text could be used advantageously in junior or community colleges and even for advanced courses in high school as well as for a standard college semester or quarter course.

"BOTANICAL BIBLIOGRAPHIES - A Guide to Bibliographic Materials Applicable to Botany" Second Printing, compiled by Lloyd H. Swift, xxxviii & 804 pp., Otto Koeltz Science Publishers, D-624 Koenigstein, West Germany. 1974

This carefully explained and useful collation of bibliographic materials referring to plant studies was first published by the Burgess Publishing Company of Minneapolis, Minnesota, in 1970. "Planned primarily for beginning graduate students in botany,.....it should [also] be useful to all classes of users of botanical literature." It starts out with library classification [Dewey, Library of Congress, etc.] and goes on to bibliographic sections on background literature for botany, for applied areas of plant studies and areas auxiliary to botany. Really, some such introduction should be required as an intelligent time saver and awareness enricher.

"ACTA BOTANICA HORTI BUCURESTIENSIS 1977-1978" or "LUCRĂRILE GRADINII BOTANICE DIN BUCUREȘTI", 274 pp., 21 b/w photo., 32 fig., 40 tab. & 3 maps, published by the Botanical Garden and the University of Bucharest. 1979.

The first three papers are tributes to the leadership and work of the former director of the botanical garden, Prof. Mihail Gusuleac, 1887-1960. There are 24 other papers in German, Romanian and one in English on such topics as *Ginkgo biloba*, naturalization of exotic woody species, biomass accumulation with cyanophyte culture and a survey of aquatic and swamp associations in Romania. *Rhododendron* is misspelled on p. 238.

"DIE PFLANZE - Eine Einführung in die Botanik" Second Edition by Reinhard Bornkamm, 191 pp., 105 b/w & red fig. & 15 tab.

Eugen Ulmer Verlag, D-7000 Stuttgart - 1, Germany. 1980.
DM 19,80 paperbound.

This is the new rendering of the Uni-Taschenbücher, Volume 114, with a text that is perhaps smoother than its earlier form and with some eye-catching red in the figures, either just as background or pinpointing specific structures. It makes a very good review or survey book; its treatment of plants is under three main topics: (1) Bau und Leitung, (2) Übrige Pflanzengruppen, and (3) Die Pflanze in der Biosphäre.

"ADAPTATIONS OF PLANTS TO WATER AND HIGH TEMPERATURE STRESS"

edited by Neil C. Turner & Paul J. Kramer, xiii & 482 pp.,
140 b/w fig., 43 tab., 10 photo. & 9 maps. Wiley-Interscience Publication, John Wiley & Sons, New York, N. Y. 10017.
1980. \$40.00.

Herewith are 28 edited and important papers by 48 contributors from the proceedings of an interdisciplinary workshop-seminar at the Carnegie Institution of Washington, Department of Plant Biology, Stanford, California. They present from temporarily or long-term dry forest, field and cropland various naturally appearing and various experimentally and selectively bred morphological and physiological adaptations to water-limited stresses and to high temperature stresses that are often concomitant.

"SEEDS AND THEIR USES" by C. M. Duffers & J. C. Slaughter, ix &
154 pp., 4 b/w photo., 49 fig. & 3 tab. John Wiley & Sons,
New York, N. Y. 10022. 1980. \$34.00

This book is based on applied biology lectures given recently at the University of Edinburgh for "students of agriculture, animal nutrition, botany, zoology, genetics, physiology, and crop and animal production" as well as "food production and food science". The preface explains that "most of the information is in expensive specialist monographs" but does not mention that much is also available - although scattered - free or nearly so in county, national, etc. publications of Departments of Agriculture, Home Economics and Farm Bureaus, etc. The illustrations vary from poor (1: 18 & 1:21) to excellent. The main topics covered are seed formation, storage and processing for various endproducts mainly of cereal grains, oilseeds and legumes. It seems odd that no consideration is given among the legumes to the winged bean, *Psophocarpus tetragonolobus*.

This book seems to be overpriced for its size, paper and intended use as an undergrad text.

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THE TAXONOMY OF THE GENUS CAPSICUM (SOLANACEAE) - 1980¹

W. Hardy Eshbaugh²

In 1977 it was suggested that any discussion of the taxonomy of the genus Capsicum should consider: 1) the generic limits of the several taxa in the subtribe Solaninae (Solanaceae), 2) the taxonomy of the wild species of Capsicum, 3) the taxonomy of the several domesticated species of Capsicum, and 4) how to treat the various cultivars and varieties now recognized within each domesticated taxon (Eshbaugh, 1977).

1. Generic Limits

The Solanaceous subtribe Solaninae established by von Wettstein in 1891, in Engler & Prantl's Die nat rlichen Pflanzenfamilien, includes eleven genera of temperate-tropical distribution. They are Athenaea Sendtn., Bassovia Aubl., Brachistus Miens, Capsicum L., Chamaesaracha Gray, Melissea Hook., Nothoestrum Gray, Physalis L., Saracha Ruiz & Pav., Solanum L., and Withania Panq. Hunziker (1969a) recently reconstructed Witheringia L'Hert from various species scattered among several genera of the subtribes Solaninae and Lyciinae and it should be included in the Solaninae. Species of the genus Capsicum have been moved back and forth between no fewer than six genera in these two subtribes including Acnistus Schott., Athenaea, Brachistus, Bassovia, Withania, and Witheringia. Investigations using pollen morphology (Murry and Eshbaugh, 1971), gross morphology (Hunziker, 1950, 1960, 1961, 1967, 1969a, 1969b, 1971, 1977), epidermal morphology (Ahmad, 1963), etc., have served to clarify better the limits of each of these genera. Three especially comprehensive papers have recently appeared that have helped to clarify the taxonomy of the Solanaceae (D'Arcy, 1979; Hunziker, 1979a, 1979b). Nevertheless, several species of Capsicum continue to be included in quite different genera.

Morton (1938) suggested that Capsicum should be limited to plants with slender, free glabrous filaments, and a shiny, pungent berry. Heiser and Smith (1958) concurred in this viewpoint stating "we are convinced that those plants now placed in Capsicum which have soft, pulp-filled, non-pungent berries should be excluded from the genus." The presence of capsaisin, a volatile phenolic amine (Maga, 1975) may still be the best single diagnostic character for

¹ Adapted from a paper presented to the 1977 EUCARPIA Meetings, Avignon, France, and tabled at a meeting on The Genetic Resources of Capsicum at CATIE, Turrialba, Costa Rica, 13-15 August, 1980. Financial support from the National Science Foundation (BMS 72-01799) is acknowledged.

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Table 1. Synopsis of the genus Capsicum based on recent additions and modifications (after Hunziker, 1956).

Tubocapsicum: C. anomalum
Pseudoacnistus: C. breviflorum

Capsicum

strictly wild species:

<u>C. buforum</u> *	<u>C. hookerianum</u>
<u>C. campylopodium</u>	<u>C. lanceolatum</u>
<u>C. chacoense</u>	<u>C. leptopodium</u>
var. <u>tomentosum</u> *	<u>C. minutiflorum</u>
<u>C. ciliatum</u>	<u>C. mirabile</u>
<u>C. coccineum</u>	<u>C. parvifolium</u>
<u>C. cornutum</u>	<u>C. scolnikianum</u> *
<u>C. dimorphum</u>	<u>C. schottianum</u>
<u>C. dusenii</u>	var. <u>flexuosum</u>
<u>C. galapagoensis</u>	<u>C. tovari</u> (?) *
<u>C. geminifolium</u>	<u>C. villosum</u>

domesticated species and spontaneous forms (hypothetical wild ancestors or weedy derivatives):

<u>C. annuum</u>
var. <u>aviculare</u> * +
<u>C. baccatum</u> +
var. <u>pendulum</u> *
<u>praetermissum</u> * +
<u>tomentosum</u> * +
<u>C. cardenasii</u> *
<u>C. chinense</u> *
<u>C. eximium</u>
var. <u>tomentosum</u> *
<u>C. frutescens</u>
<u>C. pubescens</u>

* Taxa added since Hunziker's original treatment.

+ Wild forms.

(?) C. tovari is not a validly published name at this time (see Heiser, 1976).

the genus. However, several species still included in the genus are not pungent, e.g. *C. anomalum* and *C. ciliatum*. Furthermore, the inheritance of pungency is controlled by a relatively simple genetic mechanism (Lippert et al., 1966) and wild non-pungent collections of many *Capsicum* species have been reported (I have several accessions of *C. chacoense* that exhibit this condition). Non-pungent forms are quite common among the several domesticated taxa.

The earlier descriptions of the genus *Capsicum* included taxa with rotate to subrotate corollas. Recent discoveries of campanulate corolla types in *C. cardenasii* (Heiser and Smith, 1958) and *C. scolnikianum* (Hunziker, 1961) require a modification of that concept. Both of these species may be unique among the peppers in being pseudo self-compatible.

Finally, most recent treatments of these several genera have seen *Brachistus* and *Bassovia* submerged into *Witheringia*. For example, Morton (1938) recognized thirteen species of *Capsicum* in Costa Rica including *C. annuum* and *C. frutescens*. Ten of these taxa have been reduced to six species of *Witheringia* by Hunziker (1969a). We are definitely closer to an understanding of generic limits in the Solaninae than we were fifteen or twenty years ago as witnessed by the recent treatments of these groups in several Latin American floras including the Flora of Panama (D'Arcy, 1973) and the Flora of Guatemala (Gentry and Standley, 1974).

2. Taxonomy of the Wild Species

von Wettstein (1891) divided *Capsicum* into two sections, Eucapsicum and the monotypic Tubocapsicum containing *C. anomalum* the only native (?) Old World species. Hunziker (1956) recognized three sections including the monotypic Tubocapsicum and Pseudo-acnistus (*C. breviflorum* Sendt. confined to southeastern Brazil, southern Bolivia, Paraguay, and northern Argentina) and *Capsicum* which included twenty-four species. A re-analysis of Hunziker's synopsis of the genus *Capsicum* in light of discoveries during the past twenty years (Table 1) suggests that the section *Capsicum* should include twenty-two wild species and three varieties as well as five domesticated species and four varieties related to these taxa. Significant realignments of certain of these species can be anticipated as Brazilian material is better studied. There are new undescribed species which will also eventually be placed within the genus *Capsicum*. It is quite possible that some species currently recognized as belonging to the genus *Capsicum* will be removed from it after further investigation.

The importance of the wild species will be evident as their genetic material becomes more available to the plant breeder. It is essential that collections of these wild species be included in genetic banks and breeding programs throughout the world. However,

Table 2. Recent classifications of domesticated species of Capsicum and spontaneous forms (hypothetical wild ancestors or weedy derivatives).

Heiser & Pickersgill (1969)			D'Arcy & Eshbaugh (1974)		
1.	<u>C. pubescens</u>	Ruiz & Pavon	cultivated	<u>C. pubescens</u>	
			spontaneous	<u>C. cardenasii</u>	Heiser & Smith
				<u>C. eximium</u>	Hunziker
2.	<u>C. baccatum</u> var. <u>pendulum</u>		cultivated	<u>C. baccatum</u> var. <u>pendulum</u>	
	(Willd.) Eshbaugh				
	<u>C. baccatum</u> L. var. <u>baccatum</u>		spontaneous	<u>C. baccatum</u> var. <u>baccatum</u>	
3.	<u>C. annuum</u> L. var. <u>annuum</u>		cultivated	<u>C. annuum</u> var. <u>annuum</u>	
	<u>C. annuum</u> var. <u>glabriusculum</u> ¹		spontaneous	<u>C. annuum</u> var. <u>aviculare</u>	
	(Dunal) Heiser & Pickersgill			(Dierbach) D'Arcy & Eshbaugh	
4.	<u>C. frutescens</u> L.		cultivated	<u>C. frutescens</u>	
5.	<u>C. chinense</u> Jacq.		cultivated	<u>C. chinense</u>	

¹ Heiser & Pickersgill (1969) used C. annuum var. minimum (Miller) Heiser but have more recently used the above name Heiser & Pickersgill (1975).

the use of materials in this way will compound the taxonomic problem of dealing with the Capsicum species.

3. Taxonomy of the Domesticated Species

To appreciate fully the taxonomic problem of domesticated Capsicum one must return to the early literature. We know that Capsicum was discovered by Columbus on one of his first voyages to the New World (Anghiera, 1944) and that it was apparently introduced into the Old World at an early date in a variety of forms. The pre-Linnaean botanists described many different species and varieties of peppers. Fuchs (1542) recognized three taxa, Bauhin (1623) eight, Tournefort (1700) twenty-seven, and Miller (1754) eighteen. Linnaeus (1753) took a more conservative viewpoint in Species Plantarum describing just two species, C. annuum and C. frutescens. In his Mantissa (1767) he added two more species. Besser (1811) recognized seventeen taxa. Fingerhuth (1832) published the first true monograph of the genus, Monographia Generis Capsici, which included thirty-two species, seven of which were dubious and required further study, and twenty-eight varieties. The publication of Sendtner's (1846) analysis of Capsicum in the Flora Brasiliensis represented the first significant treatment of several valid wild species and domesticated taxa from a single geographic area. In 1852 Dunal published an extensive analysis of the genus in which he recognized fifty species with eleven more requiring further investigation. By the end of the nineteenth century more than ninety specific names had been associated with the genus Capsicum. In retrospect, much of the naming of Capsicum species was a result of taxonomists using primarily fruiting herbarium material to describe these taxa.

Irish (1898), at the urging of Stutevant and Rusby, published an extensive revision of the genus. He concluded that there were only two species including C. frutescens with one variety and C. annuum with seven varieties. Irish included C. pubescens as a species he was unable to examine. Bailey (1923) relegated the confusion of the preceding two hundred years to a single name, C. frutescens with five named varieties. Shinnars (1956) took exception with Bailey's choice of name but was in agreement with his concept and accepted Kuntze's (1891) use of the single species C. annuum.

The treatments of the modern era, the past twenty-five years, are best summarized by Heiser and Pickersgill (1969) and D'Arcy and Eshbaugh (1974) (Table 2).

For those working with the evolution of domesticated Capsicum the obvious overlap of certain domesticated taxa has been a perplexing problem. Two recent approaches to the problem are illustrated by Pickersgill, Heiser, and McNeil (1979) using numerical analysis and Jensen, McLeod, Eshbaugh, and Guttman (1979) and McLeod, Eshbaugh, and Guttman (1979a, 1979b) using isoenzyme

analysis. These studies are in general agreement that C. pubescens and C. baccatum var. pendulum are clearly defined domesticated species. The question of the relationship of the C. annuum, C. frutescens, C. chinense domesticates is much more complex.

Pickersgill et al. see these three species as the end point of an evolutionary tree with very poor separation of these taxa in the semi-domesticated and ancestral wild forms. Thus at the lower end of the evolutionary scale it is numerically difficult to separate wild C. annuum and C. frutescens. Pickersgill et al. (1979) suggest that the ancestral gene pool of these domesticated taxa may have a single common karyotype.

Eshbaugh (1970) reports that intraspecific crosses between various collections (populations) of C. baccatum are accomplished at quite different levels of difficulty suggesting the genetic isolation of some of these collections. Pickersgill et al. say that within certain populations of C. annuum intraspecific crossing barriers are as or more pronounced than between C. chinense and C. frutescens. Pickersgill (1971) indicates that crosses between wild species of this three species complex are more likely to result in functional progeny than crosses between the different domesticated taxa of this complex. Eshbaugh (1975) concludes that although hybridization may be difficult and limited between three taxa it can be accomplished by several mechanisms including "genetic bridges" between the wild and domesticated taxa.

Jensen et al. (1979) using isoenzyme data and Nei's (1972) Standard Genetic Distance have shown that the distinction of C. annuum, C. frutescens, and C. chinense as species is somewhat arbitrary. In this analysis, alleles of several enzyme systems are used as taxonomic characters while each sample is treated as a separate OTU (Operational Taxonomic Unit). It can be shown that within each species many genotypes are repeated. When analyzing these species the OTU's were chosen to represent a given genotype at random. The final cluster analysis of these representative OTU's shows the complete dispersion of C. annuum, C. frutescens, and C. chinense genotypes amongst each other. The dendrogram and cluster analysis developed by this technique indicate that the three domesticates cannot be distinguished based on enzymatic profiles.

The unpublished data of Perrine (1980) using the kinetics of reassociation DNA indicate that C. annuum and C. frutescens are very closely related. In the three collections investigated Perrine has found that one collection of C. annuum is more closely associated and virtually indistinguishable from collections of wild C. chacoense. These data are in general agreement with portions of data from Pickersgill et al. and Jensen et al.

The dilemma is that two independent numerical analyses have suggested quite different conclusions. On the one hand Pickersgill

et al. find *C. annuum*, *C. frutescens*, and *C. chinense* as distinct based on morphology while Jensen et al. find the three taxa indistinguishable based on enzyme profiles. The problem posed by these two analyses is not unique to these investigators. It is in fact the basis for the taxonomic confusion within this complex over the past several hundred years. Pickersgill et al. state "it is easier to suggest the probable course of evolution in the *C. annuum* - *C. chinense* - *C. frutescens* group than to suggest a suitable taxonomic treatment."

Mayr (1970) and Grant (1971) have eloquently developed the concept of the taxonomic and biological species. The usefulness of these concepts has been debated by many authors (Sokal and Crovello, 1970). Nonetheless, when applied to the systematic problem of the domesticated chili peppers, some interesting anomalies arise.

If morphology is used as the primary basis for recognizing taxonomic species it is apparent that each of the five domesticated species can be maintained as a distinct category. The morphological separation of the spontaneous (wild) taxa is not nearly so clear. *Capsicum eximium* and *C. cardenasii* can be shown to intergrade morphologically within certain portions of their geographic range (Eshbaugh, unpublished) while they are distinct from *C. pubescens*. Wild *C. baccatum* is morphologically distinct from other wild species but intergrades into domesticated *C. baccatum* (Eshbaugh, 1970). Wild *C. annuum*, *C. frutescens*, and *C. chinense* morphologically fuse to form indistinguishable phenotypes at the most primitive level. Furthermore, each of the wild types shows a series of transitional forms from the wild to the domesticated taxa. If taxonomic logic is followed the variety *C. annuum* var. *glabriusculum* or its equivalent should be maintained while two new varieties are designated to represent the wild ancestral *C. frutescens* and *C. chinense*.

If one turns to the biological species concept to solve this dilemma other difficulties arise. The biological species is defined by Mayr (1970) as "groups of interbreeding natural populations that are reproductively isolated from other such groups" while Grant (1971) states that "it is the reproductively isolated system of breeding populations." Using this approach one can recognize only three domesticated species. These would include *C. pubescens* with *C. eximium* and *C. cardenasii* as a self contained breeding unit; *C. baccatum* as another such unit; and *C. annuum*, *C. frutescens*, and *C. chinense* as another unit genetically linked together by a wild ancestral gene pool. The problem with this approach is that certain populations within each of these biological species are in fact isolated from each other. Pickersgill et al. indicate that there are sterility barriers within *C. annuum*, from population to population, that are more pronounced than barriers

between C. chinense and C. frutescens. The same can be said for intrapopulational barriers in C. pubescens and C. baccatum.

Although this discussion has not served to provide a solution to the predicament of how to taxonomically treat the domesticated Capsicums it may well explain part of the dilemma faced by the early taxonomists who did not recognize the difference between the taxonomic and biological species. When this is considered in light of the many varieties, cultivars, races, forms, etc., created by man the problem of developing a rational taxonomy for the plant breeder and horticulturist becomes enormous.

4. Taxonomic Treatment of Subspecific Categories

The taxonomy of subspecific categories in Capsicum presents some especially vexing difficulties. Within the wild species, several local geographical variants have been described as varieties and this seems appropriate with respect to the general use of this category.

The real difficulty is in treating the variation encountered within the domesticated taxa. The two categories most commonly used have been subspecies and variety. Although the subspecies was used extensively by Filov (Terpo, 1966) in his treatment of cultivated Capsicum it seems inappropriate since the use of this category has customarily implied a geographical constraint that is not demonstrated within the domesticated chili peppers. The term variety has been used in two quite different ways in the systematic treatment of domesticated Capsicum. One use has been to designate the wild (progenitor or weedy) and domesticated taxa as species pairs while another use has been to circumscribe each single morphological variant (Terpo, 1966) within a domesticated taxon. Although the use of variety may be appropriate in the former situation its use in the latter case may be inappropriate since for many the term variety still has geographical connotations of a somewhat smaller or more local scale.

In an attempt to deal with these difficulties several authors have developed elaborate hierarchical systems that seem to compound the problem. Jirásek (1961, 1966) developed an elaborate system employing twelve categories. Terpo (1966) used four of these terms to describe variation in C. annuum. Zhukovsky (1967) proposed a hierarchy for cultivated taxa which included six categories. Jeffrey believed (1968) that the variation encountered within a domesticated taxon could be adequately described with four basic categories and four supplemental categories to be used only in specialized situations as necessary. Harlan and de Wet (1971) envisioned a system that divided the wild and cultivated races into two subspecies with the variation of the cultivated species adequately described by four categories.

In the past decade numerical methods have been used to categorize groups of Manioc (Rogers and Fleming, 1973) and races of Maize (Goodman and Bird, 1977) with some degree of success but this methodology has not yet been applied to Capsicum.

One of the difficulties in developing a subspecific taxonomy in the genus Capsicum relates to convergent evolution within the three to five domesticated species. Subspecific classification has been based entirely on fruit shape, position, color, etc., and these characters have been altered by man in essentially the same pattern within each of the domesticates. Therefore, when morphology of the fruit is used to classify subspecific variation we encounter the problem of the fruits of several species which have evolved along parallel lines being included under a single varietal name. The morphology of C. pubescens fruits is distinct enough that varieties within this group should not be confused with various forms of the other domesticated peppers. However, the parallel development in C. annuum, C. chinense, C. frutescens, and C. baccatum has and will inevitably lead to erroneous conclusions regarding subspecific classifications. Is there an adequate solution to this predicament so that at least the workers within this genus can communicate intelligently with each other? At the present time it does not seem so. We are still unable to define the domesticated taxa to everyone's satisfaction. At the subspecific level categories are at best confused. A system such as Harlan and de Wet's (1971) is very useful although the various categories should be modified so as not to require that the concept of subspecies be interfaced where geographical parameters cannot be meaningfully invoked. Numerical methods will remain difficult to use at the subspecific level because of the very close morphological correlation of fruit characters in several of the domesticated taxa. Therefore, for the present it would seem that the best approach available for the horticulturalist and geneticist would be the use of the category cultivar with the appropriate "fancy" or common name as outlined under the International Code of Nomenclature for Cultivated Plants - 1969. To further assure each of us that we are all referring to the same material a system of race or strain numbers might prove useful. Nonetheless, such a system will be adequate for only a small sample of the known variation of the domesticated species since the vast majority of the variant material from South America has not come to the attention of plant breeders and horticulturalists. If Capsicum were a crop of the same importance of Manioc or Maize a system of subspecific taxonomy would have come into general usage long before now.

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NOVITATES ANTILLANAE . VIII

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Continuing explorations and plant collecting, first in the Dominican Republic, and actually in Puerto Rico, have yielded some species new to science and quite a number of new records for both islands. My own field work, most of the time in the company of my wife Perfa, and at the present time accompanied by Luis F. Martorell, of the Botanic Garden of the University of Puerto Rico, and the lifelong field work of Roy O. Woodbury in Puerto Rico, have contributed to the production of a revised Check-list of the Flora of Puerto Rico; at the same time, the result of my own work, both in the field and in the Herbarium on the plants of Hispaniola, will soon produce the first publication on the Flora of Hispaniola. This last project has been in progress for several years and the first part will soon be published. As for the project of the Check-list of the Flora of Puerto Rico, the preparation of the manuscripts is well advanced, and will hopefully be printed within a few months.

Although there are many more new records for the island of Puerto Rico, I cite here only the plants I have been able to study, either in Mr. Woodbury's collections, or in my own. Some new combinations are also necessary as a result of my own studies in both floras. The Herbarium at the Botanic Garden of the University of Puerto Rico is here cited as UPR, and the Herbarium of the Jardín Botánico Nacional in Santo Domingo, as SDM.

LYCOPODIACEAE.

Lycopodium clavatum L.- PUERTO RICO: In open places, Toro Negro, A. & P. Liogier, L. Martorell 28287 (UPR 006); Cerro Maravilla, A. & P. Liogier, L. Martorell 28263 (UPR 085). New record for Puerto Rico; cosmopolitan.

MARATTIACEAE.

Marattia kaufussii J. Smith - PUERTO RICO: At higher elevations, in Guilarte and Toro Negro, in upper palm forest, R. Woodbury (UPR 045). New record for Puerto Rico; tropical America.

SCHIZAEACEAE.

Lygodium venustum Sw.- PUERTO RICO: On shaded banks, Río Piedras, A. Liogier 29097 (UPR 050); La Muda, Caguas, A. & P. Liogier 29669 (UPR 049). New record for Puerto Rico; West Indies, continental tropical America.

Schizaea fluminensis Miers ex Sturm - PUERTO RICO: In wet forest, El Verde, Luquillo Mountains, Nov 1969, R. Woodbury (UPR 051). New record for Puerto Rico; Jamaica, Grenada, South America.

POLYPODIACEAE.

Polypodium repens Aubl.- PUERTO RICO: In wet forest, El Verde, Luquillo Mountains, at middle elevation, R. Woodbury (UPR 279). New to Puerto Rico; Greater Antilles, except Cuba, Lesser Antilles, Central America, northern South America.

Polytaenium urbanii (Brause) Alain, comb. nov.

Antrophyum urbanii Brause in Urb., Symb. Ant. 7: 487. 1913.

DOMINICAN REPUBLIC: Barahona, Fuertes 1497b; endemic to Hispaniola.

PIPERACEAE.

Peperomia spathulifolia Small - PUERTO RICO: Luquillo Mountains, R. Woodbury (UPR 411), also observed by him in the Cayey Mountains. A new record for Puerto Rico; Bahamas.

Piper tuberculatum Jacq.- PUERTO RICO: In a limestone ravine, S. of Florida, on road 140, R. Woodbury (UPR 454, 455). New record for Puerto Rico; Cuba, Jamaica, Hispaniola, Guadeloupe, Trinidad, Tobago, continental tropical America.

URTICACEAE.

Laportea cuneata (A. Rich.) Chew.- PUERTO RICO: In a nursery, Río Piedras Botanic Garden, A. & P. Liogier 28837 (UPR 5054). A new record for Puerto Rico; Cuba, Hispaniola.

Pilea depressa (Sw.) Blume - PUERTO RICO: An escape from cultivation: A. & P. Liogier, L. Martorell, E. Solano 30014 (UPR 517); Cerro Pandura, Yabucoa, A. & P. Liogier, L. Martorell, E. Solano 31022 (UPR 6377). New record for Puerto Rico; native of Jamaica.

OLACACEAE.

Ximeniopsis Alain, gen. nov.

Frutex, pubescentia pilis simplicibus et pilis biramosis; rami elongati, ramuli brevi in spinas desinentes; folia alterna; flores 1-2 axillares; calyx parvus, brevis, 4-dentatus, non in fructu auctus; petala 4, valvata, linearia, intus barbata; stamina 4 petalis opposita, antherae lineares, rima longitudinali dehiscentes, filamenta brevissima, libera; ovarium 3-4-loculare, stylus integer, stigma apice non ampliatus; ovula 3-4, linearia, pendula; fructus drupaceus, globosus, epicarpium tenue, endocarpium coriaceum; semina 1, endospermum carnosum. In Hispaniola crescit.

Ximeniopsis horridus (Urb. & Ekm.) Alain, comb. nov.

Ximenia horrida Urb. & Ekm. in Ark. Bot. 20 (15): 19. 1926.

HAITI: Manneville, Ekman 3065 (Typus, S); Morne Grammont, Ekman 3357; Anse à Pitre, Ekman 6699. DOMINICAN REPUBLIC: Duvergé, Howard 12120; Cabo Rojo to Las Mercedes, A. Liogier 13824 (NY); Monte Río, Azua, A. Liogier 14950 (NY); Cabo Rojo area, A. Liogier 16892 (NY); about 5 miles E of Pedernales, A. Liogier 17884 (NY); near Pedernales, A. & P. Liogier 23338 (UPR 5117), 25246 (UPR 5119), 26940 (UPR 5120); near La Descubierta, A. & P.



Fig. 1.- Ximeniopsis horridus (Urt. & Ekm.) Alain

Liogier 27476 (UPR 5118).- Fig. 1

This genus is in many aspects similar to Ximenia L.; the main differences are:

A. Stamens 4, opposite the petals; flowers 1-2; ovary cells 3-4.

Ximeniopsis.

A. Stamens 8; flowers several in a short inflorescence; ovary cells 3.

Ximenia.

I have given much thought to this plant before deciding in the establishment of a new genus; the consistency of the four stamens, the 3-4-locular ovary justify my decision. It is very strange that I. Urban in describing the species, states the number of stamens as being 8; thanks to the Curator of the Riksmuseet in Stockholm, I have been able to study the type specimen Ekman 3065, and failed to find any flower with 8 stamens.

As Urban did not describe the fruit, I shall give here its description:

Fructus (in A. & P. Liogier 25246 et 26940) globosus, luteus (in sicco nigricans), usque 14 mm diam, apice apiculatus.

LORANTHACEAE.

Eubrachion ambiguum (Hook. & Arn.) Engl.- PUERTO RICO: West slope of Monte del Estado, Maricao, R. Woodbury (UPR 584, 585). New record for Puerto Rico; Jamaica, Hispaniola, Brasil, Uruguay, Argentina.

POLYGONACEAE.

Coccoloba tenuifolia L.- PUERTO RICO: Moist coastal forest, along cliff, Quebradilla^s, R. Woodbury (UPR 666). New to Puerto Rico; Bahamas, Cuba, Jamaica.

AMARANTHACEAE.

Acnida cuspidata Bert.- PUERTO RICO: In coastal marshes, Tortuguero Lagoon, R. Woodbury (UPR 5146, 5239, 5437). New to Puerto Rico; Florida, Greater Antilles, Trinidad.

Alternanthera pungens HBK.- PUERTO RICO: In dry area, Ensenada, A. & P. Liogier, L. Martorell 29505 (UPR 699). New to Puerto Rico; United States, tropical America, southern Europe, East Indies.

NYCTAGINACEAE.

Guapira obtusata (Jacq.) Little - PUERTO RICO: Guajataca, R. Woodbury (UPR 762); Road 112, R. Woodbury (UPR 763). New to Puerto Rico; Bahamas, Cuba, Jamaica.

CAPPARACEAE.

Cleome serrata Jacq.- PUERTO RICO: Near San Sebastián, A. & P. Liogier, S. Barrett, J. Shore 30751 (UPR 5859). New to Puerto Rico; Greater Antilles, Trinidad, continental tropical Ame-

rica.

CRUCIFERAE.

Rorippa heterophylla (Blume) Williams - PUERTO RICO: Road 155, R. Woodbury (UPR 955); Cerro La Santa, Guavate, A. & P. Liogier, L. Martorell 29791 (UPR 954). New to Puerto Rico; native of tropical Asia, established in North America and the West Indies.

DROSERACEAE.

Drosera capillaris Poir.- PUERTO RICO: In sandy soil, banks of Tortuguero Lagoon, R. Woodbury (UPR 960). New to Puerto Rico; North America, Cuba, Hispaniola, Jamaica, Central America, Trinidad, British Guiana.

CRASSULACEAE.

Kalanchoë blossfeldiana Poelln.- PUERTO RICO: On roadside, near Adjuntas, escaped from cultivation, A. & P. Liogier, L. Martorell, E. Solano 30380 (UPR 3113). New to Puerto Rico; native of Madagascar, cultivated in the tropics.

Bryophyllum daigremontianum (Hamet & Perry) A. Berger - PUERTO RICO: Spontaneous after cultivation in the southwestern districts: Ensenada, A. & P. Liogier, L. Martorell 29554 (UPR 962). New to Puerto Rico; native of Madagascar, cultivated in the tropics.

Bryophyllum tubiflorum Harv.- PUERTO RICO: Cultivated and escaped; typical collection: near Tortuguero, Vega Baja, A. & P. Liogier, D. Barrett, J. Shore 30668 (UPR 5960). New to Puerto Rico; native of S. Africa and Madagascar, becoming a weed after cultivation.

PAPAVERACEAE.

Argemone alba Letisb.- DOMINICAN REPUBLIC: On slope, near Constanza, A. & P. Liogier 27658 (SDM). New to Hispaniola; North America.

LEGUMINOSAE-MIMOSOIDEAE.

Mimosa casta L.- PUERTO RICO: Common in the eastern part of the island: Loiza, R. Woodbury (UPR 1027); southwest of Fajardo, A. Liogier & L. Martorell 28032 (UPR 1025); Sierra de Cayey, A. & P. Liogier, L. Martorell 29859 (UPR 1026). New to Puerto Rico; Lesser Antilles, Panama, Colombia, Brazil.

Neptunia oleracea Lour.- PUERTO RICO: Río Jueyes, A. & P. Liogier, L. Martorell 29390 (UPR 1035). New to Puerto Rico; Cuba, Central and South America, tropical Asia and Africa.

Pithecellobium domingense Alain, sp. nov.

Frutex 3 m altus, rami patenti; ramuli teretes, patente brunneo-pilosi, iterum; stipulae lineari-lanceolatae, 1 mm longae, striolatae; folia spiraliter disposita, petiolo 2-3 mm longo,

brunneo-piloso; pinnae 1-jugae rachis inter juga glandula globosa bipartita, dorso squama lanceolata obsita; foliola in 1-3 paria subsessilia, inter sese eglandulosa, summa oblique obovata, 2-2.5 cm longa, 1-1.5 cm lata, apice rotundata vel truncata, apice ipso breviter cuspidato-apiculata, basi versus angustata basi ipsa oblique rotundata, caetera minora, ovalia vel breve obovata, nervo medio supra leviter impresso, subtus prominulo, lateralibus supra obsoletis subtus 1-3, venis laxis, levissime reticulatis, supra glabra, subtus glabrescentes et pallidiora pergamacea. Inflorescentiae ad axillas solitarias vel binae, pedunculi 2.5-6 cm longi, brunneo-pubescenti, capitulatae; flores sessiles, bractae oblongae, 5 mm longae, apice pubescentes; flores albi, glabri; calyx turbinatus, 3-3.2 mm longus, lobi minuti 0.2-0.3 mm longi, apice ciliati; corolla turbinata, 10 mm longa, lobi acuti 1 mm longi; stamina in altitudine corollae coalita, pars libera usque 1.4 cm longe exserta glabra; caetera ignota.

DOMINICAN REPUBLIC: On wooded slope, El Aguacate, Duvergé, alt 1,200 m, 25 June 1977, Alain & Perfa Liogier 27024 (Typus: SDM; Isotypus: NY).

This species is notable for its very short petiole, the 2-lobed gland, the number of pinnae in 1 pair and the number of leaflets in 1-3 pairs; these leaflets are truncate-cuspidate at the apex and present a callus at the base; not having seen the legumes, I cannot appreciate the affinities of this species. Characteristically, this plant has insect bites on the leaves, these forming galls covered with appressed brown hairs.

LEGUMINOSAE-CAESALPINIOIDEAE.

Cassia pilosa L.- DOMINICAN REPUBLIC: In woods, Loma de Cabrera, A. Liogier 27755 (UPR 1093, SDM), det. R. Barneby. New to the island of Hispaniola; Cuba, Jamaica, Central America, northern South America.

Cassia uniflora Mill.- PUERTO RICO: Ensenada, R. Woodbury (UPR 5164); A. & P. Liogier, L. Martorell 29551 (UPR 1105); waste grounds between Ponce and Adjuntas, A. & P. Liogier, L. Martorell 30243 (UPR 1552); found in the semi-dry thickets in the southwest of the island. New to Puerto Rico; Greater Antilles, Bahamas, Barbados, continental tropical America.

LEGUMINOSAE-PAPILIONOIDEAE.

Aschynomene brasiliana (Poir.) DC.- DOMINICAN REPUBLIC: Caballoña, Sabana Guabatico, A. & P. Liogier 27694 (UPR 1116, SDM). New to Hispaniola; widespread in tropical America.

Brya ebenus (L.) DC.- PUERTO RICO: From Caguas to Cayey, A. Liogier, L. Martorell, R. Woodbury & E. Solano 30457 (UPR 5642). New to Puerto Rico; Cuba, Jamaica.

Crotalaria intermedia Kotschy - PUERTO RICO: On roadsides, near

Aibonito, A. & P. Liogier, L. Martorell 28799 (UPR 1161); on roadside, between Rosario and Maricao, A. & P. Liogier, L. Martorell & E. Solano 30885 (UPR 6220). New to Puerto Rico, an escape from cultivation; native of the Old World tropics, also in Guadeloupe, Martinique, Costa Rica.

Crotalaria pallida Ait. and C. falcata Vahl ex DC.- Following C. D. Adams (Flowering Plants of Jamaica, p. 344-347. 1972), I name the common species in Puerto Rico and Hispaniola C. falcata Vahl ex DC. (C. striata of Britton and Wilson); C. pallida Ait. has been collected by me in Puerto Rico: Las Mesas, Mayagüez, A. & P. Liogier 30545 (UPR 5709), 30660 (UPR 5934).

Crotalaria spectabilis Roth.- PUERTO RICO: Las Mesas, Mayagüez, A. Liogier, L. Martorell, F. & L. Gould, E. Solano 30534 (UPR 5711). New to Puerto Rico, perhaps an escape; native of India, scattered through the tropics.

Eriosema crinitum (HBK.) D. Don - PUERTO RICO: On sandy soil, Tortuguero Lagoon, R. Woodbury (UPR 5152). New to Puerto Rico; Cuba, Hispaniola, continental tropical America.

Galactia longifolia Benth.- PUERTO RICO: On roadside, Guayama, A. & P. Liogier 29066 (UPR 1211). New to Puerto Rico; Hispaniola, Lesser Antilles.

Indigofera hendecaphylla Jacq.- PUERTO RICO: Utuado to Caonillas, A. & P. Liogier, L. Martorell 29156 (UPR 1218); Lake Carite, A. & P. Liogier, L. Martorell 29783 (UPR 1217). New to Puerto Rico, introduced as a soil improver, now a weed; native of South Africa, introduced into Florida.

Macroptilium atropurpureum (DC.) Urb.- PUERTO RICO: A weed in the Isla Verde-Piñones area, A. & P. Liogier, L. Martorell 30151 (UPR 1553). New to Puerto Rico; Cuba, Hispaniola, Central America.

Vigna hosei (Craib) Back.- PUERTO RICO: A weed in the eastern part of the island; Agronomic Station, Río Piedras, A. Liogier 27987 (UPR 1293); waste grounds, Cayey, A. & P. Liogier 29052 (UPR 1295); on roadside, Carite Forest, A. & P. Liogier, L. Martorell 29717 (UPR 1294); Bayamón, R. Woodbury (UPR 5142). New to Puerto Rico; native of Borneo and Java, sometimes planted as a soil improver, also in the Lesser Antilles.

POLYGALACEAE.

Polygala crucianelloides DC.- PUERTO RICO: Río Abajo, Utuado, R. Woodbury (UPR 1464). New to Puerto Rico; Hispaniola.



Fig. 2.- Casabitoa perfae Alain

EUPHORBIACEAE.Casabitoa Alain, gen. nov.

Frutex sarmentosus, verisimiliter dioecus; folia alterna; inflorescentiae femineae racemiformes e rami vetustiori pendentes, flores pauci brevipedicellati; bracteolae subulatae; sepala 6-8, subulata; petala nulla; discus lobulatus, lobi anguste oblongi; ovarium ovatum pilosum; styli 3, curvi, lineari, usque ad basim liberi, integri; fructus bacciformes, pyriformes, 3-loculari, semina 2 in quoque loculo, placenta centrali-apicalis; semina anguste oblonga.- Crescit in Hispaniola.

This genus is near to Phyllanthus; the main differences are: Phyllanthus is monoecious, with 4-6 calyx-lobes, the stigmas are bifid, multifid or dilated at the apex, the fruit is nearly always a capsule; in Casabitoa, the plant is dioecious, the calyx lobes are 6-8, the stigmas are simple and not dilated at the apex, the fruit is a fleshy drupe.

The generic name is given after the place where it has been collected. The plant is extremely rare, as we have seen only one very small population. In spite of a thorough search in the area, we have not been able to find male flowers.

Casabitoa perfae Alain, sp. nov.

Frutex sarmentosus, 3 m altus; rami grisei, pilosi, ramuli brunnei, dense pilosi, teretes; folia alterna, petiolo usque 4 mm longo, terete, pilosulo; lamina ovato-oblonga ad elliptica, basi rotundata vel obtusa vel truncata, apice acuminata, 5.5-15 cm longa, 3-5.5 cm lata, nervo medio supra impresso, subtus prominulo et piloso, venis utrinque prominulis, reticulatis, margine integra, plana, subcoriacea. Inflorescentiae femineae e ramis vetustioribus pendentes, racemosae, 4.5 cm longae, pilosulae, pauciflorae, pedunculo 3.5 cm longo; bracteolae subulatae, 1 mm longae; pedicelli 1 mm longi; sepala 6-8, subulata, 1.5 mm longa, extus pilosula; discus lobatus; ovarium ovoideum, 2 mm longum, 1 mm latum, pilosum, albidum; styli 3, curvati, 0.75 mm longi, lineari; fructus bacciformes, pyriformes, usque 5 cm longi, 3.5 cm lati, 3-loculares, loculi 2-seminei; semina anguste oblonga, 2.5 cm longa, 1 cm lata, laevia.

DOMINICAN REPUBLIC: In cloud forest, Alto Casabito, Bonao, 13 Oct. 1976, Alain & Perfa Liogier 25574 (Typus: UPR 5115; Isotypi: NY, US); id., 4 May 1975, A. & P. Liogier, Y. Garcia & N. Melo 23883 (UPR 5116, NY).

The specific name is given to this plant in honor of my wife Perfa, who discovered it.

Chamaesyce orbifolia Alain, sp. nov.

Suffruticosa e radice crasso, caules caespitosi, striati, rubro-brunnei usque 1.5 mm crassi, non radicantes, ad nodis incrassati, glabri, internodiis usque 1 cm longis, ramuli linea ventrali pilosuli; stipulae 0.4 mm longae, triangulares, margine fimbriatae; fo-



Fig. 3.- Chamaesyce orbifolia Alain

lia usque 1 mm longe petiolata, suborbicularia vel elliptica vel subreniformia, basi rotundata vel subcordata, apice rotundata vel submarginata, usque 5 mm longa et 6 mm lata, nervo medio utroque latere inconspicuo, lateralibus nullis, margine integra incrassata obsolete recurva; superficie glabra, coriacea. Involucra ad apicem ramorum vel in axillis superioribus solitaria, usque ad 2 mm longe pedunculata, turbinata, glabra, 0.8 mm longa, basi acuta, intus ad faucem pilosa, lobi primarii triangulares, ciliati, glandulae transverse ellipticae, in sicco brunneae, 0.6 mm latae, appendice antica subnulla; styli 1 mm longi usque ad medium bifidi; ramis apice paullum dilatatis; capsulae nutantes valde exsertae 1.5 mm diametro, obtuse triangulares, glabrae; semina anguste ovata, grisea, transversim leviter rugulosa, 4-angula, angulo dorsali magis, ventrali minus prominente, ventrali sulcata, 1 mm longa, 0.6 mm lata.

MONA ISLAND, PUERTO RICO: On limestone plateau, near lighthouse, Feb. 22-24, 1968, R. Woodbury, L.F. Martorell & J. García 235 (Typus: UPR 5107; Isotypi: NY, US, GH).

This species is readily identified by its leaf-shape, its long-exserted capsule, its grayish seeds, its small stipules, toothed at the apex. It could be considered to belong to the Chamaesyce cowellii complex. C. cowellii Millsp. has much smaller leaves, the stipules are fringed near to the base, the leaves are not suborbicular and are thinner.

Croton stenophyllus Griseb.- PUERTO RICO: Piñeros Island, R. Woodbury (UPR 1640). New to Puerto Rico; Cuba.

Phyllanthus cuneifolius (Britt.) Croizat

A recent collection (Liogier 30794) of the plant named by Britton Andrachne (?) cuneifolia has both staminate and pistillate flowers; this enables me to determine the correct genus to which it belongs. The 3 filaments united forming a column, the 6-7 imbricate calyx-lobes, the 6-7 glands forming the disk in the staminate flowers, the cupuliform disk in the pistillate flowers, the 3 bifid styles, all point toward Phyllanthus. Contrary to Grady Webster's note in Journ. Arn. Arbor. 39: 208. 1958, this plant has to be named Phyllanthus cuneifolius (Britt.) Croizat, Journ. Wash. Acad. Sci. 33: 12. 1943. (Andrachne (?) cuneifolia Britton, Mem. Torr. Bot. Club 16: 72. 1920).

Add to the description: (See also Urban I.- Ark. Bot. 20 (15): 44. 1926.)

Planta monoica. Flores masculi usque 1 cm longe pedicellati; calyx 0.8 mm longus, lobi 6-7, basim 0.3 mm longe coaliti, caetera liberi imbricati viridi, apice in appendice brunneo suborbiculari 0.1 mm longo abrupte contracti; disci glandulae 6-7, inter calycis lobi disposita; stamina 3, filamenta in columna 0.3 mm longa coalita; antherarum loculi longitrorsum rimosi.

Recent collections: A. & P. Liogier 29570, pistillate flowers,



Fig. 4.- Allophylus domingensis Alain

and A. & P. Liogier 30794, staminate and pistillate flowers, both collections from the serpentine barrens, Susua, Puerto Rico.

I have also collected this plant in barren state in the Dominican Republic, between Oviedo to Los Salados, in the Pedernales Peninsula, A. Liogier 17005, sterile.

Phyllanthus debilis Klein ex Willd.- PUERTO RICO: Occasional as a weed in the San Juan area; representative specimens: Botanic Garden, Río Piedras, A. Liogier 28698 (UPR 1692), 28890 (UPR 1691). New to Puerto Rico; native of southern Asia and Ceylon, introduced into Guadeloupe, Indonesia and the Pacific Islands.

AQUIFOLIACEAE.

Ilex krugiana Loes.- PUERTO RICO: Aguada, Rincón, R. Woodbury (UPR 1760). New to Puerto Rico; Bahamas, Hispaniola.

SAPINDACEAE.

Allophylus domingensis Alain, sp. nov.

Frutex 2.5 m altus, ramosissimus, rami hornotini dense adpresse albido- vel ferrugineo-puberuli, vetustiores nigrescentes lentice- llosi; folia 1-foliolata, foliolum (petiolo 2-4 mm long^o, supra applanato vel leviter canaliculato, puberulo), ellipticum, basi obtusum vel acutiusculum, apice obtusum vel acutum, nervo medio supra leviter impresso, subtus prominulo, lateralibus utroque late- re 6-8 supra albidis applanatis vel prominulis, subtus prominulis, ad marginem anastomosantibus, venis supra nullis, subtus paucis, laxe reticulatis, coriaceum, margine denticulatum, supra in sicco obscure brunneum, subtus pallidum, glabrum, in nervorum axillis barbatum, minute glanduloso-punctatum; inflorescentiae axillares, 2.5-3 cm longae, graciles, puberulae, simplices, pedunculo usque 8 mm longo; pedicelli 1-2 mm longi; flores albi 1.5-2 mm diam; se- pala orbicularia margine glanduloso-ciliolata, albida; petala ve- rosimiliter nulla; filamenta glabra; fructus ignotus.

DOMINICAN REPUBLIC: In forest on limestone rocks, Cañada de Cayo, Aceitillar, Pedernales, Jul 24-25, 1973, Alain & Perfa Liogier 19612 (Typus: UPR 5111; Isotypus: NY).

This plant is to be considered as belonging to the A. crassinervis Radlk. group. The small leaves with lax reticulation, the lateral nerves anastomosed at the margin, the absence of petals, the glabrous filaments are the main distinguishing characters.

A. crassinervis has a different aspect, the branchlets are longer, not blackish, and the leaves are green on the upper side, pale green underneath; its flowers are larger and have white petals. Unfortunately, I have not been able to collect the fruits.

Allophylus montanus Alain, sp. nov.

Frutex 2-3 m altus, rami erecti cortice griseo vel subfusco, striato; ramuli puberuli; folia 3-foliolata, petiolo usque 1.5 mm longo; foliola 3 elliptica, obovata vel oblongo-elliptica, apice obtusa vel subacuta, basi versus angustata, basi ipsa acutata se-



Fig. 5.- Talisia jimenezii Alain

ssilia, intermedium 3.5-6 cm longum, 1.5-3 cm latum, laterales 1.8-3 cm longa, 1-2 cm lata, omnia in medio distale valde dentata, supra nervis albis prominulis, utroque latere 5-9, subtus pallide viridis prominulis, venis laxe reticulatis, subchartacea, supra in sicco brunnea nitida, subtus pallida, glabra, vel subtus nervo medio pulverulento; racemi axillares, usque 5 cm longi, puberuli pauciflori; bracteae subulatae, pilosae, 0.5 mm longae; sepala subulata, 0.4 mm longa, extus pilosa; petala non visa; ovarium globosum, glabrum, 0.2 mm diam; fructus (in Liogier 13787) globoso-ovoideus, 7 mm longus, 6.4 mm latus, brunneus, rugulosus.

DOMINICAN REPUBLIC: In woods, in a ravine, Hoyo de Pelempito, Pedernales, alt 900 m, 3-8 Jul 1971, Alain H. Liogier 18147 (Typus: NY; Isotypus: SDM); id., A. Liogier 13787 (NY).

This species is considered close to Allophylus haitiensis Radlk. & Ekm., which is distinguished by its glabrous branchlets, its leaflets up to 11 x 4.5 cm, the lateral nerves 8-12; the inflorescence is 6-7 cm long, the flowers are pedicellate and 2 mm in diameter.

Talisia jimenezii Alain, sp. nov.

Arbor 8 m alta glabra, rami teretes longitudinaliter striati, juniores rubro-brunnei; folia pari-pinnata, (petiolo 2.5-3 cm longo longitudinaliter striato supra applanato); foliola plerumque 4, opposita, sessilia, elliptica vel late elliptica, basi rotundata vel acuta, apice rotundata vel obtuse subcuspidata, 4-9 cm longa, 2-4.5 cm lata margine integra recurvata, nervo medio supra in sulco prominulo, subtus valde prominente, lateralibus utroque latere 8-12, utrinque prominulis ad marginem anastomosantibus, venis reticulatis, chartacea. Inflorescentiae axillares, 5-6 cm longae, glabrae; pedicelli 1 cm longi; calyx ut videtur leviter lobatus, in fructo 1 mm latus, glaber; petala non visa; discus lobatus glaber; fructus juvenili tantum visi, ellipsoidei apice stylo brevi coronati, ut videtur 1.8 cm longi, 1.2 cm lati glabri, superficie rugosi.

DOMINICAN REPUBLIC: In coastal thickets, Bayajibe, La Romana, at sea level, Oct 2, 1976, Alain & Perfa Liogier, & J.J. Jiménez 25442 (Typus: UPR 5113; Isotypus: NY); id. Feb. 21, 1976, Alain & Perfa Liogier 24886, sterile (NY, UPR 5112)

This plant has been named by José J. Jiménez Talisia oliviformis (HBK.) Radlk. The most obvious differences are in this last species: the petiolulate leaflets, the densely tomentose inflorescences, the sepals acute and tomentose outside, the fruits densely pale tomentulose. This is the first record of the genus in the West Indies, an obvious link with the vegetation in northern South America and in Central America.

Curiously, this plant has the same vernacular name in the Dominican Republic and in Venezuela for Talisia oliviformis: COTOPERI, or COTOPERIZ.



Fig. 6.- Pereskia quisqueyana Alain

MALVACEAE.

Sida javensis Cav. emend. Borss. ssp. expilosa Borss.- PUERTO RICO:

A weed at lower and middle elevations; this plant was named by Britton & Wilson (Sci. Surv. Puerto Rico & Virg. Isl. V: 553. 1924) Sida humilis Cav., with some doubt. My own collections are: In forest, Guajataca gorge, A. & P. Liogier, L. Martorell E. Solano 30374 (UPR 3120); in thickets, Punta Vacía Talega, A. & P. Liogier, L. Martorell, E. Solano 30177 (UPR 2262); Cabeza Chiquita, Fajardo, A. & P. Liogier, L. Martorell, E. Solano 30091 (UPR 1988); in forest, Las Tetás, Cayey, A. & P. Liogier, L. Martorell 28475 (UPR 1989); above Cayey, A. & P. Liogier, L. Martorell 29051 (UPR 1990); scattered through the tropics.

HYPERICACEAE.

Hypericum ekmanii Alain, sp. nov.

Perennis lignosum usque 75 cm altum, glabrum, e radice crassa lignosa usque 1 cm crassa; caulis ramosus, rami ascendentes, striatis binis e foliorum basi decurrentibus bianguli; folia oblonga vel subrhombea, apice acuta, basi versus in petiolum brevem (usque 1 mm longum) angustata, 7-9 mm longa, 2 mm lata, uninervia, nervo medio supra leviter impresso subtus prominulo, margine in sicco incurva, pellucido-punctata; flores in apice ramorum solitarii pedicelli 3-10 mm longi striati, complanati viridi vel brunnei; sepala aequalia, oblongo-linearia, apice acuta vel breve acuminata, usque 6 mm longa, 1-2 mm lata, inferne striata, superne pellucido-punctata, erecta; petala flava obovato-oblonga, usque 8 mm longa, 2 mm lata; stamina numerosa, libera, filamenta 3-4 mm longa, antherae orbiculatae 0.2 mm diam; styli 3, liberi, 3-8 mm longi; capsula oblonga, 3-4 mm longa, 2 mm lata, apiculata; semina lineari-oblonga, 1.2 mm longa, 0.3 mm lata, longitudinaliter et transversim striata, foveolata, pallide brunnea.

DOMINICAN REPUBLIC: On slope, in cloud forest, La Nevera, San José de Ocoa, alt 2000 m, Jun 9, 1978, Alain & Perfa Liogier 27672 (Typus: SDM); San José de Ocoa, Ekman 11718 (S).

This species is similar to H. christii Urb.; this last species differs in having only 10 stamens, the leaves are 2-5 mm long and the petals 4 mm long.

CACTACEAE.

Pereskia quisqueyana Alain, sp. nov.

Frutex 3-4 m altus, glaber; truncus usque 10 cm diam; rami hornotini in sicco striati pallide brunnei 3-4 mm diam; areolae paucae tomentosae, aculei pauci usque 2 cm longi, recti, fusci; folia elliptica vel obovato-elliptica vel oblanceolata, 4-6 cm longa, 1-2 cm lata, apice et basi acuminata, nervo medio supra obsoleto, subtus praesertim ad basim prominulo, minutissime glanduloso-punctata margine integra plana, in sicco membranacea; flores axillares solitarii; ovarium turbinatum, 8 mm longum et latum, areolis paucis non aculeatis obsitum, truncatum; petala roseo-rubra usque 2.2 cm longa, glabra, apice valde emarginata. Fructus igno-



Fig. 7.- Eugenia wodburyana Alain

tus.

DOMINICAN REPUBLIC: In coastal thickets, on limestone rocks, Bayahibe, La Romana, Jul 9, 1977, Alain H. Liogier 27032 (Typus: UPR 5114; Isotypi: NY, US).

This species is somewhat similar to Pereskia zinniifolia DC., from Mexico; this past species presents smaller leaves (up to 4 cm long), the flowers all terminal and larger (5 cm wide, against 4 cm in our species). As stated by Britton & Rose (The Cactaceae I: 21. 1920), P. zinniifolia is little known.

LYTHRACEAE.

Cuphea carthagenensis (Jacq.) Mcbr.- PUERTO RICO: A weed at lower and middle elevations; typical collections: Río Mar, Luquillo, A. & P. Liogier, L. Martorell 28195 (UPR 2253); at the base of Luquillo Mountains, A. Liogier, L. Martorell 28501 (UPR 2252); Florida, R. Woodbury (UPR 2255); coastal wet area, San Juan, R. Woodbury (UPR 2256). New to Puerto Rico; a native of South America, now a weed in tropical and subtropical America, Hawaii, Fidji, the Philippines, Okinawa.

MYRTACEAE.

Eugenia woodburyana Alain, sp. nov.

Arbor parva, usque 6 m alta; rami hornotini grisei minute puberuli, applanati, vetustiores tereti ad nodos incrassati; folia petiolo 1-2 mm longo, puberulo supra sulcato obovata vel elliptica, apice rotundata, basi angustata et in petiolum contracta, 1.5-2 cm longa, 1-1.5 cm lata, nervo medio supra applanato vel basim versus leviter impressus, subtus prominente, ad apicem evanescente, lateralibus utroque latere 5-8 supra prominulis a margine 1-2 mm anastomosantibus, subtus vix prominulis, margine plana leviter incrassata, plus minus ciliolata, supra nitentia obscure viridia, subtus pallida, glanduloso-punctata glabra chartacea; inflorescentiae axillares, abbreviatae 1-5-florae, pilosulae; pedunculi 1-3 mm longi; bracteae late ovatae 0.6 mm longae, ciliatae; calycis lobi 4, majores elliptici 4 mm longi, 3 mm lati, minores suborbiculares 3 mm longi, omnes pilosuli glanduloso-punctati margine ciliati; hypanthium obconicum, 8-costatum, pilosulum, petala suborbicularia, albidia, 4 mm longa, 3.5 mm lata, glanduloso-punctata glabra; filamenta 5-6 mm longa, antherae ovato-rectangulares; ovarium 2-loculare; fructus globosus, longitudinaliter anguste 8-alatus, pilosulus, dense glandulosus, 2 cm longus et latus.

PUERTO RICO: In thickets on limestone, Guánica, Oct. 31, 1977, R. Woodbury (UPR 5108), specimen A (Typus: UPR; Isotypi: NY, US, GH); other specimens, from the same locality, presumably the same tree and the same collector: Specimen B (UPR 5110), flowers, May 1976; Specimen C (UPR 5109), barren, Feb. 1977.

A striking species for its 8-winged fruit. Specimens B and C have leaves up to 4 x 2.5 cm; Specimen C has leaves pilose on



Fig. 8 .- Myrciaria borinquena Alain

both faces.

Myrciaria borinquena Alain, sp. nov.

Verisimiliter arbor parva glabra; rami hornotini compressi grisei glandulosi, vetustiores teretes striati cortice fisso; folia (petiolo 6-8 mm longo supra canaliculato) ovata vel elliptica, basi rotundata vel obtusissima, apice acuminata vel raro rotundata, 4-8 cm longa, 3.5-4.5 cm lata, nervo medio supra ad basim vix impresso, subtus prominulo, lateralibus utroque latere 16-20 in sicco utrinque prominulis, ad marginem anastomosantibus, glandulis pellucidis obsita opaca, margine integra, chartacea. Inflorescentiae plerumque 4-florae valde abbreviatae ad ramos vetustiores sessilia, bracteae ovato-oblongae, membranaceae, 1 mm longae, glandulosae, bracteolae connatae, 1 mm longae; hypanthium supra germen 1.5 mm productum, discus 4 mm latus glaber; calycis lobi 2.5 mm lati; petala orbiculata 2 mm longa et lata glandulosa margine leviter fimbriata; stamina numerosa, antheris 0.3 mm longis; fructus non visus.

PUERTO RICO: Ranchos Guayama, Feb. 2, 1978, R. Woodbury (UPR 5103), Specimen A (Typus: UPR; Isotypi: NY, US, GH); id. Jan. 1978, sterile, R. Woodbury (UPR 5106), Specimen B; Coamo area, rd. 155, Km. 25, May 1977, R. Woodbury (UPR 5104), Specimen C; Coamo, May 1978, R. Woodbury (UPR 5105), Specimen D.

Among the species known from tropical America in this genus, this one is nearest to M. vexator McVaugh, by its total absence of pubescence; it is distinguished from it by its smaller and pellucid-dotted leaves, its fimbriate petals, its connate bracteoles, forming a cup subtending each flower.

Psidium insulanum Alain, sp. nov.

Verisimiliter frutex; rami hornotini subcompressi, rubri, pilosuli; vetustiores grisei cortice fisso; folia (petiolo 1-2 mm longo supra applanato glabro glanduloso) elliptica vel elliptico-ovata apice rotundata vel submarginata saepe mucronulata, basi rotundata vel obtusissima, nervo medio rubro, supra prominulo subtus praesertim basim versus valde prominente, lateralibus utroque latere 4-6 ad marginem anastomosantibus, utrinque prominulis, venis reticulatis, glabra, supra nitida viridia, subtus vix opaca pallidiora, margine integra coriacea. Pedunculi axillares solitarii, 3 cm longi ad apicem leviter incrassati; bracteolae ad apicem pedunculi ellipticae vel ovatae 1.5 mm longae glabrae; fructus globulosus 6 mm longus 5 mm latus glaber, 3-locularis; calycis lobi ovati usque ad 3 mm longi glabri glandulosi.

VIEQUES ISLAND, PUERTO RICO: East Point, May 24 1978, R. Woodbury (UPR 5101) (Typus: UPR; Isotypus: NY).

This species can be placed near P. brevifolium Alain, from the Dominican Republic, which is glabrous, has sessile leaves, the pedicels are much shorter (6-7 mm long), the fruit larger (up to 13 x 8 mm), the calyx lobes semi-orbicular, 2 mm long.



Fig. 9.- Psidium insulanum Alain

MELASTOMATACEAE.

Miconia virescens (Vahl) Triana - PUERTO RICO: In forest, Toro Negro, R. Woodbury (UPR 2594). New to Puerto Rico; Hispaniola, Lesser Antilles, Venezuela.

Pterolepis glomerata (Rottb.) Miq.- PUERTO RICO: Maravilla area, Toro Negro, Rd. 143, R. Woodbury (UPR 3275); Lago Guineo, Alt. 900 m, A. Liogier, F. & L. Gould, E. Solano 30583 (UPR 5700). New to Puerto Rico; Hispaniola, some of the Lesser Antilles, tropical South America.

ONAGRACEAE.

Ludwigia decurrens Walt.- PUERTO RICO: In a stream, San Lorenzo, R. Woodbury (UPR 2643). New to Puerto Rico; tropical and subtropical America.

MYRSINACEAE.

Ardisia solanacea Roxb.- PUERTO RICO: Planted for ornament and naturalized in the western half of the island; Guajataca Camp, A. & P. Liogier, L. Martorell 28680 (UPR 2719). New to Puerto Rico; native of India, cultivated in the tropics.

GENTIANACEAE.

Leiphalmos parasitica Schl. & Cham.- PUERTO RICO: In forest, near Arecibo, R. Woodbury (UPR 2832); Tortuguero, Vega Baja, R. Woodbury (UPR 5441). New to Puerto Rico; Florida, Bahamas, Greater Antilles, Mexico.

CONVOLVULACEAE.

Aniseia martinicensis (Jacq.) Choisy - PUERTO RICO: In swampy area, Lake Tortuguero, Vega Baja, R. Woodbury 5573 (UPR 5205). New to Puerto Rico; Florida, West Indies, Panama, northern South America.

Ipomoea aquatica Forsk.- PUERTO RICO: In ponds and marshes, Piñero Island, R. Woodbury (UPR 2914).- New to Puerto Rico; native of the East Indies, cultivated and escaped in the tropics.

BORAGINACEAE.

Heliotropium saonae Alain, sp. nov.

Herba caespitosa ad nodos radicans; caules filiformes pilis albidis laxe pilosi; folia alterna, petiolo 1-2 mm longo, piloso, lamina elliptica vel ovato-elliptica, basi obtusa vel cuneata, apice acuta, 1.5-2.2 mm long, 0.8-1.5 mm lata, integra margine plana, nervio medio supra obsoleto, subtus basim versus praesertim prominulo, lateralibus nullis, venis in sicco saepe minute reticulatis, utrinque pilis albidis strigosa; flores solitarii axillares; pedicelli in anthesi brevi 1 mm longi, in fructo valde elongati, usque 1.5 cm longi; calycis lobi subulati 1 mm longi strigosi; corolla alba 6 mm longa, tubus pars inferiori 2 mm longa angusta, superne dilatatus, pilosus, lobi 5 obovati 3 mm longi 1.5 mm lati;

stamina 5 ad corollam adnata in corollae parte dilatata affixa, 0.8 mm longa, filamenta nulla; fructus 4-coccus verisimiliter in maturitate hypogaeus, cocci sphaerici 1 mm diam.

DOMINICAN REPUBLIC: Saona Island, in open thickets, on limestone, Mano-Juan, at sea level, Nov. 30 - Dic. 1, 1977, Alain & Perma Liogier, José J. Jiménez 27223 (Typus: UPR 5102).

This species is very distinct by its 4-lobed fruit, the lobes spherical, the corolla very narrow at the base, dilated toward the apex, the lobes spreading. It resembles in habit to H. lagoense (Warm.) Gürcke (H. antillanum Urb.), whose flowers are long-pedicelled, the fruits are beaked and not hypogaeous.

LABIATAE.

Satureja viminea L.- PUERTO RICO: In serpentine barrens, Susúa State Forest, R. Woodbury (UPR 3231). New to Puerto Rico; Greater Antilles.

SCROPHULARIACEAE.

Veronica peregrina L.- PUERTO RICO: On roadside, in the Cerro Maravilla area, A. & P. Liogier, L. Martorell 28915 (UPR 3395). New to Puerto Rico; native of North America, naturalized in Bermuda, the Bahamas, Hispaniola.

ACANTHACEAE.

Barleriola solanifolia (L.) Oerst.- PUERTO RICO: Coastal hills, near Manatí, R. Woodbury (UPR 3466); Mar Chiquita, R. Woodbury (UPR 5156). New to Puerto Rico; Cuba, Hispaniola.

RUBIACEAE.

Randia parvifolia Lam.- MONA ISLAND, PUERTO RICO: On dry limestone; cultivated in the Botanic Garden, Río Piedras, A. Liogier 28840 (UPR 3395). New to the Flora of Puerto Rico and the adjacent islands; Hispaniola.

CUCURBITACEAE.

Anacaona Alain, gen. nov.

Scandens, monoicus, pilis articulatis obsitus et minute tomentosus; folia 3-5-lobata, cirrhi 3-partita; flores masculi in axillis fasciculati; calyx campanulatus, lobi basi connati; corolla subcylindrica, lobi alte connati; stamina 3 e columna basali libera, antherae sigmoideo-flexuosae, staminodia nulla; flores feminei solitarii, sepala usque ad basim libera, petala 5, in alabastro connata, in aestivatione ad basim libera; staminodia nulla; ovarium ovoideum, 3-loculare; styli 3, bifidi, incurvi, rama altera una longiora; ovula numerosissima, horizontalia; fructus sphaericus, indehiscens, exocarpium coriaceum, semina nulla horizontalia, elliptica. Crescit in Hispaniola.

This genus is similar to Posadaea Cogn., from Central America; the main difference is in the petals, which in Posadaea are free



Fig.10.- Anacaona sphaerica Alain

to the base in the staminate flowers; the pistillate flowers have three staminodia in Posadaea, and the stigmas are entire and obcordate, reflexed. Anacaona is peculiar in having the stigmas bifid, with the unequal branches incurved. Anacaona is the name of a famous Indian Queen, at the time of the discovery and the conquest of the Island of Hispaniola, or Quisqueya.

Anacaona sphaerica Alain, sp. nov.

Alte scandens, 8-10 m alta, monoica; rami graciles, pilis articulatis obsiti et minute pilosi, in maturitate longitudinaliter sulcati; petiolus gracilis 4-5 cm longus dense pilis articulatis obsitus; folia plerumque 3-5-lobata basi profunde cordata, sinus rotundatus, 5-8 cm longa, 5-7 cm lata, e basi 3-5-nervia, nervis supra pallidis applanatis subtus prominulis, venis subtus laxe reticulatis, supra pilosa et tomentosa, subtus dense albido-pilosa, margine minute et remote dentata, lobi mucronati, membranacea; cirrhi 3-ramosi. Flores masculi in axillis fasciculati; pedicelli usque ad 1 cm longi pilosi; calyx campanulatus, extus pilosus, 1 cm longus, lobi ovati usque 2 mm a basi liberi, acuminati; corolla pallide viridis, subcylindrica 1 cm longa, lobi alte coaliti apice acuti vel acuminati, extus pilosa; stamina 3 ad basim coalita, columna glabra, antherae sigmoideae, staminodia nulla; flores feminei in axillis solitarii, sepala 5 ovato-oblonga, 8 mm longa 4 mm lata, apice acuta, extus pilosa; petala in alabastra coalita, in aestivatione 5 mm longa, ovata; ovarium ellipsoideum, 3 mm longum, 2 mm latum, pilosum; fructus sphaericus vel paullo applanatus, usque ad 7 cm diam, laevis, viridis vel luteus; semina multa, horizontalia, elliptica 6 mm longa, 3 mm lata.

DOMINICAN REPUBLIC: Along Tablones River, Ciénaga de Manabao, Jarabacoa, alt 1,000 m, Mar 16, 1977, Alain H. Liogier 26588 (Typus: UPR 5121; Isotypi: NY, US); id., Aug. 14, 1968, A. Liogier 12074 (NY, pistillate flower); Loma Campanario, Ciénaga de la Culata, Constanza, alt. 1650-1850 m, A. Liogier 16072 (NY) in fruit.

Psiguria trifoliata (L.) Alain, comb. nov.

Anguria trifoliata L., Sp. Pl. ed. 2, 1376. 1763.

Anguria cookiana Britt. in Britt. & Wils., Sci. Surv. Puerto Rico & Virgin Islands 6: 267. 1925.

I here reduce Anguria cookiana Britt. to the synonymy of Psiguria trifoliata; the few differences are well within the variability of this last species, known also from Hispaniola, and are in agreement with the specimens from that island.

LOBELIACEAE.

Lobelia salicina Lam.- PUERTO RICO: MONA ISLAND: On limestone rocks, facing the sea, R. Woodbury & J. yivaldi (UPR 3809). New to the Flora of Puerto Rico; Cuba, Hispaniola. This is an interesting ecological stunted form, due to exposure to the sun and salt spray.

COMPOSITAE.

Aster subulatus Michx. var. cubensis (DC.) Shinnars (A. exilis Ell.).- PUERTO RICO: Frequent as a weed in the wet parts of the island; typical collections: Cerro Maravilla, A. & P. Liogier, L. Martorell 28241 (UPR 3821), 28946 (UPR 3822); Punta Comején, Río Grande, A. & P. Liogier, L. Martorell 29212 (UPR 2823); Tortuguero Lagoon, Vega Baja, R. Woodbury (UPR 5147). New to Puerto Rico; southeastern United States, Bahamas, Greater Antilles, Mexico.

Centratherum punctatum Cass.- PUERTO RICO: Cultivated and escaped in wet parts; typical collections: Trujillo Alto, A. & P. Liogier 28490 (UPR 3834); Caonillas, A. & P. Liogier, L. Martorell 29161 (UPR 3833). New to Puerto Rico; native of Brazil.

Crepis japonica (L.) Benth.- PUERTO RICO: A weed, now generalized in many areas, mostly in wet regions; typical collections: Botanic Garden, Río Piedras, A. Liogier 28775 (UPR 3860), 27910 (UPR 3861); on roadsides, near Adjuntas, A. & P. Liogier, L. Martorell 30249 (UPR 3859). New to Puerto Rico; native of Asia, naturalized and becoming a weed in the Greater Antilles, and in tropical America.

Taraxacum officinale Weber - PUERTO RICO: A weed in Cerro Maravilla, Cordillera Central, A. Liogier, F. & L. Gould 30581 (UPR 5779). New to Puerto Rico; native of north temperate countries, now widespread.

GRAMINEAE.

Agrostis hyemalis (Walt.) B.S.P.- PUERTO RICO: On top of Cerro de Pontita, Jayuya, A. & P. Liogier, L. Martorell 28948 (UPR 4069); id. F. W. Gould, A. Liogier, E. Solano 15856 (UPR 6027). New to Puerto Rico; eastern United States, Hispaniola.

Brachiaria echinulata (Mez) Parodi - PUERTO RICO: On roadside, San Santa Isabel, A. & P. Liogier, L. Martorell 29380 (UPR 4107). New to Puerto Rico; West Indies, to Bolivia and Paraguay.

Brachiaria plantaginea (Link) Hitchc.- PUERTO RICO: Common weed in the whole island; typical collections: Sabana Grande, A. & P. Liogier, N. Melo 29584 (UPR 4117); El Yunque, Luquillo Mts., A. & P. Liogier, L. Martorell 29282 (UPR 4118); in cane fields, Toa Baja, A. & P. Liogier 28646 (UPR 4119); Botanic Garden, Río Piedras, A. Liogier 28627 (UPR 4120); between Caguas and Carite, F. W. Gould with R. Woodbury, L. Martorell, E. Solano 15752 (UPR 6046); Mayagüez, F. W. Gould 15821 with A. Liogier, L. Martorell, E. Solano (UPR 6208). New to Puerto Rico, introduced as a pasture, now widespread; United States to Argentina.

Brachiaria ruzizlensis R. Germain & C. Evrard - PUERTO RICO: Introduced as a pasture, now a weed; typical collections: Jardín

Botánico, Río Piedras, F. W. Gould & L. Martorell 15737 (UPR 6043); Las Mesas, Mayagüez, A. & P. Liogier, S. Barrett & J. Shore 30657 (UPR 5059); id. A. & P. Liogier, E. Solano 30918 (UPR 6257). - New to Puerto Rico; native of tropical Africa.

Brachiaria subquadripara (Trin.) Hitchc. - PUERTO RICO: On roadside, Santa Isabel, A. & P. Liogier, L. Martorell 29385 (UPR 4125); Mayagüez, F. W. Gould 15798, with A. Liogier, L. Martorell, E. Solano (UPR 6045); Laguna Tortuguero, Vega Baja, F. W. Gould 15704, with R. Woodbury, L. Martorell, E. Solano (UPR 6040); Laguna Cartagena, F. W. Gould & A. Liogier 15845 (UPR 6044); Río Piedras Experimental Station, F. W. Gould & L. Martorell 15735 (UPR 6042). New to Puerto Rico; Cuba; native of India, used as a pasture.

Cynodon nlemfuensis Vanderhyst - PUERTO RICO: Introduced as pasture, and weedy in the island; Jardín Botánico, Río Piedras, F. W. Gould 15730 (UPR 6091). - New to Puerto Rico; native of tropical Africa.

Dactylis glomerata L. - PUERTO RICO: On top of Cerro de Punta, Jayuya, A. & P. Liogier, L. Martorell 28928 (UPR 4158). - New to Puerto Rico; native of Europe, introduced into the United States and Jamaica.

Dichanthelium dichotomum (L.) Gould - PUERTO RICO: In white sand area, Tortuguero Lagoon, Vega Baja, R. Woodbury (UPR 4171). New to Puerto Rico; southeastern United States, Mexico, Bahamas, Cuba, Hispaniola.

Dichanthelium ovale (Ell.) Gould & Clark var. addisonii (Nash) Gould & Clark - PUERTO RICO: Laguna Tortuguero, Vega Baja, F. & L. Gould, L. Martorell, E. Solano 15705. New to Puerto Rico; eastern, Central and southern United States, Mexico.

Dichanthium aristatum (Poir.) C.E. Hubb. - PUERTO RICO: Mayagüez, F. W. Gould 15820 with A. Liogier, L. Martorell, E. Solano (UPR 5982); Experimental Station, Río Piedras, A. Liogier 30143 (UPR 5080); Buchanan, R. Woodbury (UPR 5144); Ramos Isl., R. Woodbury & L. Martorell (UPR 5143). New to Puerto Rico; warmer regions of the Old World, introduced into America.

Digitaria bicornis (Lam.) R. & S. - PUERTO RICO: Río Loiza, A. & P. Liogier, L. Martorell, E. Solano 30219 (UPR 4179); Sabana Grande, A. & P. Liogier, N. Melo 29582 (UPR 4178); Cabeza Chiquita, Fajardo, A. & P. Liogier, L. Martorell, E. Solano 30122 (UPR 5843); Río Jueyes, A. & P. Liogier, L. Martorell 29450 (UPR 4180); Punta Comején, Río Grande, A. & P. Liogier, L. Martorell 29207 (UPR 4181); Susua Forest, A. & P. Liogier, N. Melo 29590 (UPR 4182); Coamo Dam, A. & P. Liogier, L. Martorell 29425 (UPR 4183); Laguna Cartagena, F. W. Gould & A. Liogier

15847 (UPR 5989), 15844 (UPR 5995). New to Puerto Rico; tropics and subtropics of the World.

Ichnananthus tenuis (Presl) Hitchc. & Chase - PUERTO RICO: Cerro de Pandura, Yabucoa, A. & P. Liogier, L. Martorell 30977 (UPR 6327). New to Puerto Rico; Trinidad, Central America, Colombia.

Lasiacis grisebachii (Nash) Hitchc. var. grisebachii - PUERTO RICO: Las Mesas, Mayagüez, F. W. Gould, A. Liogier, L. Martorell, E. Solano 15822 (UPR 6013). New to Puerto Rico; Mexico, Honduras, Cuba.

Leptochloa panicoides (Presl) Hitchc.- PUERTO RICO: Río Piedras, F. W. Gould & L. Martorell 15738 (UPR 6068). New to Puerto Rico; south-central United States, Mexico and Central America, Brazil.

Lolium perenne L.- PUERTO RICO: On top of Cerro de Punta, Jayuya, A. & P. Liogier, L. Martorell 28926 (UPR 4297); id. F. W. Gould 15851 with A. Liogier & E. Solano (UPR 6066). New to Puerto Rico; native of Europe, introduced into the New World, mostly in North America.

Panicum dichotomiflorum Michx.- PUERTO RICO: Lajas to Cabo Rojo, A. & P. Liogier, N. Melo 29613 (UPR 4308); Sierra de Cayey, A. & P. Liogier, L. Martorell 29908 (UPR 4309). New to Puerto Rico; United States to Argentina.

Paspalum arundinaceum Poir. in Lam.- PUERTO RICO: Near Guavate, F. W. Gould 15760, with R. Woodbury, L. Martorell, E. Solano (UPR 6052). New to Puerto Rico; West Indies, Central America, French Guiana, Brazil.

Paspalum dispar Chase - PUERTO RICO: In open places, Cerro La Santa, A. & P. Liogier, L. Martorell 29812 (UPR 4353); Orocovis to Morovis, A. Liogier 30060 (UPR 4352). New to Puerto Rico; Hispaniola.

Paspalum fasciculatum Willd.- PUERTO RICO: Introduced as a pasture and becoming a weed; typical collections: Botanic Garden Río Piedras, A. Liogier 29558 (UPR 4360); Experimental Agronomic Station, Río Piedras, A. Liogier 29099 (UPR 4361). New to Puerto Rico; southern Mexico to Ecuador and Argentina.

Poa annua L.- PUERTO RICO: In open place, Cerro de Punta, Jayuya, A. & P. Liogier, L. Martorell 28947 (UPR 4430). New to Puerto Rico; Cuba, Jamaica, Hispaniola, Bermuda; native of Europe, introduced into North America.

Poa pratensis L.- PUERTO RICO: On the summit of El Yunque, Luquillo Mts., A. Liogier 28318 (UPR 4431). New to Puerto Rico;

Bermuda, Jamaica, Hispaniola; native of Europe, introduced into North America.

Rottboellia exaltata L.f.- PUERTO RICO: On roadsides, a weed; typical collections: Agronomic Station, Río Piedras, A. Liogier 28892 (UPR 4435); Ponce, A. & P. Liogier 29363 (UPR 4434); El Rosario, Mayagüez, A. & P. Liogier, L. Martorell, E. Solano 30924 (UPR 6203). New to Puerto Rico; native of southern Asia, introduced as a weed into the West Indies.

Schizachyrium tenerum Nees - PUERTO RICO: On lateritic soil, Las Mesas, Mayagüez, A. & P. Liogier, L. Martorell, E. Solano 30902 (UPR 6253). New to Puerto Rico; Greater Antilles.

Setaria chapmani (Vasey) Pilger - PUERTO RICO: On white sand, Tortuguero, Vega Baja, R. Woodbury (UPR 4446). New to Puerto Rico; southern Florida, Bahamas, Cuba.

Vulpia bromoides (L.) S. F. Gray - PUERTO RICO: Near Cerro de Punta, Jayuya, A. & P. Liogier, L. Martorell 28929 (UPR 4247); id., F. W. Gould, A. Liogier, E. Solano 15853 (UPR 6080). New to Puerto Rico; United States, Jamaica, Hispaniola; native of Europe.

CYPERACEAE.

Rhynchospora longifolia Presl - PUERTO RICO: Guilarte Peak, R. Woodbury (UPR 4652); Cerro de Punta, Jayuya, A. Liogier, F. & L. Gould, E. Solano 30576 (UPR 5722). New to Puerto Rico; Cuba, Hispaniola, Lesser Antilles, Mexico.

Rhynchospora oligantha A. Gray var. brevisetata Gale - PUERTO RICO: Tortuguero Lake, Vega Baja, R. Woodbury (UPR 4668); Dorado, on wet sand, R. Woodbury (UPR 4669); Luquillo Mts., R. Woodbury (UPR 4670). New to Puerto Rico; eastern and southern United States; Greater Antilles.

Rhynchospora oligantha A. Gray var. oligantha - PUERTO RICO: El Yunque, Luquillo Mountains, R. Woodbury (UPR 4667). New to Puerto Rico; New Jersey to Florida and Texas, Central America.

Rhynchospora plumosa Ell.- PUERTO RICO: In wet sand, Tortuguero, Vega Baja, R. Woodbury (UPR 4671, 4672, 4676, 4677, 4678, 4679, 5531); Dorado, R. Woodbury (UPR 4673, 4674, 4675). New to Puerto Rico; southeastern United States, Cuba.

Rhynchospora rariflora (Michx.) Ell.- PUERTO RICO: On moist sand, Tortuguero, Vega Baja, R. Woodbury (UPR 4686, 4687); Dorado, R. Woodbury (UPR 4684, 4685). New to Puerto Rico; eastern and southern United States, Greater Antilles.

Scleria georgiana Core - PUERTO RICO: On wet sand, Tortuguero,

Vega Baja, R. Woodbury (UPR 4703, 4704, 4706, 4707). New to Puerto Rico; southeastern United States; Greater Antilles, Honduras.

LEMNACEAE.

Wolffiella lingulata (Hegelm.) Hegelm.- PUERTO RICO: In water, Florida and Aguada, A. Liogier 30064 (UPR 4767), collected by R. Woodbury. New to Puerto Rico; southern California to Panama.

BROMELIACEAE.

Catopsis nutans Griseb.- PUERTO RICO: Epiphytic on trees, Barranquitas to Aibonito, A. & P. Liogier, L. Martorell 30064 (UPR 4772). New to Puerto Rico; Greater Antilles, Central America, Ecuador, Venezuela.

COMMELINACEAE.

Murdannia nudiflora (L.) Brennan - PUERTO RICO: On roadsides, Luquillo Mountains, A. & P. Liogier, L. Martorell 28164 (UPR 4828), 29287 (UPR 4829), 30471 (UPR 5672). New to Puerto Rico; Florida, Venezuela; native of Asia tropics.

JUNCACEAE.

Juncus tenuis Willd.- PUERTO RICO: Common on roadsides in the Central Mountains; typical collections: A. & P. Liogier, L. Martorell 28913 (UPR 4834), 28960 (UPR 4835), 28233 (UPR 4836); Toro Negro, J. L. Vivaldi 71-49 (UPR 5378). New to Puerto Rico; Jamaica; native of North America, now widely distributed as a weed.

AMARYLLIDACEAE.

Zephyranthes citrina Baker - PUERTO RICO: Introduced and escaped in wet places; typical collection: Cidra, A. & P. Liogier, L. Martorell 29082 (UPR 4856). New to Puerto Rico; Cuba, Hispaniola, British Guiana, Central America and Mexico.

IRIDACEAE.

Sisyrinchium exile Bickn.- PUERTO RICO: Near Cerro Maravilla, A. & P. Liogier, L. Martorell 28916 (UPR 4868); Cerro Maravilla, A. Liogier, F. & L. Gould, E. Solano 30580 (UPR 5772). New to Puerto Rico; Hispaniola, continental tropical America.

ORCHIDACEAE.

Basiphyllaea angustifolia Schltr.- PUERTO RICO: In forest, Mariacao, R. Woodbury (UPR 4892). New to Puerto Rico; Cuba, Hispaniola.

Eulophidium maculatum (Lindl.) Pfitz.- PUERTO RICO: Common on northern slopes of the Central Mountains, at lower elevations; typical collections: Cambalache Forest, A. & P. Liogier, L. Martorell 29228 (UPR 4927); also observed on Mona Island. New to

Puerto Rico; Florida, Hispaniola, Trinidad, Venezuela to Peru and Argentina; tropical Africa.

Helleriella punctulata (Rchb.f.) Garay & Sweet - PUERTO RICO: In wet forest, upper Luquillo Mountains, R. Woodbury 5418 (UPR 5168); El Toro Trail, Luquillo Mountains, R. Woodbury (UPR 5165). New to Puerto Rico; Guadeloupe, Grenada, Andean regions of South America.

Maxillaria rufescens Lindl.- PUERTO RICO: In moist forests, El Verde, Luquillo Mountains, R. Woodbury (UPR 4982). New to Puerto Rico; Greater Antilles, Trinidad, Honduras to Brazil.

Spathoglottis plicata Blume - PUERTO RICO: Luquillo Mountains, A. & P. Liogier, L. Martorell 30472 (UPR 5675). New to Puerto Rico, escaped from cultivation; native of Malaysia.

CHROMOSOME NUMBERS IN THE MELASTOMATACEAE

M. L. Solt (+) and J. J. Wurdack
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Chromosome numbers for the approximately 3500 species of New World Melastomataceae have scarcely been studied, with only the genus Rhexia having been thoroughly surveyed. The literature up to 1967 was summarized by Fedorov in "Chromosome numbers of flowering plants" (1969, page 430), a total of 56 taxa there listed (10 neotropical). Since then, additional counts have been reported for 1 species of Rhynchanthera, 1 of Tibouchina, 2 of Miconia, 1 of Mecranium, 7 of Monochaetum, 3 of Centradenia, and 13 taxa of Rhexia (references included in tribal discussions below). The current tabulation is approximately a 10-fold increase in reported chromosome numbers for New World species, but the total sample still covers only about 8% of the neotropical melastomes.

The cytologic work proceeded for 10 years (1967-1976), ending because of the illness of the senior author; laboratory and taxonomic facilities at the Smithsonian Institution were used. The cytologic and plant culture (except for pot-washing) aspects of the research were Solt's province, the taxonomy and systematic discussion her husband's. We have been grateful to the numerous collaborators who collected viable seeds throughout the neotropics (the names appearing with the vouchers) or furnished cultivated material. Also G. R. Proctor helped greatly during a trip to Jamaica in 1969 and numerous Venezuelan botanists in Caracas (Julian and Cora Steyermark, Getulio Agostini), Maracay (V. M. Badillo, George Bunting), and Mérida (M. López-Figueiras, H. Rodríguez, L. Ruiz-Terán, S. S. Tillett) were superb field companions in 1972.

Counts were mostly made from plants raised from seed in our Beltsville home or from flower buds collected in the field, occasionally from botanical garden greenhouse plants. Seed germination and growth was best in a mixture of 3 parts bottom-land loam, 3 parts peat, 1 part perlite, and 1 part sand; the mixture was overlain by shredded sphagnum, damping-off thus being inhibited. Since almost all the species sampled had quite small seeds, sowing was directly on the moist sphagnum.

Seedling germination was generally rapid (1-2 weeks) in capsular-fruited species, slower (1-2 months) in those with baccate fruits; the longest germination time after sowing was 4 months for Mouriri myrtilloides. Seedlings generally grew very slowly for several months, but thereafter more rapidly. They were transplanted into flats and later into pots, using the above-mentioned soil mixture; this mixture was rather acidic, only a very few melastomes being calciphiles. All seedlings were grown under fluorescent lights (16 hours per day) until about

20 cm tall, thereafter in daylight on a sunporch or (in the summer) in pots sunken in the ground out of doors. Some of the seedlings were grown to flowering; however in most cases this was impossible since the species are trees or large shrubs.

Root tips were used for mitotic counts, being treated for 3-5 hours in 8-hydroxyquinoline and fixed in Carnoy's solution (3:1 ethanol-glacial acetic acid). For staining, tips were treated for 5 minutes in a solution of 95% ethanol-concentrated HCl (1:1), rinsed with water, and squashed in aceto-carmin. For meiotic counts, anthers from young flower buds were fixed in modified Carnoy's solution (6:3:1 ethanol-chloroform-glacial acetic acid), transferred to 70% ethanol after 24 hours, and squashed in aceto-carmin. Numerous other techniques were tried, but with much less success than the above procedure. Camera lucida drawings were made under 1800X; a sampling of the drawings is here appended. Melastome chromosomes are mostly so small (0.5-1 micron) that even under the magnification used they appeared as mere dots without differential morphology.

For many of the species grown from seeds, a secondary herbarium voucher was made, a more direct reflection than usual of the actual identity of the chromosome source. All the secondary vouchers, as well as most of those which were seed sources, are deposited in the U. S. National Herbarium. A few primary vouchers are only in the herbaria of The New York Botanical Garden, Missouri Botanical Garden (Croat), University of Texas at Austin (Whiffin Central American collection numbers), or Harvard University (a few Schnell collections). Several of the chromosome numbers here reported were from preserved material sent by us to P. H. Raven prior to 1967 and are included at his request; these are so credited in the listings. The prefix W in the voucher numbers indicates Wurdack et al specimens; for specimens with multiple collectors, generally only the first botanist is listed. For localities, in the larger countries the state or equivalent political division is included while this detail is omitted in smaller ones; more exact localities can be obtained from the vouchers. A few Old World melastomes (Dissochaeteae, Sonerileae, Melastomeae) are included in the tabulations. As in the Flora of Ecuador, the generic order within the New World tribes follows an unpublished complete sequence.

MERIANIEAE

Meriania

grandifolia Triana. n = 31. W2757, Mérida, Venezuela.

hexamera Sprague. n = 23-25. Tillett 673-310, Amazonas, Peru.

leucantha Sw. n = 15-17. W2612, Jamaica.

macrophylla (Benth.) Triana subsp. costanensis Wurdack. n = ca. 30. W2689, Aragua, Venezuela.

macrophylla (Benth.) Triana subsp. meridensis Wurdack. n = 31. W2756, Mérida, Venezuela.

steyermarkii Gleason. n = 31. W2736, Mérida, Venezuela.

urceolata Triana. n = 17. W2845, Bolívar, Venezuela.

MERIANIEAE (continued)

Adelobotrys

adscendens (Sw.) Triana. $2n = 30$. Seedlings from Cuatrecasas 27456, Valle, Colombia.

Axinaea

grandifolia (Naud.) Triana. $n = 30-31$. W2715, Mérida, Venezuela.

cf. grandifolia (Naud.) Triana. $n = 31$. W2735, Mérida, Venezuela.

ruizteranii Wurdack. $n = 31$. W2787, Táchira, Venezuela.

Graffenrieda

conostegioides Triana. $2n = 56^{+2}$. W2647, from seeds of Cowan 2407, Caquetá, Colombia.

gracilis (Triana) L. Wms. $2n = 26$. Seedlings from W2811, Táchira, Venezuela.

obliqua Triana. $n = 26$. W2822, Bolívar, Venezuela.

Bucquetia

vernica Gleason. $n = 18$. W2802, Táchira, Venezuela.

Acanthella

sprucei Hook. f. $2n = 20$. W2570, seedlings from Dressler s. n., Amazonas, Venezuela.

DISSOCHAETAE

Medinilla

astronioides Triana. $n = 21$. W2860, from seeds of Price 178, Luzon, Philippines.

curtisii Hook. f. $n = 21(20)$. Brooklyn Botanic Garden (no voucher).

myriantha Merrill. $n = 21$, $2n = 42$. Seedlings from Price 190, Luzon, Philippines.

ternifolia Triana. $2n = ca. 36$. Seedlings from Price 191, Luzon, Philippines.

BERTOLONIEAE

Opisthocentra

clidemioides Hook. f. $2n = 24$. Seedlings from Steyermark & Bunting 102897, Amazonas, Venezuela.

Macrocentrum

droseroides Triana. $n = 12$. W2819, Bolívar, Venezuela.

minus Gleason. $n = 12$. W2828, Bolívar, Venezuela.

Bertolonia

maculata DC. $n = 14$. W2659, from seeds furnished by Kew.

BERTOLONIEAE (continued)

Bertolonia (continued)

- marmorata (Naud.) Naud. var. aenea (Naud.) Cogn. n = 14.
W2578, from plants of New York Botanical Garden 70819.

Monolena

- sp. 2n = 16, n = 8. N. Williams s. n., Cerro Jefe, Panama.
sp. n = 8. Dressler 4247, Panama.

Triolena

- hirsuta (Benth.) Triana. n = 17. W2569, from seeds of Cowan 2402, Costa Rica.
pustulata Triana. n = 17. W2645, from seeds furnished by Kew.

SONERILEAE

Sonerila

- margaritacea Lindl. cv. 'Argentea'. n = 17. W2642, from plants of New York Botanical Garden 1288/64.

Calvoa

- orientalis Taub. 2n = 34. W2853, from seeds furnished by Botanic Garden, University of Copenhagen.
orientalis Taub. n = 17. W2854, from seeds furnished by Jardin botanique national de Belgique (as C. sessiliflora).

Amphiblemma

- cymosum (Schrاد. & Wendl.) Naud. n = 38. W2661, from plants of New York Botanical Garden 502/63.

MICROLICIEAE

Trembleya

- parviflora (Don) Cogn. subsp. triflora (DC.) Cogn. 2n = 22.
Seedlings from Irwin 8149, Distrito Federal, Brazil.

Lavoisiera

- bergii Cogn. 2n = 26 (Raven). Seedlings from Santos & Castellanos 24161, Minas Gerais, Brazil.
grandiflora Naud. 2n = 24. Seedlings from Irwin 8593, Distrito Federal, Brazil.
sp. (aff. crassifolia DC.). 2n = 24. Seedlings from Irwin 20816, Minas Gerais, Brazil.
sp. (aff. pectinata Cogn.). 2n = 26. Seedlings from Irwin 20494, Minas Gerais, Brazil.

Microlicia

- fasciculata Mart. ex Naud. 2n = 46. W2575, from seeds of Lima 24, Distrito Federal, Brazil.
cf. graveolens DC. 2n = ca. 34. Seedlings from Irwin 20723, Minas Gerais, Brazil.

MICROLICIEAE (continued)

Rhynchanthera

grandiflora (Aubl.) DC. $2n = 20$. W2663, from seeds of Bunting s. n., Amazonas, Venezuela.

grandiflora (Aubl.) DC. var. microphylla Naud. $2n = 22$.

W2865, from seeds of McDaniel 15460, Pará, Brazil.

rostrata DC. $n = (9)10$. W2548, from seeds of Sucre 829, Distrito Federal, Brazil.

serrulata (Rich.) DC. $n = 9$. Seedlings from Tamayo 4544, Guarico, Venezuela.

Siphanthera

cordifolia (Benth.) Gleason. $n = 10$. W2838, Bolívar, Venezuela.

hostmannii Cogn. $n = 18$. W2835, Bolívar, Venezuela.

Centradenia

floribunda Planchon. $n = 18$. W2546, from plants of Longwood Gardens 631027, Mexico.

inaequilateralis (S. & C.) G. Don. $n = 18$. W2565, from seeds of Cowan 2403, Costa Rica.

TIBOUCHINEAE

Marcetia

taxifolia (St. Hil.) DC. $2n = 24$ (Raven). W2637, from seeds of Santos 5254, Guanabara, Brazil.

taxifolia (St. Hil.) DC. var. glandulosa (DC.) Cogn. $2n = 24$. W2605, from seeds of Irwin 20879, Minas Gerais, Brazil.

Macairea

pachyphylla Benth. $n = 12$. W2844, Bolívar, Venezuela.

parvifolia Benth. $n = 12$. W2843, Bolívar, Venezuela.

spruceana Triana. $2n = 22$. Seedlings from Bunting 4082, Amazonas, Venezuela.

stylosa Triana. $2n = 24$. Seedlings from Steyermark 102968, Amazonas, Venezuela.

Comolia

microphylla Benth. $n = 18(19)$. W2840, Bolívar, Venezuela.

Ernestia

maguirei Wurdack. $n = 11$. W2751, Mérida, Venezuela.

quadrisseta Triana. $2n = 22$. Seedlings from McDaniel 14243, San Martín, Peru.

Nepsera

aquatica (Aubl.) Naud. $n = 9^{+1}$. W2554, from seeds of Duke s. n., Porto Rico.

TIBOUCHINEAE (continued)

Acisanthera

quadrata Pers. n = 22. W2564, from seeds of Schnell 418, Costa Rica.

Aciotis

aff. aristellata Markgraf. n = 30. W2851, from seeds of W2848, Bolívar, Venezuela.

laxa (Rich.) Cogn. n = 26. W2847, Bolívar, Venezuela.

levyana Cogn. 2n = 24. Seedlings from Schnell 519, Costa Rica.

polystachya (Bonpl.) Triana. n = 10. W2568, from seeds of Tillett 676-410, Peru.

polystachya (Bonpl.) Triana. n = 10. W2852, from seeds of Rimachi 395, Loreto, Peru.

purpurascens (Aubl.) Triana. n = ca. 40. W2634, from seeds of Cowan 2414, Caquetá, Colombia.

rostellata (Naud.) Triana. n = 30. Seedlings from Schnell 1006, Costa Rica.

Tibouchina Sect. Involucrales

mutabilis (Vell.) Cogn. 2n = 36. Longwood Gardens 581557 (Peterson 62).

organensis Cogn. 2n = 36. Meyer 8331, cultivated U. S. National Arboretum.

Tibouchina Sect. Pleroma

candolleana (DC.) Cogn. 2n = 36. Seedlings of Pires 11938, Distrito Federal, Brazil.

clavata (Pers.) Wurdack. 2n = 36. W2587, from seeds of L. B. Smith s. n., São Paulo, Brazil.

cryptadena Gleason. 2n = 54. Seedlings of W2725, Mérida, Venezuela.

granulosa (Desr.) Cogn. 2n = 36. Seedlings from Pires 10193, Distrito Federal, Brazil.

lindeniana Cogn. n = 18. W2732, Mérida, Venezuela.

multiflora (Gardn.) Cogn. 2n = 36. Seedlings from Steyermark 100211, cultivated in Miranda, Venezuela.

multiflora (Gardn.) Cogn. 2n = 36. Seedlings from Irwin 19802, Minas Gerais, Brazil.

urvilleana (DC.) Cogn. 2n = 56 (Raven). W2536, cultivated in Beltsville, Maryland.

Tibouchina Sect. Lepidotae

aristeguietae Wurdack. n = ca. 27. W2724, Mérida, Venezuela.

lepidota (Bonpl.) Baillon. 2n = ca. 122 (Raven). Seedlings from W1392, Amazonas, Peru.

Tibouchina Sect. Tibouchina

fraterna N. E. Brown. n = 9. W2834, Bolívar, Venezuela.

TIBOUCHINEAE (continued)

Tibouchina Sect. Diotanthera

chironioides (Griseb.) Cogn. $2n = 36$. Seedlings from Ernst 2169, Dominica.

ciliaris (Vent.) Cogn. $2n = 36$. W2639, from seeds of Cowan 2413, Caqueta, Colombia.

geitneriana (Schl.) Cogn. $n = 18$. W2671. Distrito Federal, Venezuela.

hintonii Gleason in ed. $2n = 18$. Seedlings from Whiffin & Rodriguez 437, Guerrero, Mexico.

kingii Wurdack. $n = 27$. W2580, from seeds of King 5999, Tolima, Colombia.

kingii Wurdack. $n = 27$. W2581, from seeds of King 6003, Tolima, Colombia.

laxa (Desr.) Cogn. $2n = 36$. Seedlings from Hutchison 6394, Cajamarca, Peru.

longifolia (Vahl) Baillon. $n = 9$. W2551, from seeds of Schnell 401, Costa Rica.

longifolia (Vahl) Baillon. $n = 9$. W2678, Distrito Federal, Venezuela.

mariae Wurdack. $n = 18$. W2571, from seed of W632, Amazonas, Peru.

mollis (Bonpl.) Cogn. $2n = 36$. Seedlings from King 5927, Cundinamarca, Colombia.

naudiniana (Dec.) Cogn. vel aff. $n = 18$. W2552, from seeds of Ernst 2533, Oaxaca, Mexico.

naudiniana (Dec.) Cogn. vel aff. $n = 18$. W2555, from seeds of Schnell 382, Costa Rica.

Tibouchina Sect. Pseudopterolepis

oerstedii (Triana) Cogn. $2n = 66$. Seedlings from Schnell 1027, Costa Rica.

sebastianopolitana (Raddi) Cogn. $n = 9$. W2544, from seeds of Santos 5004, Guanabara, Brazil.

simplicicaulis (Naud.) Cogn. $2n = 18$. Seedlings from Irwin 19599, Minas Gerais, Brazil.

versicolor (Lindl.) Cogn. $2n = 18$. Seedlings from L. B. Smith 15442, Santa Catarina, Brazil.

Tibouchina Sect. Purpurella

grossa (L.f.) Cogn. $2n = 54 \pm 2$. Seedlings from King 5904, Cundinamarca, Colombia.

Pterolepis

glomerata (Rottb.) Miquel. $n = 18$. W2635, from seeds of King 6368, Dominica.

pumila (Bonpl.) Cogn. $n = 7$. W2573, from seeds of Schnell 380, Costa Rica.

Heterocentron

elegans (Schl.) Kuntze. $n = 18$. W2636, plant from Longwood

TIBOUCHINEAE (continued)

Heterocentron (continued)

Gardens.

glandulosum Schenk. n = 18. W2550, from seeds of Schnell 383, Costa Rica.macvaughii Whiffin var. vallartense Whiffin in ed. 2n = 36.W2666, from seeds of Whiffin & Rodriguez 455, Jalisco, Mexico.parviflorum Whiffin in ed. 2n = 36. W2665, from seeds of Whiffin & Rodriguez 436, Guerrero, Mexico.parviflorum Whiffin in ed. 2n = 36. W2667, from seeds of Whiffin & Rodriguez 439, Guerrero, Mexico.undulatum Naud. 2n = 36. W2668, from seeds of Whiffin & Rodriguez 453, Jalisco, Mexico.Brachyotumcogniauxii Wurdack. 2n = 20 (Raven). Seedlings from Hutchison 5513, Amazonas, Peru.multinervium Wurdack. 2n = 20 (Raven). Seedlings from Wurdack 1304, Amazonas, Peru.parvifolium Cogn. 2n = ca. 20. Seedlings from Hutchison 7268, Amazonas, Peru.quinquenerve (R. & P.) Triana var. pusillum Wurdack. 2n = 20. Seedlings from Tillett 673-337, Amazonas, Peru.radula Triana. 2n = 20 (Raven). Seedlings from Wurdack 1267, Amazonas, Peru.strigosum (L.f.) Triana. 2n = 20 (Raven). Seedlings from Wurdack s. n., Cundinamarca, Colombia.tyrianthinum Macbride. 2n = 20 (Raven). Seedlings from Ferreyra 15120, Cajamarca, Peru.Chaetolepislindeniana (Naud.) Triana. n = 18. W2721, Mérida, Venezuela.lindeniana (Naud.) Triana. n = 18. W2769, Mérida, Venezuela.microphylla (Bonpl.) Miquel. n = 9. W2773, Mérida, Venezuela.Desmoscelisvillosa (Aubl.) Naud. 2n = 18 (Raven). Seedlings from Pires 9379, Distrito Federal, Brazil.Schwackaeacupheoides (Benth.) Cogn. n = 18. W2563, from seeds of Dwyer 668, Panama.Monochaetumbonplandii (Kunth) Naud. 2n = 36. Seedlings from W2711, Mérida, Venezuela.bonplandii (Kunth) Naud. X villosum Gleason subsp.venezuelense Wurdack. n = 18. W2722, Mérida, Venezuela.bonplandii (Kunth) Naud. var. 2n = 36. Seedlings from W2789, Tachira, Venezuela.

TIBOUCHINEAE (continued)

Monochaetum (continued)

- brachyurum Naud. $2n = 36$. Seedlings from W2740, Mérida, Venezuela.
- floribundum (Schlecht.) Naud. $2n = 36$. Seedlings from Schnell 504, Costa Rica.
- gleasonianum Wurdack. $n = 18$. W2768, Mérida, Venezuela.
- humboldtianum (Kunth & Bouché) Kunth ex Walpers var. hirtum (Karst.) Wurdack. $2n = 36$. Seedlings from Steysmark & Wurdack 95859, Distrito Federal, Venezuela.
- lineatum (Don) Naud. $2n = 36$ (Raven). Seedlings from Ferreya 15230, Amazonas, Peru.
- lineatum (Don) Naud. $n = 18$. W2793, Táchira, Venezuela.
- macrantherum Gleason. $2n = 36$. Seedlings from Schnell 259, Costa Rica.
- mariae Wurdack. $n = 18$. W2792, Táchira, Venezuela.
- myrtoideum (Bonpl.) Naud. $n = 18$. W2788, Táchira, Venezuela.
- polyneuron Triana. $n = ca. 18$. W2723, Mérida, Venezuela.
- rodriguezii Wurdack. $n = 18$. W2734, Mérida, Venezuela.
- tachirense Wurdack. $n = 18$. W2790, Táchira, Venezuela.
- venosum Gleason. $n = 18$. W2796, Táchira, Venezuela.
- venosum Gleason X lineatum (Don) Naud. $n = 18$. W2798, Táchira, Venezuela.

RHEXIEAE

Arthrostema

- ciliatum R. & P. $2n = 60$, $n = 30$. W2557, from seeds of Ernst 2588, Oaxaca, Mexico.
- ciliatum R. & P. $n = 30$. W2760, Mérida, Venezuela.

MELASTOMEAE

Osbeckia

- octandra (L.) DC. $2n = 20$, $n = 10$. W2664, from seeds of Read 2250, Ceylon.
- stellata Ham. ex Ker-Gawl. var. crinita (Naud.) C. Hansen. $n = 18$. W2545, from seeds of United States National Arboretum PE 307301.

Melastoma

- polyanthum Blume. $2n = 24 \pm 2$. W2861, from seeds of Price s. n., Luzon, Philippines.

Tristerma

- mauritianum J. F. Gmel. $n = 17$. W2556, from plant of Longwood Gardens 66860.

Dissotis

- rotundifolia Triana. $n = 15$. Longwood Gardens Acc. 5765 (Peele 7).

MICONIEAE

Conostegia

arborea (Schlecht.) Steud. $2n = 34$. Seedlings from Rodman & Schnell 33, Mexico.

icosandra (Sw.) Urban. $n = 17$. W2693, Miranda, Venezuela.

montana (Sw.) DC. $2n = 34$. W2601, from seeds of Meussner 2, Martinique.

oerstediana Triana. $2n = 34$. Seedlings from Schnell 1020, Costa Rica.

subcrustulata (Beurl.) Triana. $2n = 34$, $n = 17$. W2644, from seeds of Schnell 400, Costa Rica.

superba Naud. $n = 17$. W2630, Jamaica.

xalapensis (Bonpl.) Don ex DC. $2n = 34$. W2856, from seeds of McDaniel 14833, Panama.

xalapensis (Bonpl.) Don ex DC. $2n = 34$. W2858, from seeds of Whiffin & Rodriguez 393, Mexico.

xalapensis (Bonpl.) Don ex DC. $n = 17$. Grown from seed of Schnell 739, Costa Rica.

Miconia Sect. Tamonea

cf. caudata (Bonpl.) DC. $2n = 34$. Seedlings from Schnell 980, Costa Rica.

dodecandra (Desr.) Cogn. $n = 68$. W2609, Jamaica.

dodecandra (Desr.) Cogn. $n = 68$. W2701, Aragua, Venezuela.

mirabilis (Aubl.) L. Wms. $2n = ca. 134$. W2650, from seeds of Wasshausen 392, Dominica.

mirabilis (Aubl.) L. Wms. $n = 68$. W2697, Miranda, Venezuela.

paleacea Cogn. $2n = 34$. W2670, from seeds of Schnell 978, Costa Rica.

sanctiphilippi Naud. $2n = 34$. Seedlings from Wurdack s. n., Aragua, Venezuela.

serrulata (DC.) Naud. $n = 46$. W2626, Jamaica.

superba Ule. $n = ca. 34$. W2818, Bolívar, Venezuela.

Miconia Sect. Adenodesma

tomentosa (Rich.) Don ex DC. $2n = 34$. W2643, from seeds of Cowan 2405, Caquetá, Colombia.

Miconia Sect. Octomeris

araguensis Wurdack. $n = 17$. W2688, Aragua, Venezuela.

araguensis Wurdack. $n = 17$. W2708, Aragua, Venezuela.

avia Wurdack. $n = 17$. W2766, Mérida, Venezuela.

breteleri Wurdack. $n = 17$. W2765, Mérida, Venezuela.

canaguensis Wurdack. $n = 17$. W2744, Mérida, Venezuela.

funkii Wurdack. $n = 17$. W2693, Miranda, Venezuela.

macrodon (Naud.) Wurdack. $n = 17$. W2699, Aragua, Venezuela.

meridensis Triana. $n = 17$. W2718, Mérida, Venezuela.

salebrosa Wurdack. $n = 17$. W2745, Mérida, Venezuela.

tuberculata (Naud.) Triana. $n = 17$. W2673, Distrito Federal, Venezuela.

MICONIEAE (continued)

Miconia Sect. Laceraria

lauriformis Naud. $2n = 34$. W2654, from seeds of Kalmbacher 56,
UC Bot. Garden.

Miconia Sect. Miconia

aeruginosa Naud. $n = 17$. W2677, Distrito Federal, Venezuela.

affinis DC. $2n = 34$. W2862, seedlings from Croat 15184,
Panama.

albicans (Sw.) Triana. $2n = 48$. Seedlings from W2622,
Jamaica.

albicans (Sw.) Triana. $2n = 34$. W2863, seedlings from McDaniel 14404, Belize.

appendiculata Triana. $2n = 34$. W2592, seedlings from Cowan 2417, Caquetá, Colombia.

astroplocama Donn. Smith. $2n = \text{ca. } 48$. W2604, seedlings from
Schnell 671, Costa Rica.

bracteata (DC.) Triana. $2n = \text{ca. } 48$. Seedlings from W2824,
Bolívar, Venezuela.

calvescens DC. $2n = 34$. W2576, seedlings from Whiffin 75,
Amazonas, Colombia.

calvescens DC. $2n = 34$. W2866, seedlings from McDaniel 15251,
Loreto, Peru.

cannabina Markgraf. $2n = 32$. Seedlings from McDaniel 13640,
Loreto, Peru.

ceramicarpa (DC.) Cogn. $2n = 34$. W2657, seedlings from
Holmquist s. n., Bolívar, Venezuela.

elata (Sw.) DC. $2n = 44-48$. Seedlings from Wurdack 2628,
Jamaica.

ericalyx Cogn. $2n = 34$. W2864, seedlings from McDaniel 14141,
Loreto, Peru.

ibaguensis (Bonpl.) Triana. $2n = 62$. Seedlings from Rodman & Schnell 62, Costa Rica.

impetiolaris (Sw.) Don ex DC. $n = \text{ca. } 27$. W2625, Jamaica.

laevigata (L.) DC. $2n = \text{ca. } 48$. W2590, seedlings from Meussner s. n., St. Croix, Virgin Islands.

laevigata (L.) DC. $n = \text{ca. } 24$. W2620, Jamaica.

lateriflora Cogn. $2n = 34$. Seedlings from Schnell 984, Costa
Rica.

macrothyrsa Benth. $n = 17$. W2681, Miranda, Venezuela.

nervosa (Smith) Triana. $2n = 34$. Seedlings from Croat 12872,
Panama.

nervosa (Smith) Triana. $2n = 34$. Seedlings from King 6110,
Putumayo, Colombia.

prasina (Sw.) DC. $2n = 48-52$. Seedlings from Cowan 2427,
Para, Brazil.

rubiginosa (Bonpl.) DC. $2n = 50$. Seedlings from Rodman & Schnell 64, Costa Rica.

tilletii Wurdack. $n = 17$. W2833, Bolívar, Venezuela.

trinervia (Sw.) Don ex Loud. $2n = 34$. W2589, seedlings from
Cowan 2415, Caquetá, Colombia.

MICONIEAE (continued)

Miconia Sect. Miconia (continued)

virescens (Vahl) Triana. $2n = 46 \pm 2$. W2603, seedlings from King 6293, Dominica.

Miconia Sect. Glossocentrum

minutiflora (Bonpl.) DC. $2n = 34$. W2579, seedlings from Pires 6, Pará, Brazil.

Miconia Sect. Amblyarrhena

ciliata (Rich.) DC. $n = 17$. W2705, Aragua, Venezuela.

lacera (Bonpl.) Naud. $n = 17$. W2692, Miranda, Venezuela.

lucida Naud. $n = 17$. W2717, Mérida, Venezuela.

mulleola Wurdack. $n = 17$. W2795, Táchira, Venezuela.

nitidissima Cogn. $n = 17$. W2739, Mérida, Venezuela.

oinchrophylla Donn. Smith. $2n = 34$. W2568, seedlings from Schnell 474, Costa Rica.

pisinna Wurdack. $n = 17$. W2794, Táchira, Venezuela.

racemosa (Aubl.) DC. $2n = 34$, $n = 17$. W2572, from seeds of Ernst 2082, Dominica.

spinulosa Naud. $n = \text{ca. } 46$. W2690, Aragua, Venezuela.

cf. spinulosa Naud. $n = 17$. W2712, Mérida, Venezuela.

ulmarioides Naud. $n = \text{ca. } 34$. W2746, Mérida, Venezuela.

Miconia Sect. Cremanium

bernardii Wurdack. $n = 17$. W2762, Mérida, Venezuela.

dolichopoda Naud. $n = 17$. W2774, Mérida, Venezuela.

elaeoides Naud. $n = 17$. W2785, Mérida, Venezuela.

jahnii Pittier. $n = 17$. W2772, Mérida, Venezuela.

mesmeana Gleason subsp. jabonensis Wurdack. $n = 17$. W2771, Mérida, Venezuela.

squamulosa (Smith) Triana. $n = \text{ca. } 38$. W2801, Táchira, Venezuela.

tamana Wurdack. $n = 17$. W2803, Táchira, Venezuela.

theaezans (Bonpl.) Cogn. $n = 17$. W2719, Mérida, Venezuela.

theaezans (Bonpl.) Cogn. subsp. flavescens Cogn. var.

lanceolata Cogn. $n = 17$. W2676, Distrito Federal, Venezuela.

theaezans (Bonpl.) Cogn. subsp. theaezans var. subtriplinervia Cogn. $n = 17$. W2755, Mérida, Venezuela.

theaezans (Bonpl.) Cogn. var. $2n = 34$. Seedlings from Cowan 2424, Costa Rica.

tinifolia Naud. $n = 17$. W2780, Mérida, Venezuela.

tinifolia Naud. var. $n = 17$. W2770, Mérida, Venezuela.

tovarensis Cogn. $n = 17$. W2716, Mérida, Venezuela.

tovarensis Cogn. $n = 17$. W2764, Mérida, Venezuela.

Miconia Sect. Chaenopleura

azuensis Urban & Ekman. $2n = 34$. W2591, from seeds of Alain 11575, Dominican Republic.

sintenisii Cogn. $2n = 34$. W2669, from seeds of Terborgh 449, Porto Rico.

MICONIEAE (continued)

Heterotrichum

- umbellatum (Mill.) Urban. $2n = 30$. W2577, from seeds of Alain 11315, Dominican Republic.
umbellatum (Mill.) Urban. $n = 15$. W2611, Jamaica.

Tetrazygia

- bicolor (Mill.) Cogn. $n = 17$. Solt 1, Florida, U. S. A.
crotonifolia (Desr.) DC. $2n = 34$. W2600, from seeds of Alain s. n., Dominican Republic.
crotonifolia (Desr.) DC. $2n = 34$. Seedlings of Terborgh 18, Dominican Republic.
discolor (L.) DC. $2n = 28$. W2599, from seeds of King 6365, Dominica.
pallens (Spreng.) Cogn. $2n = 34$. W2652, from seeds of W2616, Jamaica.

Charianthus

- corymbosus (Rich.) Cogn. var. longifolius (Cogn.) Hodge. $n = 17$. W2660, from seeds of King 6387, Dominica.

Tococa

- cf. coronata Benth. $2n = 56$. Seedlings from Steiermark & Bunting 102961, Amazonas, Venezuela.
guianensis Aublet. $2n = 34$, $n = 17$. W2566, from seeds of Schnell 487, Costa Rica.
guianensis Aublet. $2n = 34$. Seedlings from McDaniel 13680, Loreto, Peru.
guianensis Aublet. $2n = 34$. W2867, from seeds of McDaniel 14317, Belize.
nitens (Benth.) Triana. $n = 17$. W2839, Bolívar, Venezuela.
perclara Wurdack. $2n = 34$. Seedlings from Wurdack s. n., Miranda, Venezuela.

Clidemia Sect. Clidemia

- bullosa DC. $2n = 30$. Seedlings from Cowan 2429, Pará, Brazil.
bullosa DC. $2n = 30$. W2597, from seeds of Whiffin TFW-30, Amazonas, Colombia.
capitellata (Bonpl.) D. Don. $n = 17$. W2558, from seeds of King 6160, Putumayo, Colombia.
dentata D. Don var. $2n = 34$. W2595, from seeds of Pires 4, Pará, Brazil.
erythropogon DC. $2n = 30$, $n = 15$. W2615, Jamaica.
heptamera Wurdack. $n = \text{ca. } 23$. W2827, Bolívar, Venezuela.
involucrata DC. $n = \text{ca. } 23$. W2825, Bolívar, Venezuela.
japurensis DC. var. heterobasis (DC.) Wurdack. $2n = 30$.
W2596, from seeds of Schnell 570, Costa Rica.
octona (Bonpl.) L. Wms. $2n = 34$, $n = 17$. W2646, from seeds of Schnell 402, Costa Rica.
octona (Bonpl.) L. Wms. $2n = 34$. Seedlings from Cowan 2408, Caquetá, Colombia.

MICONIEAE (continued)

Clidemia Sect. Clidemia (continued)

- octona (Bonpl.) L. Wms. 2n = 34. W2857, from seeds of McDaniel 15205, Loreto, Peru.
- octona (Bonpl.) L. Wms. n = 17. W2702, Aragua, Venezuela.
- petiolaris (S. & C.) Schlecht. ex Triana. n = 17. W2559, from seeds of Schnell 599, Costa Rica.
- pustulata DC. n = 17. W2849, Bolívar, Venezuela.
- ruddae Wurdack. n = 23. W2638, from seeds of Rudd 3019, Nayarit, Mexico.
- stellipilis (Gleason) Wurdack. n = ca. 17. W2832, Bolívar, Venezuela.
- strigillosa (Sw.) DC. n = 25(26). W2618, Jamaica.
- strigillosa (Sw.) DC. 2n = ca. 54. Seedlings from W2842, Bolívar, Venezuela.
- urceolata DC. 2n = 34. W2594, from seeds of Irwin 20685, Minas Gerais, Brazil.
- urceolata DC. n = ca. 25. W2683, Miranda, Venezuela.

Clidemia Sect. Sagraea

- ciliata Don var. elata (Pittier) Uribe. n = 24-26. W2731, Mérida, Venezuela.
- cursoris Wurdack. n = 17. W2814, Táchira, Venezuela.
- epiphytica (Triana) Cogn. 2n = 30. Seedlings from Schnell 525, Costa Rica.
- grandifolia Cogn. n = 17. W2698, Aragua, Venezuela.
- insularis Domin. n = 17. W2623, Jamaica.
- monantha L. Wms. n = 17. W2696, Miranda, Venezuela.
- pilosa Don. n = 23(22). W2583, from seeds of Hutchison 3952, Amazonas, Peru.
- pilosa Don. n = 23. W2729, Barinas, Venezuela.
- plumosa (Desr.) DC. n = 17. W2680, Distrito Federal, Venezuela.
- sericea Don. n = 17. W2574, from seeds of Meyer 9923, Honduras.
- tillettii Wurdack. n = 17. W2728, Barinas, Venezuela.
- ulei Pilger. 2n = 34. W2593, from seeds of Whiffin TFW-79, Amazonas, Colombia.
- verticillata (Vahl) DC. n = 17. W2560, from seeds of Ernst s. n., Dominica.

Maieta

- guianensis Aublet. 2n = 34. Seedlings from L. B. Smith s. n., Pará, Brazil.
- poepigii Mart. ex Triana. 2n = 46. Seedlings from Whiffin 56, Amazonas, Brazil.

Myriasporea

- egensis DC. 2n = 30. W2633, from seeds of Pires 3, Pará, Brazil.

MICONIEAE (continued)

Bellucia

axinantha Triana. $n = 20(21)$. W2813, Táchira, Venezuela.

Henriettea

ramiflora (Sw.) DC. $n = 28$. W2627, Jamaica.

Henriettella

fascicularis (Sw.) Triana. $2n = 56$. W2868, from seeds of Croat 15080, Panama.

Leandra

caquetensis Gleason. $2n = 34$. W2653, from seeds of Cowan 2409, Caqueta, Colombia.

dichotoma (Don) Cogn. $2n = 34$. W2859, from seeds of Croat 13197, Panama.

granatensis Gleason. $2n = 30$. Seedlings from Schnell 574, Costa Rica.

longicoma Cogn. $n = 17$. W2584, from seeds of Schnell 535, Costa Rica.

mexicana (Naud.) Cogn. $2n = 34$. Seedlings from Schnell 992, Costa Rica.

rufescens (DC.) Cogn. $2n = 30(28)$. W2598, from seeds of Pires 2, Pará, Brazil.

sanguinea Gleason subsp. tepuiensis Wurdack. $n = 17$. W2816, Bolívar, Venezuela.

secunda (Don) Cogn. $2n = 34$. W2648, from seeds of Whiffin 64, Amazonas, Colombia.

solenifera Cogn. $n = 17$. W2602, from seeds of King 6219, Putumayo, Colombia.

subseriata (Naud.) Cogn. $2n = 34$. Seedlings from King 6009, Tolima, Colombia.

subseriata (Naud.) Cogn. $n = 17$. W2720, Mérida, Venezuela.

xanthostachya Cogn. $2n = 34$. W2869, from seeds of Anderson 36036, Minas Gerais, Brazil.

sp. (aff. oblongifolia Cogn.?). $2n = 48$. Seedlings from Anderson 35383, Minas Gerais, Brazil.

Ossaea

hirsuta (Sw.) Triana. $n = 17$. W2614, Jamaica.

quinquennervia (Mill.) Cogn. $2n = 34$. W2662, from seeds of Schnell 1015, Costa Rica.

BLAKEAE

Blakea

schlimii (Naud.) Triana. $n = \text{ca. } 90$. W2713, Mérida, Venezuela.

trinervia L. $n = 31$. W2610, Jamaica.

tuberculata Donn. Smith. $2n = \text{ca. } 62$. W2649, from seeds of Cowan 2425, Costa Rica.

BLAKEEAE (continued)

Topobea

superba Naud. $2n = 56$. W2651, from seeds of Cuatrecasas 27577, Valle, Colombia.

MEMECYLEAE

Mouriri

myrtilloides (Sw.) Poiret. $2n = 14$. Seedlings from W2624, Jamaica.

All available species of Merianieae were recalcitrant, both in cultural requirements and cytologic study. Whiffin & Tomb (Amer. Journ. Bot. 59: 411-422. 1972) reported merianoid seeds in Bucquetia; however, the chromosome number is not in line with those of the other genera in the very limited sampling. Acanthella is an aberrant genus; seedlings have swollen bases and usually died after reaching 12-15 cm in height.

Previous $2n$ reports in the Dissochaeteae were 64-68 (Dicellandra) and ca. 40 (Sakersia). Medinilla, currently with almost 500 binomials listed, now has almost 1% of the species counted.

Whiffin & Tomb found the seeds of Opisthocentra to be bertolonoid; other morphologic features as well as the chromosome number indicate that placement (rather than in the Merianieae) to be preferable. The seedlings of Opisthocentra clidemioides have leaves with regular lines of white spots as in some species of Bertolonia. The known base numbers in the Bertolonieae (8, 12, 14, 17) certainly do not refute my still-held thought that the neotropical tribe should be merged with the Sonerileae (8, 17, 19). The genus Monolena is being studied at the University of Minnesota, binomials for the chromosome vouchers to be supplied later.

In the Microlicieae, the sampling is too skimpy for any taxonomic extrapolations. The endemic genera of the Brazilian Planalto have been culturally refractory, perhaps because of mycorrhizal necessities (being investigated for Lavoisiera by Lourdes Queiroz Cobra in Brasilia). Davide (Taxon 19: 103. 1970) reported $2n = 20$ for Rhynchanthera paludicola (Donn. Smith). Gleason and Almeda (Journ. Arn. Arb. 58: 80. 1977) published counts (all $n = 18$) for four taxa of Centradenia; Heitz' earlier-reported count for Centradenia floribunda was surely erroneous. Irwin 20723 is at least varietally distinct from Microlicia graveolens. Both species of Lavoisiera with $2n = 26$ belong to Sect. Cataphractae DC., while those with $2n = 24$ are in Sect. Gentianoideae DC.

Certainly the base number for Tibouchina and intimately related genera (Pterolepis, Heterocentron, Desmoscelis, Schwackaea) is 9. The species of Tibouchina counted include representatives from 7 of the 11 sections recognized by Cogniaux; of these sections, Pleroma and Involucrales are scarcely distinct

from each other, nor is Diotanthera well-marked from Pseudopterolepis. Purpurella probably represents evolutionary ends from various lines. The report for T. semidecandra by Favarger undoubtedly refers to the cultivated clone of T. urvilleana (Baileya 15: 1-6. 1967), which is self-sterile. The chromosome numbers substantiate the differentiation of T. organensis (T. "semidecandra var. floribunda") from T. urvilleana. The species complex around T. longifolia needs monographic study; the material here reported as T. naudiniana is vegetatively more like T. schiedeana (S. & C.) Cogn., but the stamens are like those in T. naudiniana; vegetatively the species also resembles T. longifolia, but has larger pink (rather than white) petals. Gadella (Act. Bot. Neerl. 18: 76. 1969) reported $2n = 36$ for T. sellowiana (Cham.) Cogn. (Sect. Involucrales). Pterolepis pumila is vegetatively perhaps the smallest of all the Tibouchineae reported, but has the largest chromosomes and lowest number.

Brachyotum, Chaetolepis, and Monochaetum all have tibouchinoid seeds and the latter two genera also have base numbers of 9. Both sections of Monochaetum are represented among the species with chromosomes counted; the genus has a rather small morphologic amplitude and hybrids in populations of sympatric species are not infrequent. Almeda reported on 7 Central American species of Monochaetum (Univ. Calif. Publ. Bot. 75: 18-19. 1978), all with $n = 18$.

The other genera of Tibouchineae here reported all have microlicioid seeds and only Comolia and Nepsera (?) have a base number of 9. The diverse counts in Aciotis are rather surprising since the genus is morphologically close-knit and the species difficult to distinguish. The other four genera (Marcetia, Macairea, Ernestia, Acisanthera) have base numbers of 11 or 12. Arthrostema has traditionally been placed in the Tibouchineae, but seems better accommodated in the Rhexieae. Bostick (Sida 3: 395. 1969) reported a base number of 11 for thirteen taxa of Rhexia, with polyploid series (up to $n = 33$) in four species and two polyploids ($n = 22$) without diploid populations.

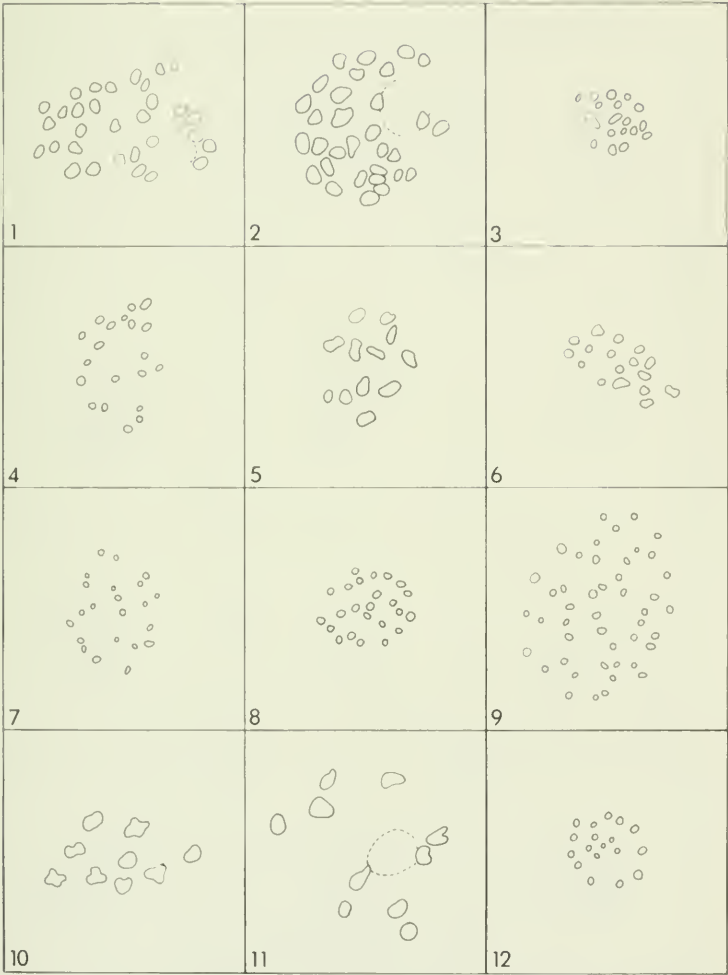
The commonest base number in the Miconieae is 17, a minority of taxa however with 23 or 24. The species thus far sampled in Miconia represent 6-7% of the described taxa and 9 of the 11 sections recognized by Cogniaux; the highest chromosome numbers are in some species of the (generally) morphologically primitive Section Tamonea. Nevling (Journ. Arn. Arb. 50: 102. 1969) reported $n = 17$ for Miconia foveolata Cogn. and $2n = ca. 34$ for M. pachyphylla Cogn., as well as $n = 12$ for Mecranium amygdalinum (Desr.) C. Wr. ex Sauv. Four of Cogniaux' seven sections, Niangae (DC.) Cogn. (L. xanthostachya), Carassanae (Triana) Cogn. (L. subseriata, L. aff. oblongifolia), Tschudya (DC.) Cogn. (L. rufescens) and Secundiflorae (DC.) Cogn. (all other species reported) are represented in the chromosome sampling; the latter two sections are well-marked within the genus, but the Carassanae are poorly distinguishable among Cogniaux' sections II-V. The 6% sampling within Leandra is quite inadequate for any

infrageneric inferences.

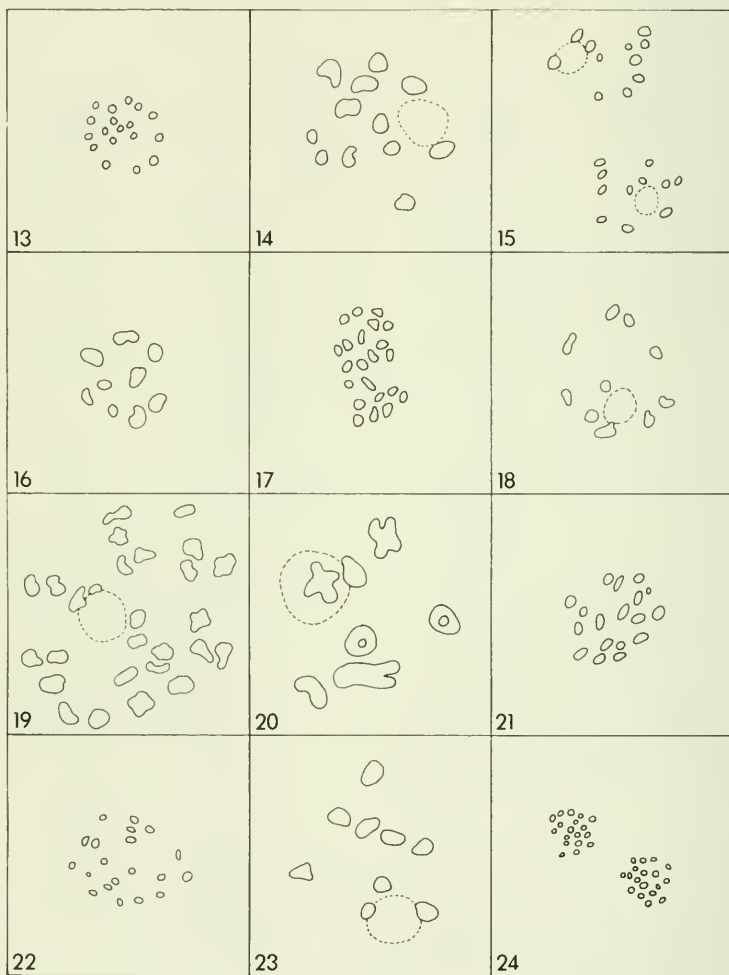
For both the Blakeae and Memecyleae, much more sampling is needed before any chromosome number data would be significant. Previously reported counts in Memecylon gave base numbers of 7 and 12.

Legend for Camera Lucida Drawings

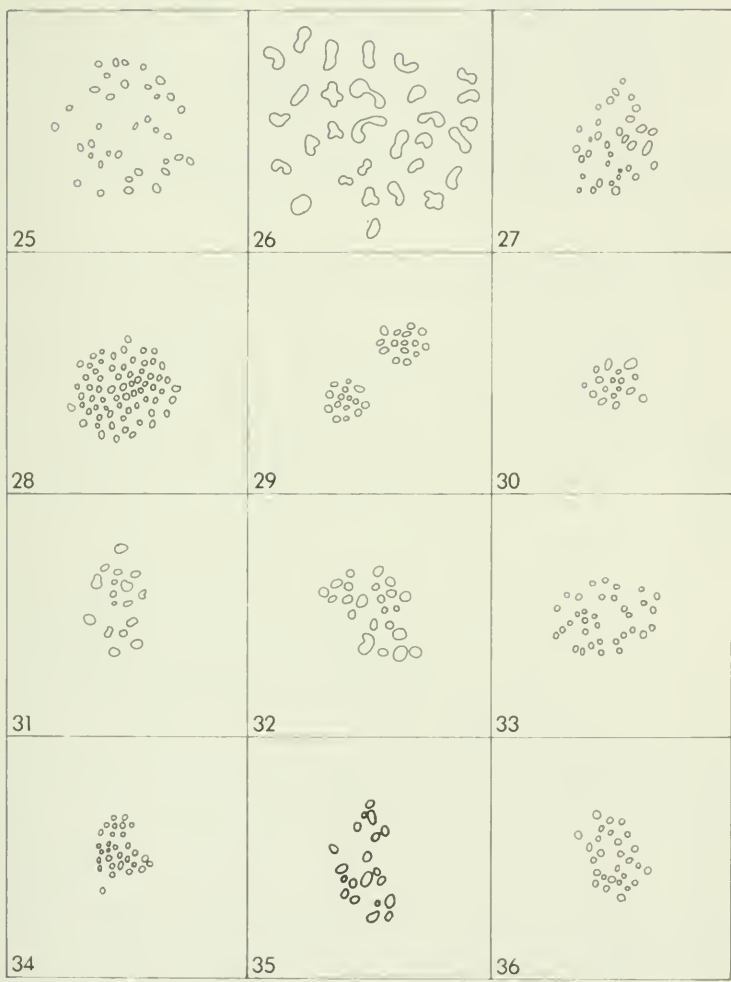
1. Meriania grandidens. $n = 31$.
2. Axinaea ruizteranii. $n = 31$.
3. Bucquetia vernicosa. $n = 18$.
4. Acanthella sprucei. $2n = 20$.
5. Macrocentrum minus. $n = 12$.
6. Triolena pustulata. $n = 17$.
7. Trembleya parviflora subsp. triflora. $2n = 22$.
8. Lavoisiera grandiflora. $2n = 24$.
9. Microlicia fasciculata. $2n = 46$.
10. Rhynchanthera serrulata. $n = 9$.
11. Siphanthera cordifolia. $n = 10$.
12. Centradenia inaequilateralis. $n = 18$.
13. Marcetia taxifolia var. glandulosa. $2n = 24$.
14. Macairea parvifolia. $n = 12$.
15. Ernestia maguirei. $n = 11$.
16. Nepsera aquatica. $n = 9$.
17. Acisanthera quadrata. $n = 22$.
18. Aciotis polystachya. $n = 10$.
19. Tibouchina kingii. $n = 27$.
20. Pterolepis pumila. $n = 7$.
21. Heterocentron glandulosum. $n = 18$.
22. Brachyotum parvifolium. $2n = 20$.
23. Chaetolepis microphylla. $n = 9$.
24. Schwackaea cupheoides. $n = 18$.
25. Monochaetum humboldti-anum var. hirtum. $2n = 36$.
26. Arthrostema ciliatum. $n = 30$.
27. Conostegia montana. $2n = 34$.
28. Miconia dodecandra. $n = 68$.
29. Heterotrichum umbellatum. $n = 15$.
30. Tetrazygia bicolor. $n = 17$.
31. Clidemia insularis. $n = 17$.
32. Clidemia ruddae. $n = 23$.
33. Maieta guianensis. $2n = 34$.
34. Myriaspora egensis. $2n = 30$.
35. Bellucia axinanthera. $n = 20$.
36. Henriettea ramiflora. $n = 28$.
37. Leandra solenifera. $n = 17$.
38. Ossaea hirsuta. $n = 17$.
39. Blakea trinervia. $n = 31$.
40. Topobea superba. $2n = 56$.



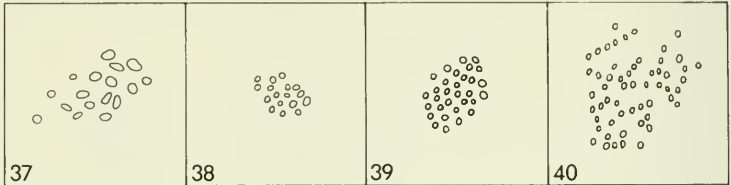
10 microns



10 microns



10 microns



10 microns

NOMENCLATURAL CHANGES IN ORCUTTIA (GRAMINEAE)

John R. Reeder

Herbarium, University of Arizona, Tucson 85721

In 1936, R. F. Hoover (Madroño 3: 229) described Orcuttia inaequalis, citing as type one of his own collections from near Montpellier in Stanislaus County, California. Five years later (Bull. Torrey Bot. Club 68: 149—156. 1941) he transferred the species to varietal status under O. californica Vasey. In this latter publication two additional taxa were described as new. One of these was O. californica var. viscida, the type a Hoover specimen from Sacramento County, seven miles south of Folsom. The other taxon, O. pilosa, is not relevant to the present discussion.

Since 1941, botanists who have been concerned with the genus have generally followed the treatment of Hoover regarding Orcuttia californica and its varieties (cf. Hitchcock, A. S., U.S.D.A. Misc. Publ. 200, 1951; Mason, H. L., A Flora of the Marshes of California, 1957; Munz, P. A., A California Flora, 1959; Crampton, B., Madroño 15: 97—110. 1959). Recent study, however, indicates that these taxa are more realistically treated as distinct species. Each has a characteristic chromosome number, and the caryopses differ significantly in size. Moreover, morphological differences among these taxa appear to be as great as those which separate other species in the genus. The appropriate names for the three taxa under discussion, therefore, are:

ORCUTTIA CALIFORNICA Vasey, Bull. Torrey Bot. Club 13: 219. 1886.

Type: Orcutt in 1886, Mexico, Baja California Norte.

ORCUTTIA INAEQUALIS Hoover, Madroño 3: 229. 1936.

O. californica Vasey var. inaequalis (Hoover) Hoover, Bull.

Torrey Bot. Club 68: 154. 1941. Type: Hoover 582.

ORCUTTIA VISCIDA (Hoover) J. Reeder, comb. nov.

O. californica Vasey var. viscida Hoover, Bull. Torrey Bot.

Club 68: 155. 1941. Type: Hoover 3709.

Documented chromosome numbers for the above three species are listed below. When collections are from the same general area they represent different vernal pools and, therefore, distinct populations. Collection numbers are those of J. R. & C. G. Reeder.

O. californica ($2n = 32$)

Mexico: Baja California Norte, mesa near Colonet, 7208, 7209.

O. inaequalis ($2n = 24$)

USA: California, Madera Co., 8 mi N of Pinedale, 6215; 7 mi N of Pinedale, 6216; 4.5 mi S of Jct. of State Hwys. 145 and 41, 6661. Stanislaus Co., 4 mi E of Waterford, 6252.

O. viscida ($2n = 28$)

USA: California, Sacramento Co., 3 mi N of Jct. of State Hwy. 16 on Grant Line Rd., NW of Sloughhouse, 6234, 6664, 6665, 6666.

NOTES ON NEW AND NOTEWORTHY PLANTS. CXLIII

Harold N. Moldenke

AVICENNIA GERMINANS f. *ABERRANS* Mold., f. nov.

Haec forma a forma typica speciei laminis foliorum majoribus in magnitudine variis plerumque lato-ellipticis usque ad 13 cm. 5 cm. latis apicaliter obtusis vel obtuse acutis recedit.

This form differs from the typical form of the species in having its leaf-blades quite variable in size and shape, but mostly larger and more broadly elliptic, to 13 cm. long and 5 cm. wide when mature and well-developed, apically obtuse to rather obtusely acute.

The form is based on *H. H. & G. W. Smith* 546 from in a forest or secondgrowth near the seacoast of Saint Vincent island in the West Indies, collected in May or June of 1889 and deposited in the Columbia University Herbarium at the New York Botanical Garden.

AVICENNIA GERMINANS f. *BRASILIENSIS* Mold., f. nov.

Haec forma a forma typica speciei laminis foliorum breviter ellipticis apicaliter abrupte acutis vel breviter acuminatis supra subtusque flavidulis perspicue reticulatis recedit.

This form differs from the typical form of the species in its leaf-blades having a decided dirty-yellowish aspect on both surfaces, being shortly elliptic, mostly 7--12 cm. long and 3--4 cm. wide when mature, and with the venation conspicuously prominent on both surfaces.

The form is based on *Francis Drouet* 2442 from the border of tidal flats 2 km. east of Soure, Ceará, Brazil, collected on September 9, 1935, and deposited in my personal herbarium.

AVICENNIA GERMINANS f. *VENEZUELENSIS* Mold., f. nov.

Haec forma a forma typica speciei laminis foliorum regulariter elongato-ellipticis apicaliter acuminatis subtus glaberrimis undique pernitidis recedit.

This form differs from the typical form of the species in having its mature leaf-blades regularly and beautifully elongate-elliptic, to 15 cm. long and 4 cm. wide, apically regularly and plainly acuminate, basally attenuate, completely glabrous and very conspicuously shiny on both surfaces.

The form is based on *F. J. Breteler* 4677 from near the edge of the forest on the left bank of the Río San Juan near its confluence with Río Guarapiche, about 53 km. northeast of Maturín, Sucre, Venezuela, at sealevel, collected on October 21, 1965, and deposited in the Britton Herbarium at the New York Botanical Garden

JUNELLIA LIGUSTRINA var. *LORENTZII* (Niederlein) Mold., comb. nov.

Verbena lorentzii Niederlein ex Hieron., Bol. Acad. Nac. Córdoba 3: 370. 1879.

LANTANA ARMATA f. *TERNIFOLIA* Mold., f. nov.

Haec forma a forma typica speciei foliis pedunculisque ternis recedit.

This form differs from the typical form of the species in having its leaves and peduncles ternate.

The form is based on *Ernesto Foldats* 227-A from an island on inundated savannas at Guapuchana, on the left bank of the Río Orinoco, about 20 km. above its confluence with the Río Ventuaru, Amazonas, Venezuela, on May 4, 1971, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collector notes: "Frútices con flores amarillas en el ápice y anaranjadas en la base. Fruto maduro morado y comestible. Crece en pequeñas maticas formadas por arbustos y frútices".

LANTANA CAMARA var. *MORITZIANA* f. *ALBIFLORA* Mold., f. nov.

Haec forma a forma typica varietatis corollis albis differt.

This form differs from the typical form of the variety in having its corollas white.

The form is based on *C. E. Wyatt* 45 from moist loamy soil in an arroyo at 4500 feet altitude 6 miles west of Yantepec, Morelos, Mexico, collected on August 14, 1950, and deposited in the herbarium of the Instituto de Biología in Mexico City. The collector describes the plant as a shrub about 10 feet tall.

LANTANA GLANDULOSISSIMA f. *ACULEATISSIMA* Mold., f. nov.

Haec forma a forma typica speciei ramulis densissime aculeatis recedit.

This form differs from the typical form of the species in having even its floriferous branchlets and twigs very densely and viciously thorny with very sharp, stout-based, often slightly recurved thorns.

LANTANA GLANDULOSISSIMA f. *FLAVA* Mold., f. nov.

Haec forma a forma typica speciei corollis constanter flavis recedit.

This form differs from the typical form of the species in having its corollas unchangingly yellow.

The form is based on *Grady L. Webster & Gary Breckon* 15971 from in scrub below and oak forest interspersed with pine, at 4600 feet altitude, along the road to the microwave station on Volcán Tequila, about 20°47' N., 103°50' W., Jalisco, Mexico, collected on October 25, 1970, and deposited in the herbarium of the Instituto de Biología in Mexico City. The collectors describe the plant as a shrub, 2.5 m. tall, with bright-yellow flowers [corollas] which have a lemony odor.

ADDITIONAL NOTES ON THE GENUS *CITHAREXYLUM*. XVI

Harold N. Moldenke

CITHAREXYLUM BERLANDIERI B. L. Robinson

Additional bibliography: Mold., *Phytologia* 47: 143. 1980.

Recent collectors have found this plant in fruit in March, September, and October. Ventura refers to it as "scarce" and "very scarce" in Veracruz, Mexico. The corollas are said to have been "white" on *Crutchfield* 1120 and *Ventura A.* 11894 and "whitish" on *Ventura A.* 3731.

Additional citations: TEXAS: Cameron Co.: *Crutchfield* 1120 (N). MEXICO: Veracruz: *Dorantes & al.* 996 (Go); *Ventura A.* 2711 (N), 3731 (N), 11894 (N).

CITHAREXYLUM BRACHYANTHUM (A. Gray) A. Gray

Additional bibliography: Mold., *Phytologia* 40: 489--490 (1978) and 41: 116. 1978.

In a letter to me, dated February 8, 1980, Dr. Richard Spellenberg cites *Spellenberg, Zimmerman, & Rincon* 5182 as probably representing this species from Zacatecas, Mexico, regarded by Dr. Marshall Johnston as the first record of this species from that state. Dr. Spellenberg says that "One [Mexican] member of our party called it 'ramoncillo', but then all little scraggly bushes were 'ramoncillo'".

Additional citations: MEXICO: Coahuila: *Wynd & Mueller* 9 (Au). San Luis Potosí: *Medellín* 1551 (Me--189863).

CITHAREXYLUM BULLATUM Mold.

Additional bibliography: Mold., *Phytologia* 40: 490. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 18. 1979.

CITHAREXYLUM CAUDATUM L.

Additional & emended bibliography: D. Dietr., *Syn. Pl.* 3: 614. 1843; H. N. & A. L. Mold., *Pl. Life* 2: 50 & 69. 1948; Metcalfe & Chalk, *Anat. Dicot.* 2: 1033. 1950; Alain in León & Alain, *Fl. Cuba*, imp. 1, 4: 299 & 301. 1957; Neal, *In Gard. Hawaii*, ed. 2, 726. 1965; Fournet, *Fl. Illustr. Phan. Guad. Mart.* 1404 & 1406. 1978; Mold., *Phytologia* 40: 490--492 (1978) and 41: 65, 66, & 118. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 15. 1979.

Recent collectors have encountered this species on the borders of mangrove swamps and describe it as a tree, 2--4 m. tall, the petioles light-orange, and the fruit orange in color, in flower in June, and in fruit in March and June. The leaf-blades on *Vincelli* 589 are narrow and mucronate as in *C. mucronatum* Fourn. & Mold., but are lightly coriaceous in texture. This collection, like several others previously cited as *C. caudatum*, may represent a natural hybrid; its corollas are said to have been "white".

The *Ortega* 460, distributed as *C. caudatum*, actually is *C. ligustrinum* Van Houtte, while *Neill* 2573, 4069, & 4541 definitely represent typical *C. mucronatum*. [to be continued]

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CIC.

A NEW GENUS *MALMEANTHUS*.

R. M. King and H. Robinson

Department of Botany

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The genus *Critonia* and its close relatives in the Critoniinae having strongly subimbricate to imbricate involucre bracts, have a distribution concentrated in Central America, northern South America and the West Indies. A smaller center of diversity is found in southern Brasil and adjacent areas with a few genera which contrast well with the mostly eximbricate Gyptidinae and totally deciduous imbricate Praxelinae that are the predominant Eupatorieae in the area. Three genera of this group have been named previously, *Steyermarkina* (King & Robinson, 1971), *Neocabreria* (King & Robinson, 1972), and *Austrocritonia* (King & Robinson, 1975). Three species from the area are here recognized as a fourth genus of the group for which we have chosen the name *Malmeanthus*.

Within the group of Critonioid genera, *Malmeanthus* can be distinguished from both *Steyermarkina* and *Neocabreria* by the lack of hairs inside of the corolla. The first of these differs further by the pyramidally thyrsoid inflorescence with spreading opposite branches. The latter can be distinguished also by its narrow elliptical leaves with closely serrulate margins. The new genus seems closest to *Austrocritonia*, but that differs by the narrowed and nearly smooth distal portions of the pappus setae and by the broad distinct carpopodium.

The new genus is named after Gustaf Malme, the Swedish botanist, noted for his studies on Brazilian Compositae.

MALMEANTHUS R. M. King & H. Robinson, genus nov. Asteracearum (Eupatorieae).

Plantae fruticulosae mediocriter ramosae. Caules subteretes distincte striati dense puberuli vel pilosuli. Folia opposita distincte petiolata; laminae ovatae base breviter acutae vel breviter acuminatae margine serrulatae vel subintegrae apice vix acuminatae supra et subtus glandulo-punctatae subtus dense puberulae vel tomentellae, nervis secundariis ascendentiter pinnatis. Inflorescentiae corymboso-paniculatae. Capitula pedicellata campanulata; squamae involucri subimbricatae ca. 4-seriatae inaequales interiores facile deciduae; receptacula leniter convexa glabra. Flores 5-22 in capitulo; corolla anguste infundibulares intus glabrae, cellulis elongatis in parietibus plerumque rectis interdum interioribus sinuosis, lobis vix vel

distincte longioribus quam latioribus utrinque laevibus; filamenta in parte superiore cylindrica, cellulis plerumque breviter oblongis vel longioribus in parietibus valde annulate ornatis; appendices antherarum oblongae longiores quam latiores; basi stylorum glabri non noduliferi; appendices stylorum anguste lineares leniter vel valde mamillosae. Achaenia longe prismatica 5-costata base angusta; carpopodia nulla vel subnulla; pappus multi-setosus, setis ad apicem scabridis. Grana pollinis in diametro ca. 25 μ m.

Type species: *Eupatorium subintegerrimum* Malme.

The genus contains the following three species .

1. Heads with 5 flowers; achenes densely glanduliferous; corolla lobes twice as long as wide; undersurfaces of leaves with rusty tomentum on veins *M. hilarii*
1. Heads with 10-22 flowers; achene without glands, with a few setae above; corolla lobes about as long as wide; whole undersurfaces of leaves with sparse whitish tomentum.
2. Heads with ca. 10 flowers; petioles ca. 5 mm long; corolla lobes slightly longer than wide; achenes with numerous short biseriate setae below pappus *M. subintegerrimum*
2. Heads with 20-22 flowers; petioles ca. 10 mm long; corolla lobes as wide as long; achenes with mostly or only uniseriate hairs above *M. catharinensis*

MALMEANTHUS HILARII (B.L.Robinson) R.M.King & H.Robinson, comb. nov. *Eupatorium hilarii* B.L.Robinson, Contr. Gray Herb. n.s. 68: 19. 1923. Brasil: Minas Gerais.

MALMEANTHUS SUBINTEGERRIMUS (Malme) R.M.King & H.Robinson, comb. nov. *Eupatorium subintegerrimum* Malme, Arkiv Bot. (Stockh.) 24A (6): 30. 1932. Argentina: Misiones, Brasil: Rio Grande do Sul, Uruguay.

MALMEANTHUS CATHARINENSIS R.M.King & H.Robinson, sp. nov.

Plantae fruticosae plus minusve 3 m altae. Caules brunnescentes teretes leniter striati subtomentelli. Folia opposita, petiolis 7-13 mm longis; laminae ovatae 5-9 cm longae et 1.3-3.3 cm latae base breviter acuminatae margine integrae vel perpauce remote serrulatae apice anguste acutae non acuminatae supra dense minute puberuli subtus tomentellae, nervis secundariis utrinque 6-7. Inflorescentiae alterne ascendenter corymbosopaniculatae, ramis dense puberulis, ramis ultimis 3-9 mm longis. Capitula 10-11 mm alta et 4-5 mm lata; squamae involucri ca. 20 subimbricatae 4-5-seriatae valde inaequales oblongae vel anguste lanceolatae 1.5-7.0 mm longae et 1.0-1.8 mm latae extus 4-costatae inferne glabrae superne ad apicem dense puberulae margine

superne dense puberulo-fimbriatae. Flores 20-22 in capitulo; corollae albae 6.5-7.0 mm longae extus glabrae, tubis cylindraceis ca. 3 mm longis, faucibus infundibularibus ca. 3 mm longis, lobis ca. 1 mm longis et latis; filamenta in parte superiore ca. 0.3 mm longa; thecae ca. 2 mm longae; appendices antherarum subquadratae ca. 0.25 mm longae et 0.3 mm latae. Achaenia ca. 4.7 mm longa ca. 0.7 mm lata, superne sparse arachnoideo-pilosula; setae pappi 30-35 plerumque 5-6 mm longae.

TYPE: BRASIL: Santa Catarina: Mun. São Joaquim. Camino a Lajes, 12 km de São Joaquim. Alt. 1000 m. Arbolito + 3 m. Fl. blancas. 15 XII 1967. *A. Lourteig 2798* (Holotype, US).

The new species is close to *M. subintegerrimus*, but differs by the larger heads with approximately twice as many flowers, by the longer leaf petioles, the shorter corolla lobes, and the finer hairs near the apex of the achene.

Literature Cited

- King, R. M. and H. Robinson 1971. Studies in the Eupatorieae (Asteraceae). XLVII. A new genus, *Steyermarkina*. *Phytologia* 22: 43-45.
- _____ and _____. 1972. Studies in the Eupatorieae (Asteraceae). LXV. A new genus, *Neocabreria*. *Phytologia* 23: 151-152.
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Malmeanthus catharinensis R. M. King & H. Robinson, Holotype.
United States National Herbarium. Photos by Victor E. Krantz,
Staff Photographer, National Museum of Natural History.



Malmeanthus catharinensis R. M. King & H. Robinson,
enlargement of heads.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CC.

ADDITIONS TO THE GENUS *CHROMOLAENA*.

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The genus *Chromolaena* was redelimited approximately ten years ago to include 129 species (King & Robinson, 1970). Since that time there have been comparatively few alterations. One species, *C. lundellii* from Guatemala, has been described as new (King & Robinson, 1978), *C. plumeri* (Urb. & Ekman) K. & R. of Haiti has been transferred to the genus *Osmiopsis* (King & Robinson, 1975a), *C. punctata* (Lam.) K. & R. of the West Indies has proven to be based on a nom. illeg. and should be treated as *C. mononeura* (Urb.) K. & R., and a number of new combinations have been made for species named in *Eupatorium*, *E. misellum* McVaugh from Mexico (King & Robinson, 1972), *E. heterosquamum* Urb. & Ekman and *E. sinuatum* Lam. of the West Indies and *E. mendezii* DC. and *E. stillingiaefolium* DC. of Mexico (King & Robinson, 1975b), *E. mucronatum* Gardn. of Brasil and *E. quercetorum* L. Wms. of Mexico and Guatemala (King & Robinson, 1977), and *E. voglii* B.L. Robins. of Venezuela (Huber, 1977). The present paper provides 13 additional new combinations and 9 additional new species descriptions so that the species can be included in the generic revision of the tribe.

The new combinations and new species are as follows:

CHROMOLAENA ANACHORETICA (B.L. Robins.) R.M. King & H. Robinson,
comb. nov. *Eupatorium anachoreticum* B.L. Robins., Contr.
Gray Herb. n.s. 104: 9. 1934. Peru.

CHROMOLAENA ASPERRIMA (Sch. Bip. ex Baker) R.M. King & H. Robinson,
comb. nov. *Eupatorium asperrimum* Sch. Bip. ex Baker, in
Martius, Fl. Bras. 6 (2): 292. 1876. Including *Eupatorium*
meyeri Pilg., Bot. Jahrb. 30: 202. 1901. Brasil.

CHROMOLAENA BRUNNEOLA (Baker) R.M. King & H. Robinson, comb. nov.
Eupatorium brunneolum Baker, in Martius, Fl. Bras. 6 (2):
288. 1876. Brasil.

CHROMOLAENA CRYPTANTHA (Sch. Bip. ex Baker) R.M. King & H. Robinson,
comb. nov. *Eupatorium cryptanthum* Sch. Bip. ex Baker, in
Martius, 6 (2): 296. 1876. Brasil.

CHROMOLAENA CYLINDROCEPHALA (Sch. Bip. ex Baker) R.M. King &
H. Robinson, comb. nov. *Eupatorium cylindrocephalum* Sch. Bip.

ex Baker, in Martius, Fl. Bras. 6 (2): 283. 1876. Brasil.

CHROMOLAENA DIAPHANOPHLEBIA (B.L.Robins.) R.M.King & H.Robinson, comb. nov. *Eupatorium diaphanophlebium* B.L.Robins., Proc. Amer. Acad. 54: 242. 1918. Colombia.

CHROMOLAENA GENTIANOIDES (B.L.Robins.) R.M.King & H.Robinson, comb. nov. *Brickellia gentianoides* B.L.Robins., Contr. Gray Herb. n.s. 68: 42. 1923. Brasil.

CHROMOLANEA HOOKERIANA (Griseb.) R.M.King & H.Robinson, comb. nov. *Eupatorium hookerianum* Griseb., Goett. Abh. 19: 118. 1874. Argentina, Rio de Janeiro, Brasil.

CHROMOLAENA MINASGERAESENSIS (Hieron.) R.M.King & H.Robinson, comb. nov. *Eupatorium minasgeraesense* Hieron., Bot. Jahrb. 22: 749. 1897. Brasil.

CHROMOLAENA PEDUNCULOSA (Hook. & Arn.) R.M.King & H.Robinson, comb. nov. *Eupatorium pedunculatum* Hook. & Arn., Comp. Bot. Mag. 1: 240. 1835. Including *Eupatorium foliatum* Hieron. Brasil.

CHROMOLAENA PICTA (Gardn.) R.M.King & H.Robinson, comb. nov. *Eupatorium pictum* Gardn., Lond. Journ. Bot. 5: 443. 1847. Excluding the Berlin isotype. Brasil.

CHROMOLAENA PUNGENS (Gardn.) R.M.King & H.Robinson, comb. nov. *Eupatorium pungens* Gardn., Lond. Journ. Bot. 5: 474. 1846. Brasil.

CHROMOLAENA VINDEX (DC.) R.M.King & H.Robinson, comb. nov. *Eupatorium vindex* DC., Prodr. 5: 160. 1836. Brasil.

CHROMOLAENA ALVIMII R.M.King & H.Robinson, sp. nov.

Plantae herbaceae erectae ca. 0.5 m altae inferne non ramosae. Caules fuscescentes teretes striati hispidulo-puberuli. Folia opposita, petiolis subdistinctis brevibus ca. 2-4 mm longis; laminae anguste ovatae vel lanceolatae ad 3.4 cm longae et 1.5 cm latae superiore decrescentes et remotiores base acutae vel vix acuminatae margine plerumque 3-4-seriatae vel dentatae apice anguste obtusae vel breviter acutae supra scabridulae subtus immerse glandulo-punctatae et in nervis et nervulis minute hispidulo-puberulae fere ad basem trinervatae. Inflorescentiae laxae corymboso-paniculatae plerumque opposito-ramosae, ramis ascendentibus, bracteis ramulorum minutis, ramulis ultimis plerumque 1-4 cm longis minute hispidulo-puberulis. Capitula anguste campanulata ca. 10 mm alta et 5 mm lata; squamae involucri purpureae ca. 30 imbricatae ca. 5-seriatae anguste vel late oblongae 1.5-6.0 mm longae et 1-2 mm latae apice late obtusae subherbaceae

reflexae minute denticulatae extus inferne leniter late 4-costatae glabrae superne multo glandulo-punctatae et perminute puberulae. Flores ca. 30 in capitulo; corollae purpureae anguste infundibulares 4.5-5.0 mm longae extus in faucibus et lobis breviter glanduliferae; tubis ca. 1 mm longis, faucibus ca. 3 mm longis in ductis solitariis atro-resiniferis, lobis ovato-triangularibus ca. 1 mm longis et 0.7 mm latis intus papillois; filamenta in parte superiore ca. 0.3 mm longa; thecae ca. 1.8 mm longae; appendices antherarum oblongo-ovatae ca. 0.35 mm longae et 0.23 mm latae. Achaenia prismatica ca. 3.5 mm longa in costis inferne et ad apicem setulifera ad medio laeves; setae pappi ca. 35 plerumque 4.5-5.0 mm longae superne leniter tenuiores, cellulis apicalibus acutis. Grana pollinis abnormalia in diametro ca. 30 μ m.

TYPE: BRASIL: Bahia: Middle N.E. slopes of the Pico das Almas ca. 25 km W.N.W of the Vila do Rio de Contas. ca. 41°57'W, 13°33'S. Alt. ca. 1500-1600 m. This plant growing in damp grassland at base of massive sandstone rock outcrops. Herb to ca. 50 cm. Leaves dark glossy green above, pale beneath. Phyllaries dark green, tinged reddish-purple with dark recurved tips. Florets bright reddish-purple. 18 March 1977. R.M.Harley, S.J. Mayo, R.M.Storr, T.S.Santos & R.S.Pinheiro 19617 (Holotype, CEPEC; isotype, US). PARATYPE: BRASIL: Bahia: Município de Rio de Contas. Pico das Almas a 18 km NW de Rio de Contas. Elev. 1600-1850 m. July 24, 1979. R.M.King, S.A.Mori, T.S.Santos & J.L.Hage 8144 (CEPEC, US).

The new species is one of those with reflexed tips on the involuclral bracts. It differs from the widely distributed *C. ivaefolia* (L.) K. & R. by the laxer inflorescence with purple, campanulate involuclres and broader more dentate leaves. The related *C. squarrosus-ramosa* (Hieron.) K. & R. also differs by a denser inflorescence and more cylindrical heads as well as the more spreading branches and the broader leaves. The more southern *C. squarrosula* (H. & A.) K. & R. is a more tomentellous plant with densely corymbose terminal inflorescences.

CHROMOLAENA BARROSOAE R.M.King & H.Robinson, sp. nov.

Plantae herbaceae erectae ad 30 cm altae inferne non vel paucae ramosae. Caules flavo-virides teretes striati minute puberuli. Folia inferne opposita vel subopposita superne alterna sessilia vel subsessilia; laminae lanceolatae 5-20 mm longae et 2-3 mm latae inferiores minutae superiores leniter minores base acutae margine saepe in partibus latissimis uni-serrulatae anguste revolutae apice acutae supra minute scabridulae subtus dense glandulo-punctatae in nervis et nervulis minute puberulae ad basem trinervatae, nervis secundariis tenuibus valde ascendentibus. Inflorescentiae terminales laxae latae cymosae alterne ramosae, ramis ultimis 5-38 mm longis minute puberulis. Capitula campanulata 8-12 mm alta et 7-9 mm lata; squamae involucri in parte superiore violaceae ca. 40 imbricatae ca. 4-seriatae latae

oblongae 1.5-5.0 mm longae et 1.0-1.5 mm latae apice erectae appressae breviter acutae interdum apiculatae extus late 4-costatae superne multo glandulo-punctatae et perminute puberulae margine superne minute puberulo-fimbriatae; receptacula sparse paleacea, paleis linearibus ad 7 mm longis. Flores ca. 40 in capitulo; corollae lavandulo-purpureae anguste infundibulares ca. 5.0-5.3 mm longae in tubis et faucibus subglabris, tubis ca. 1 mm longis in ductis binis rubro-resiniferis; faucibus ca. 3.5 mm longis; lobis ovato-triangularibus ca. 0.9 mm longis et 0.6 mm latis intus papillosis extus et in faucibus superioribus multo glandulo-punctatis et raro unisetiferis; filamenta in parte superiore ca. 0.3 mm longa; thecae ca. 1.7 mm longae; appendices antherarum oblongae ca. 0.35 mm longae et 0.23 mm latae. Achaenia prismatica 3.0-3.5 mm longa base breviter angustiora in costis et superne setulifera; setae pappi ca. 30 plerumque 4.5-5.0 mm longae apice leniter latiores et densius obtuse scabridulae. Grana pollinis in diametro ca. 25 μ m.

TYPE: BRASIL: Minas Gerais: Serra do Espinhaço, ca. 12 km N.E. of Diamantina, road to Mendanha. Elev. 1300 m. Wet sand. Sandy cerrado and thickets in sandy pockets in outcrops. Erect herb to ca. 30 cm tall. Heads lavender-purple. 28 Jan. 1969. *H.S. Irwin, R. Reis dos Santos, R. Souza & S.F. da Fonseca 22797* (Holotype, RB; isotypes, NY, UB, US).

Chromolaena barrosoae has scattered paleae on the receptacle, a character seen in a few other members of the genus, including the type. The paleaceous species have no other notable features in common, and they are obviously not a natural group. The new species is otherwise rather distinctive in the alternate upper leaves, the lax few-headed terminal inflorescence, and the comparatively few series of bracts in the involucre. Closest relationship may be to two species with similar involucre which lack paleae, *C. adenolepis* (Sch.Bip. ex Baker) K. & R. which has broader, mostly opposite leaves and a less lax more scapose inflorescence, and *C. xylorrhiza* (Sch.Bip. ex Baker) K. & R. which is more pilose with broader leaves and a denser inflorescence.

The species is named for Dr. Graziela Barroso who forwarded material noted as a possible new species.

CHROMOLAENA BREEDLOVEI R.M. King & H. Robinson

Plantae fruticosae ad 0.7 m altae mediocriter ramosae. Caules atrescentes in parte rubescentes teretes leniter multistriati tenuiter pilosi. Folia opposita, petiolis 5-10 mm longis laxe tomentosis; laminae ovatae 2-8 cm longae et 1-3 cm latae base rotundatae margine in partibus latioribus serrulatae apice anguste acutae vix acuminatae supra sparse pilosae subtus dense glandulo-punctatae et plerumque in nervis et nervulis pilosae. Inflorescentiae in ramis candelabriformibus terminales in ramulis dense cymosae, ramulis ultimis 2-8 mm longis hirsutae. Capitula cylindrica ca. 16 mm alta et 4 mm lata; squamae involucri ca. 27 imbricatae 5-6-seriatae lanceolatae 3-12 mm longae et 1-2 mm

latae apice laxe erectae anguste acutae extus glabrae 4-6-costatae superne rubro-tinctae margine integrae saepe undulatae. Flores ca. 19 in capitulo; corollae lavandulae 6-7 mm longae anguste infundibulares glabrae vel subglabrae, tubis ca. 2.5 mm longis, faucibus ca. 4 mm longis, lobis triangularibus ca. 1 mm longis et 0.7 mm latis intus dense breviter papillois extus subapice interdum unisetiferis; filamenta in parte superiore ca. 0.4 mm longa; thecae ca. 2.3 mm longae; appendices antherarum oblongae ca. 0.5 mm longae et 0.28 mm latae. Achaenia 6.5-7.2 mm longa anguste fusiformia 5-costata in costis dense setifera; setae pappi ca. 27 ca. 6.5 mm longae apice non latiores. Grana pollinis multiformia, typis A in diametro ca. 25 μ m.

TYPE: MEXICO: Chiapas: Municipio of Carranza. 2 km SW of Aguacatenango, slope with *Quercus* along road to Pinola. Shrub 2 feet tall; flowers blue. Dec. 18, 1964. *D.E.Breedlove 7936* (Holotype, NY).

The species is related to the widely distributed *C. odorata* (L.) K. & R. from which it differs by the extremely pointed lanceolate involucral bracts. In the same general area of Central America there is a variant of *C. odorata* having enlarged herbaceous basal bracts on the involucre. The variant and the new species together suggest a small center of diversity in Central America of the generally widely distributed *C. odorata* group.

CHROMOLAENA MORII R.M.King & H.Robinson, sp. nov.

Plantae fruticosae ad 2.5 m altae mediocriter ramosae. Caules brunnescentes teretes striati puberuli inferne glabrescentes. Folia opposita, petiolis distinctis 3-8 mm longis; laminae ovatae plerumque 2-4 cm longae et 1.0-2.5 cm latae base rotundatae vel subtruncatae margine saepe 5-7 serrulatae vel obtuse serratae apice argute acutae vix acuminatae supra glabrae nitidae subbullatae subtus dense immerse glandulo-punctatae in nervis prominentes et puberulae vel pilosulae interdum in areolis puberulae fere ad basem trinervatae. Inflorescentiae in ramis candelabrifformibus terminales in ramulis dense corymboso-cymosae, bracteis ramulorum minutis in laminis 5-8 mm longis, ramulis ultimis 2-10 mm longis puberulis vel hirtellis et glandulo-punctatis. Capitula cylindrica 10-12 mm longa et 2.5-3.0 mm lata: squamae involucri ca. 35 imbricatae 6-7-seriatae oblongo-ovatae vel anguste oblongae 1.5-8.0 mm longae et 1-2 mm latae apice rotundatae vel subtruncatae appressae dense puberulo-fimbriatae extus 4-costatae inferne glabrae subapice multo glandulo-punctatae in marginis lateralibus interdum ribro-tinctae ad medio saepe virido-vittatae interdum trans apicem infusatae. Flores 14-16 (-17) in capitulo; corollae lavandulae anguste infundibulares 4.5-5.5 mm longae extus breviter glanduliferae vel glandulo-punctatae, tubis ca. 1.2 mm longis; faucibus 3.0-3.5 mm longis, lobis triangularibus 0.6-0.8 mm longis et 0.4-0.5 mm latis intus papillois extus interdum minute unisetiferis; filamenta in parte superiore 0.3-0.4 mm longa; thecae 1.2-1.8 mm longae; appendices

antherarum oblongo-ovatae 0.3-0.4 mm longae et 0.18-0.22 mm latae. Achaenia anguste prismatica 4.0-4.8 mm longa in costis dense minute scabridula: setae pappi ca. 35 plerumque 3.5-4.5 mm longae ad apicem vix latiores, cellulis apicalibus congestis breviter acutis in aggregatis subtruncatis. Grana pollinis in diametro ca. 23-25 μ m.

TYPE: BRASIL: Bahia: Município de Rio de Contas. Base de Pico das Almas, a 18 km ao NW de Rio de Contas. Elev. ca. 1300 m. Shrub 1½ meters tall, flowers lavender. July 24, 1979. *R.M.King, S.A.Mori, T.S.dos Santos & J.L.Hage 8122* (Holotype, CEPEC; isotype, US). PARATYPES: BRASIL: Bahia: Município de Rio de Contas, a 4 km ao NW de Rio de Contas. Campo rupestre. Elev. ca. 1000 m. Shrub 1 meter tall, flowers light lavender. July 21, 1979. *R.M.King, et al. 8067* (US); Base de Pico das Almas, a 18 km ao NW de Rio de Contas. Elev. ca. 1300 m. Shrub 2-2½ meters tall, flowers lavender. July 24, 1979. *R.M.King, et al. 8131* (US); Lençóis. arbusto de + 2 m de alt. 24-9-1965. *A.P.Duarte 9177 & E.Pereira 10087* (RB, US).

The new species seems closest to *C. minasgeraesensis* (Hieron.) K.& R., but the latter has leaves with cuneate bases and more shortly acute tips. The upper leaf surfaces are glabrate without the lustrous surface, and the undersurface is only sparsely glandular. The type photographs also show the latter has rather short branchlets in the inflorescence with larger foliose bracts.

CHROMOLAENA MYRIADENIA R.M.King & H.Robinson, sp. nov.

Plantae herbaceae erectae ad 0.5 m altae paucae ramosae rhizomatosae. Caules fuscescentes teretes vix striati dense hirsuti et glandulo-punctati. Folia opposita, petiolis brevibus 2-4 mm longis; laminae lanceolatae 2-7 cm longae et 0.3-1.7 cm latae base acutae margine remote 4-10-serrulatae vel subintegrae apice breviter acutae supra et subtus hirsutae et glandulo-punctatae subtus densius pellucidius glanduliferae supra basem trinervatae, nervis secundariis valde ascendentibus sensim sublongitudinalibus. Inflorescentiae racemoso- vel thyrsoido-paniculatae apice et in ramis simplices vel 2-3-capitatae plerumque dichasialiter cymosae, ramis ultimis ad 27 mm longis interdum nullis dense hirsutis et glandulo-punctatis. Capitula anguste campanulata ca. 12 mm alta et 6-7 mm lata; squamae involucri fusco-vides ca. 50 imbricatae 6-7-seriatae oblongo-ovatae vel lineares 2-10 mm longae et 1-2 mm latae apice erectae obtusae vel breviter acutae extus 4-costatae dense rubro-glandulo-punctatae et puberulae margine puberulo-fimbriatae. Flores 35-40 in capitulo; corollae lavandulae anguste infundibulares ca. 6.5 mm longae in tubis et faucibus glabrae. tubis ca. 2 mm longis, faucibus ca. 3.5 mm longis, lobis triangularibus ca. 0.8 mm longis et 0.6 mm latis intus papillosis extus paucae glandulo-punctatis; filamenta in parte superiore ca. 0.5 mm longa inferne non latiora; thecae ca. 2 mm longae; appendices antherarum

oblongae ca. 0.5 mm longae et 0.24 mm latae. Achaenia prismatica 5-6-costata ca. 3.8 mm longa in costis perminute scabridula apice pauce setulifera; setae pappi 30-35 plerumque 6.0-6.5 mm longae apice distincte leniter latiores, cellulis apicalibus acutis. Grana pollinis in diametro 18-20 μ m.

TYPE: BRASIL: Gofas: Chapada dos Veadeiros. Alto do Paraíso (formerly Veadeiros). Cerrado and gallery woods in steep rocky gorge. Cerrado. Elev. 1000 m. Erect herb to ca. 50 cm tall. Heads lavender. 21 March 1969. *H.S. Irwin, R. Reis dos Santos, R. Souza & S.F. da Fonseca 24812* (Holotype, RB; isotypes, NY, UB, US).

The new species has the most densely glanduliferous involucreal bracts that have been seen in the genus. The plant is also rather distinctive in the simple to simply cymose lateral branches of the inflorescence.

CHROMOLAENA PERIJAENSIS R.M. King & H. Robinson

Plantae herbaceae volubiles mediocriter ramosae. Caules flavo-virides distincte hexagonales glabri. Folia opposita sessilia; laminae anguste ovatae vel lanceolatae plerumque 4.5-5.5 cm longae et 1.3-1.8 cm latae base rotundatae margine subremote serrulatae apice anguste acuminatae supra et subtus glabrae a basis valde trinervatae. Inflorescentiae terminales pyramidaliter paniculatae in ramis dense corymbosae, ramis 0-7 mm longis glabris vel subglabris. Capitula saepe 2-3-fasciculata cylindrica ca. 8 mm alta et 3 mm lata; squamae involucri pallide virides vel superne violaceo-tinctae ca. 20 imbricatae 4-5-seriatae plerumque oblongae vel lineares 1.5-6.0 mm longae et 1.0-1.5 mm latae apice rotundatae vel subtruncatae extus 4-6-costatae glabrae margine superne minute puberulo-fimbriatae. Flores 8-9 in capitulo; corollae albae subcylindricae ca. 4.2 mm longae in tubis et faucibus sparse perminute glanduliferae, tubis guam faucibus leniter angustioribus ca. 0.8 mm longis, faucibus ca. 3 mm longis, lobis ovato-triangularibus 0.6-0.7 mm longis et 0.4 mm latis intus breviter papillosis extus multo piluliferis, pilis uniseriatis apice rotundatis; filamenta in parte superiore ca. 0.4 mm longa; thecae ca. 1.3 mm longae; appendices antherarum ovatae ca. 0.3 mm longae et 0.2 mm latae. Achaenia prismatica 5-7-costata ca. 3.5 mm longa dense setulifera; setae pappi ca. 30 plerumque 3.5-4.0 mm longae longiores ad apicem leniter latiores. Grana pollinis in diametro ca. 25 μ m.

TYPE: COLOMBIA: Magdalena: Cordillera Oriental. Sierra de Perijá, 11 km ENE of Manaure, 47 km E of Valledupar, 2 km from the Venezuelan border. Alt. 2700 m. Temperate forest. Herbaceous vine, heads white. Feb. 5, 1945. *Martin L. Grant 10835* (Holotype, US).

The new species is easily distinguished by the scandent habit and the sessile leaves. The somewhat similar *C. subscandens* (Hieron.) K. & R. from Colombia and Venezuela, is a more robust plant with petiolate leaves and 11-15 flowers per head.

CHROMOLAENA PERSERICEA R.M.King & H.Robinson, sp. nov.

Plantae fruticosae mediocriter vel multo ramosae. Caules hexagonales obscure striati dense flavo-sericei. Folia opposita, petiolis 2-7 mm longis; laminae ovatae 1.0-2.5 cm longae et 0.7-1.2 cm latae base obtusae vel breviter acutae margine 4-6-crenato-serrulatae vel subintegrae apice obtusae vel breviter acutae supra leniter bullatae perdense sericeae non glanduliferae subtus dense lanatae et dense glandulo-punctatae in nervis et nervulis prominentes fere ad basem ascendentiter trinervatae. Inflorescentiae thyrsoido-paniculatae in ramis ca. 45° ascendentibus dense corymbosae, ramulis dense breviter sericeis. Capitula plerumque in aggregatis triplicibus sessilia cylindracea 8-9 mm alta et ca. 2.5 mm lata; squamae involucris superne violascentes ca. 25 imbricatae ca. 5-seriatae oblongae vel lineares 1.5-7.0 mm longae et 0.7-1.3 mm latae apice obtusae in interiores breviter acutae appressae extus 4-costatae superne in exteriores ad medio setuliferae et interdum paucae glandulo-punctatae margine superne minute setulo-fimbriatae. Flores ca. 7-8 in capitulo; corollae purpureae anguste infundibulares ca. 5 mm longae, tubis inferne angustioribus ca. 2.2 mm longis extus glabris, faucibus ca. 2.5 mm longis inferne glabris superne glanduliferis, lobis breviter triangularibus ca. 0.5 mm longis et latis intus papillosis extus dense glandulo-punctatis; filamenta in parte superiore ca. 0.3 mm longa; thecae ca. 1.5 mm longae; appendices antherarum oblongo-ovatae ca. 0.27 mm longae et 0.17 mm latae. Achaenia prismatica 3-4-costata ca. 3.5 mm longa in costis dense setulifera interdum inter costam dense setulifera; setae pappi 40-45 plerumque 2.5-3.5 mm longae apice non latiores, cellulis apicalibus acutis. Grana pollinis in diametro ca. 23 μ m.

TYPE: COLOMBIA: Magdalena: Cordillera Oriental. Sierra de Perijá, Casacará Valley, 23 km east of Codazzi, 2 km from the Venezuelan border. Paramo. Alt. 3100 m. Herb, 1 foot high, corolla purple. Feb. 15, 1945. *Martin L. Grant 10957* (Holotype, US). PARATYPE: VENEZUELA: Zulia: Perijá. Paramo. Alt. 2800-2900 m. Height 2 m, flor morada. 29 XII 1950. *Hermano Gines 1990* (US).

The new species is one of a series of pubescent, shrubby members of the genus centering at higher elevations in Colombia. Of the group, *C. bullata* (Klatt) K. & R. and *C. leivensis* (Hieron.) K. & R. are distinct in their longer corolla lobes and the low insertion of their anther filaments. The latter also has a flat upper leaf surface and particularly numerous hairs on the outer surface of the corolla lobes. The new species seems closest to *C. tacotana* (Klatt) K. & R. which is similar in the shorter corolla lobes, the much narrowed base of the corolla, and the higher insertion of the filaments, but is more robust and puberulous to tomentellous rather than sericeous and has the upper leaf surface visible with scattered glandular punctations. The bracts of the latter are more pubescent with 1-3 dark lines along the furrows.

CHROMOLAENA PSEUDINSIGNIS R.M.King & H.Robinson, sp. nov.

Plantae herbaceae semicarnosae 3-4 dm altae pauce vel medio-criter ramosae in sicco atro-virides; radices fasciculatae carnosae. Caules subteretes leniter striati glabri. Folia plerumque opposita sessilia anguste linearia 1-7 cm longa et 0.10-0.25 cm lata superiora minora et remotiora integra uninervia glabra. Inflorescentiae uni- vel pauci-capitatae in posteriore laxa cymosae. Capitula longe pedicellata late campanulata 9-11 mm alta et ca. 8 mm lata; squamae involucri ca. 30 imbricatae 4-5-seriatae ellipticae vel obovatae aut oblanceolatae 4-8 mm longae et 1.5-2.5 mm latae glabrae extus inferne leniter 4-costatae superne subcarnosae in marginis lateralibus anguste scariosae purpurascentes in medio ad apicem atro-virides apice breviter acutae appressae vel vix reflexae; paleae paucae peripherales ad 4 mm longae et 0.5 mm latae scariosae argute acutae vel laciniatae. Flores ca. 40-45 in capitulo; corollae purpureae ca. 5 mm longae anguste infundibulares superne densim densius glandulopunctatae, tubis ca. 1 mm longis glabris, faucibus ca. 3 mm longis, lobis oblong-ovatis ca. 1 mm longis et ca. 0.8 mm latis intus papillois; filamenta in parte superiore ca. 0.35 mm longa; thecae ca. 1.5 mm longae; appendices antherarum rotundatae ca. 0.25 mm longae et 0.27 mm latae. Achaenia ca. 3.2 mm longa 5-7-costata in costis inferne et apice breviter spiculifera; setae pappi ca. 40 plerumque 3.5-4.0 mm longae ad apicem vix latiores. Grana pollinis in diametro ca. 25 μ m.

TYPE: BRASIL: Goias: Chapada dos Veadeiros. 18-19 km N of Alto Paraíso. Wet campo at 4300 ft. elev. Semisucculent herb. Florets and style branches blue. Local. Jan. 24, 1980. *R.M. King & F.Almeda 8279* (Holotype, UB; isotype, US). PARATYPES: BRASIL: Goias: 17 km West of Alto Paraíso in seasonal marsh. Herbs 30 cm tall. Flowers purple. Feb. 13, 1977. *B.B.Simpson 8609* (US); 17 km North of Alto Paraíso on the Chapada de Veadeiros in seasonally flooded marsh. *B.B.Simpson 8617* (US); Chapada dos Veadeiros, c. 65 km due North of Brasilia. Campo at foot of rocky hillside. Herb with deep purplish flowers. 21 Dec. 1968. *R.M.Harley, G.M.Barroso, et al. 11462* (NY); Chapada dos Veadeiros, ca. 20 km W. of Veadeiros. Elev. 1000 m. Rocky slopes, wet campo and creek margin. Herb ca. 25 cm tall. Heads blue-violet. 10 Feb. 1966. *H.S.Irwin, J.W.Grear, Jr., R.Souza & R.Reis dos Santos 12540* (NY); Erect herb ca. 20 cm tall. Heads white. 11 Feb. 1966. *H.S.Irwin, et al. 12606* (NY); Slender herb with ascending stems ca. 35 cm tall. 11 Feb. 1966. *H.S.Irwin, et al. 12607* (NY, US).

The species has the aspect of *Praxelis insignis* (Malme) K. & R., and the Simpson paratypes were originally determined as that species. The present entity clearly differs in the generic characters, and it can be further distinguished by the darker color of the plant, the more succulent leaves and involucre, the carnosae fasciculate roots, and the involucre bracts which are distinctly broadest above the middle.

CHROMOLAENA VERTICILLATA R.M.King & H.Robinson, sp. nov.

Plantae herbaceae erectae ad 0.4 m altae inferne non ramosae. Caules fuscescentes teretes striati puberuli. Folia plerumque 3-4-verticillata, petiolis 2-3 mm longis; laminae anguste ellipticae vel leniter oblanceolatae plerumque 2.0-3.5 cm longae et 0.3-0.7 cm latae base anguste cuneatae margine integrae vel sub-integrae apice breviter acutae supra subnitidae sparse pilosulae glabrescentes subtus dense glandulo-punctatae in nervis et nervulis puberulae a basis triplinervae. nervis secundariis sublongitudinalibus, nervis et nervulis utrinque prominulis. Inflorescentiae aliquidum laxae corymboso-cymosae plerumque alterne ramosae, ramis ultimis plerumque 1-4 cm longis puberulis. Capitula cylindrica ca. 9 mm alta et 4-5 mm lata; squamae involucri sordido-rubrescentes ca. 30 imbricatae 4-5-seriatae oblongae vel late oblongae 1-6 mm longae et 1.0-1.7 mm latae apice erectae vel in exteriores breviter reflexae breviter acutae et apiculatae extus late 4-costatae superne multo glandulo-punctatae margine superne minute puberulo-fimbriatae. Flores ca. 25 in capitulo; corollae lavandulae? 4.2-4.5 mm longae, tubis ca. 1.4 mm longis inferne sensim angustioribus extus glabris, faucibus 2.0-2.2 mm longis extus sparse glandulo-punctatis, lobis ovato-triangularibus ca. 0.7 mm longis et 0.45 mm latis intus papillosis extus sparse glandulo-punctatis; filamenta in parte superiore ca. 0.15 mm longa; thecae ca. 1.8 mm longae; appendices antherarum oblongo-ovatae ca. 0.23 mm longae et 0.2 mm latae apice obtusae. Achaenia prismatica ca. 3.3 mm longa base sensim angusta plerumque in costis distincte setulifera; setae pappi ca. 30 plerumque 3.5-4.0 mm longae apice vis vel non latiores, cellulis apicalibus acutis. Grana pollinis ca. 25 μ m.

TYPE: BRASIL: Minas Gerais: Serra do Cipo, km 137. Campo; solo alto-turfo-arenoso. 13-2-1963. *A.P.Duarte 7562* (Holotype, RB; isotype, US).

The new species is distinctive in its verticillate leaves. One plant of *C. pedunculosa* (H. & A.) K. & R. has been seen with ternate leaves, but that species has more pointed lanceolate leaf blades with more irregular margins, has a more foliose inflorescence, and has involucrel bracts with rounded appressed tips.

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Chromolaena alvimii R. M. King & H. Robinson, isotype,
United States National Herbarium. Photos by Victor E. Krantz,
Staff Photographer, National Museum of Natural History.



Chromolaena barrosoae R. M. King & H. Robinson, isotype,
United States National Herbarium.



Chromolaena breedlovei R. M. King & H. Robinson, Holotype,
New York Botanical Garden.



ASTERACEAE / BAHIA BRAZIL

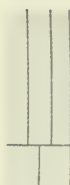
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Chromolaena morii R. M. King & H. Robinson, isotype,
United States National Herbarium.



Chromolaena myriadenia R. M. King & H. Robinson, isotype,
New York Botanical Garden.



PLANTS OF COLOMBIA SOUTH AMERICA

Cordillera Oriental
Sierra de Perija, 1 km. east ne. of Manizales 4700 m.
east of Valledupar 2 km. from the Venezuelan border
Temperate forest
Feb. 5, 1945
Herbaceous vine.
Fls. white

Martin L. Grant

11135
Station 11

UNITED STATES NATIONAL MUSEUM

— Foreign Economic Administration, Colombia

Chromolaena perijaensis R. M. King & H. Robinson, Holotype,
United States National Herbarium.





PLANTS of Brasil

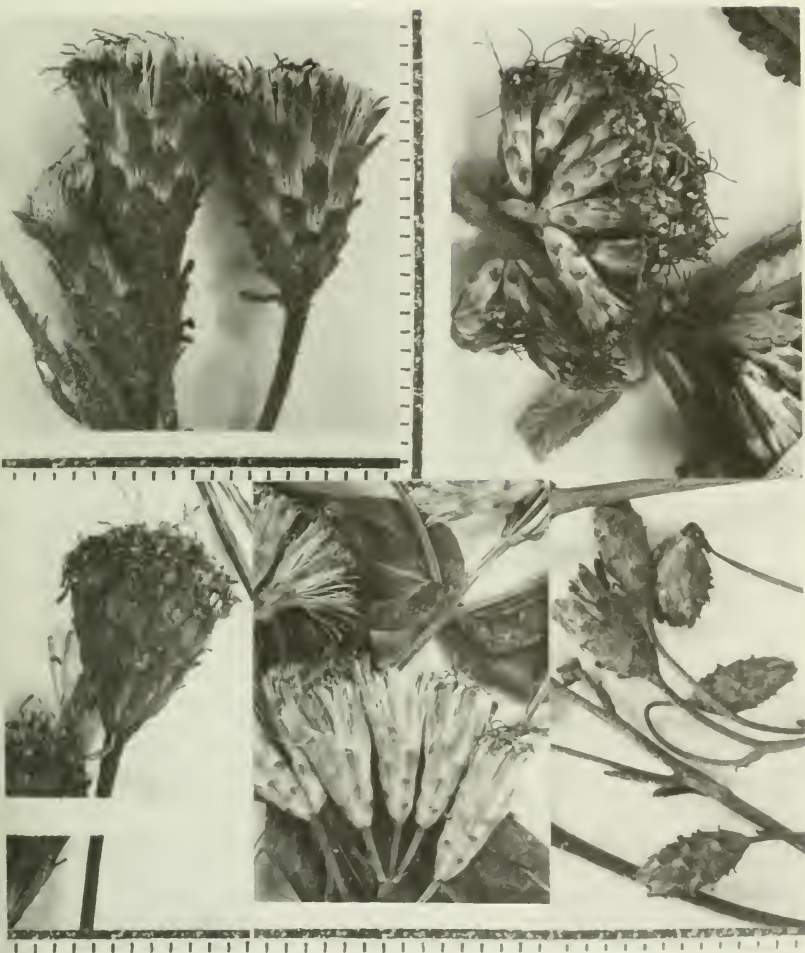
Chromolaena pseudinsignis R. M. King & H. Robinson, Holotype,
Herbário Universidade de Brasília.



Chromolaena verticillata R. M. King & H. Robinson, isotype,
United States National Herbarium.



Chromolaena enlargements of heads. Top left. *C. alvimii*.
Top right. *C. barrosoae*. Bottom left. *C. breedlovei*. Bottom
right. *C. morii*.



Chromolaena enlargemnets of heads. Top left. *C. myriadenia*.
Top right. *C. persericea*. Bottom left. *C. pseudinsignis*.
Bottom middle. *C. perijaensis*. Bottom right. *C. verticillata*.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CCI.

A NEW GENUS *HUGHESIA*.

R. M. King and H. Robinson

Department of Botany

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A number of members of the Eupatorieae have subscandent habits, but fully developed vines are less common, being restricted mostly to the genus *Mikania*. One scandent member of the tribe from Peru that was received some years ago on exchange as a *Mikania*, proves to be unrelated to that genus, and proves to be a member of the Critonioid series. The species is described here and placed in a new genus *Hughesia*.

The specimen of the new genus has been under consideration since early in the present study of the Eupatorieae, and it has been rejected in turn from various generic concepts. The strongly subimbricate involucre with deciduous inner bracts and the glabrous nonglandular leaves seemed to resemble those of *Critonia*, but the corollas are broader with more shortly triangular lobes, and the leaves have ducts along the veins without formation of pellucid cavities in the areoles. Also, the pappus setae are less stout with unenlarged or scarcely enlarged tips. The small rounded receptacles recall those of *Hebeclinium* in the near Critonioid *Hebeclinium*-series, but the inflorescence of the new genus lacks the arcuate-cymose branching, the style appendages are broader, and the anther collars are not as elongate as in the latter series. The strongly thyrsoid inflorescence of the new genus, which does superficially resemble those of some members of *Mikania*, differs from those of many additional Critonioid genera. A combination of all features causes us to regard the new genus as closest to the more shrubby *Steyermarkina* of Brasil and Venezuela. The latter differs notably by the narrower, more deeply cut corolla lobes, and the dense pubescence on the inside of the corolla.

The leaves of the genus seem to have unusually prominent ducts along the larger veins. In both X-sections and cleared material the ducts are seen to rest in a concavity in the upper surface of the veins.

The new genus and species are named after the well-known botanical illustrator, Dr. Regina Hughes, who has contributed greatly to our revision of the tribe Eupatorieae.

HUGHESIA REGINAE R.M.King & H.Robinson, gen. et sp. nov.
Asteracearum (Eupatorieae).

Plantae volubiles 6-7 m altae. Caules rubro-fulvi teretes

glabri, internodis ca. 4.0-4.5 cm longis. Folia opposita, petiolis ca. 1 cm longis; laminae ovatae 8-9 cm longae et 3.5-4.5 cm latae base late rotundatae margine subintegrae perminute remote serrulatae apice breviter acutae vix minute acuminatae supra et subtus glabrae in nervulis dense reticulatae prominulae fere ad basem valde ascendenter trinervatae. Inflorescentiter in ramulis lateralibus terminales subdense thyrsoido-paniculatae, ramis penultimis 3-9 mm longis minute puberulis. Capitula in fasciculis 2-3-capitatis aggregata campanulata ca. 5 mm longa et 3-4 mm lata; squamae involucri subimbricatae ca. 18 ca. 4-seriatae valde inaequales late ovatae vel oblongae vel lineares 1-4 mm longae et 0.8-1.2 mm latae apice rotundatae margine subhyalinae extus glabrae 2-4-costatae; receptacula in diametro ca. 0.5 mm convexa vel hemisphaerica. Flores ca. 9 in capitulo; corollae in sicco supra medio purpureae ca. 3.5 longae intus et extus glabrae, tubis ca. 1.5 mm longis, faucibus anguste infundibularibus ca. 1.7 mm longis, lobis triangularibus ca. 0.35 mm longis et latis intus et extus laevibus, cellulis breviter oblongis vel longioribus interdum oleiferis in parietibus non vel vix sinuosis; filamenta in parte superiore 0.2-0.3 mm longa, cellulis inferne subquadratis vel brevioribus numerosis in parietibus annulate ornatis; thecae ca. 0.9 mm longae; appendices antherarum oblongae ca. 0.25 mm longae et 0.18 mm latae; basi stylorum glabri non noduliferi; appendices stylorum anguste lineares dense distincte mamillosae vel breviter papillosae. Achaenia prismatica 5-costata submatura ca. 1.5 mm longa superne breviter setifera inferne glabra; carpodia annuliformia 0.35 mm lata et 0.05-0.08 mm longa in costis breviter procurrentia, cellulis ca. 7-seriatis subquadratis in diametro 10-15 μ m in parietibus perdense noduliferis; setae pappi majores ca. 30 ca. 3 mm longae superne tenuiores interdum apice leniter latiores in seriebus exterioribus paucioribus ca. 0.5-0.9 mm longae, cellulis apicalibus argute acutis. Grana pollinis in diametro ca. 18-20 μ m.

TYPE: PERU: Junin: Agua Dulce ad Tarma. In secondary forest, alt. 1600 m. Liana 6-7 m high; flowers white; stem reddish-brown. July 28, 1962. *F. Woytkowski* 7471 (Holotype, US; isotype, MO).



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PLANTS OF PERU

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Hughesia reginae R. M. King & H. Robinson, Holotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.



Hughesia reginae R. M. King & H. Robinson, isotype, Missouri Botanical Garden.



Hughesia reginae R. M. King & H. Robinson, enlargement of inflorescence.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CCII.

A NEW GENUS *KAUNIA*.

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Over ten years ago the genus *Ageratina* Spach was one of the first to be redefined in the series of studies in the Eupatorieae (King & Robinson, 1970), but a group of related species, which was recognized at that time, has been left as the last genus to be resolved in the series. The reason for the delay has been the lack of positive characters such as are found in most genera of the tribe. The genus is primarily recognized by its evident relationship to the Oxylobinae but its lack of the most notable specializations of that subtribe. The group of mostly Andean species is described here as the genus *Kaunia*.

The lack of specialized features in *Kaunia* would ordinarily suggest closer relation to the Critoniinae rather than the Oxylobinae, but a number of other characters suggest otherwise. The carpopodium has larger thinner-walled cells than in members of the Critoniinae but like those in the Oxylobinae. The corolla lobes have cells on the inner surface that are noticeably shortened compared to those of the corolla throat and cells of the throat that are laxly oblong, a condition not seen in the Critoniinae but approaching that in *Ageratina*. Finally, attempts by Royce Oliver of the Smithsonian staff to obtain a chromosome number from root material of *Kaunia ignorata* have been only partially successful, but have shown a high number near 45. Such chromosome numbers are not typical of the Critoniinae but are to be expected in the Oxylobinae. Further conviction can be derived from characters that are less definitive but still more indicative of the Oxylobinae such as the only weakly subimbricate subherbaceous involucre and the elongate anther collars with many unornamented subquadrate cells.

The combination of characters cited was largely recognized 10 years ago and the species of *Kaunia* were suspected of being relatives of *Ageratina* at that time. However, the last 10 years has altered our original inclination to regard the group as transitional to the Critoniinae. The critonioid combination of features of *Kaunia*, the lack of a styler node and the lack of papillae on the inner surface of the corolla lobes, may or may not be plesiomorphic in the Oxylobinae, but other characters indicate that relationship is to the Oxylobinae and remote from the Critoniinae.

Within the Oxylobinae, *Kaunia* is notable for the lack of papillae on the corolla lobes and the lack of a styler node.

The unornamented style base is not so rare in the subtribe, being found in *Pachythammus* K. & R., *Spaniopappus* B.L.Robins., and *Ageratina* subg. *Apoda* K. & R. among the genera with papillose corolla lobes. In the lack of both papillae and a styler node, *Kaunia* seems to be most closely related to the recently described genus *Jaramilloa* (King & Robinson, 1980). The latter represents a geographically isolated subarborescent element in northern Colombia having strongly campanulate throats of the corolla and a distinctive granular pubescence on the stems and leaves.

Many species of *Kaunia* show an interesting variation not common in other genera. In some of the leaves the largest pair of secondary veins is aligned with the others in a pinnate arrangement, and at other times the pair is at a sharper angle in a trinervate form.

The new genus is named for Edward Kaun of Baltimore, Maryland who has provided extensive help in the present effort to revise the tribe Eupatorieae.

KAUNIA R.M.King & H.Robinson, gen. nov. Asteracearum (Eupatorieae).

Plantae fruticulosae vel subarborescentes ad 4 m altae medio-criter ramosae. Caules non fistulosi plerumque teretes glabri vel dense velutini non granulariter pilosi. Folia opposita plerumque distincte petiolata; laminae plerumque ovatae base rotundatae vel acuminatae margine integrae vel serratae subtus interdum glandulo-punctatae fere ad basem trinervatae vel ascendenter pinnate nervatae. Inflorescentiae in ramis oppositis corymboso-paniculatae, ramulis sparse vel dense minute bracteiferis. Capitula pedicellata non aggregata campanulata; squamae involucri leniter subimbricatae ca. 3-seriatae leniter inaequales subherbaceae persistentes capitulis maturis valde breviores plerumque anguste oblongae demum patentes; receptacula leniter convexa glabra epaleacea. Flores (10-) 16-50 in capitulo; corollae plerumque albae interdum lavandulae anguste infundibulares inferne glabrae vel subglabrae in lobis paucae glandulo-punctatae; tubis cylindraceis elongatis indistinctis in nervis tenuibus, cellulis faucis laxae oblongis in parietibus non vel leniter sinuosis, lobis triangularibus leniter longioribus quam latioribus utrinque laevibus, cellulis interioribus subquadratis vel breviter oblongis, nervis ad apicem confluentibus; filamenta in parte superiore elongatis, cellulis subquadratis numerosis in parietibus non vel vix ornatis; appendices antherarum longiores quam latiores; basi stylorum glabri non noduliferi; appendices stylorum anguste lineares sublaeves vel minute mamillosae. Achaenia prismatica 5-angulata base et apice saepe densius setulifera vel glandulifera; carpodia annuliformia vel breviter obturaculiformia, cellulis ca. 5-seriatis subquadratis in parietibus non incrassatis; pappus plerumque uniseriatus capillaceus non vel mediocriter deciduus, setis 25-30 scabridis superne plerumque leniter tenuius, seriebus exterioribus brevioribus

nullis vel subnullis, cellulis apicalibus acutis. Grana pollinis in diametro ca. 20-22 μ m valde vel minute spinulosa.

Type species: *Eupatorium eucosmoides* B.L.Robinson

The genus contains the following 14 species. The genus is concentrated in Bolivia but extends northward to southern Ecuador and southward into Argentina.

KAUNIA ARBUSCULARIS (B.L.Robins.) R.M.King & H.Robinson, comb. nov. *Eupatorium longipetiolatum* var. *arbusculare* B.L.Robins., Contr. Gray Herb. n.s. 61: 9. 1920. Ecuador. The species includes material recently distributed as *Ageratina longipetiolata* from southern Ecuador.

KAUNIA CAMATAGUIENSIS (Hieron.) R.M.King & H.Robinson, comb. nov. *Eupatorium camataguiense* Hieron., Bot. Jahrb. 40: 377. 1908. Bolivia.

KAUNIA ENDYTA (B.L.Robins.) R.M.King & H.Robinson, comb. nov. *Eupatorium endytum* B.L.Robins., Contr. Gray Herb. n.s. 60: 13. 1919. Peru.

KAUNIA EUCOSMOIDES (B.L.Robins.) R.M.King & H.Robinson, comb. nov. *Eupatorium eucosmoides* B.L.Robins., Contr. Gray Herb. n.s. 75: 6. 1925. Peru.

KAUNIA GROSSIDENTATA (Hieron.) R.M.King & H.Robinson, comb. nov. *Eupatorium grossidentatum* Hieron., Bot. Jahrb. 40: 377. 1908. Bolivia.

KAUNIA GYNOXIMORPHA (Rusby ex B.L.Robins.) R.M.King & H.Robinson, comb. nov. *Eupatorium gynoximorphum* Rusby ex B.L.Robins., Contr. Gray Herb. n.s. 61: 7. 1920. *Eupatorium gynoxioides* Rusby, Bull. N. Y. Bot. Gard. 4: 380. 1907, not *Eupatorium gynoxioides* Wedd. Bolivia.

KAUNIA HOSANENSIS (B.L.Robins.) R.M.King & H.Robinson, comb. nov. *Eupatorium hosanense* B.L.Robins., Contr. Gray Herb. n.s. 100: 14. 1932. Bolivia.

KAUNIA IGNORATA (Hieron.) R.M.King & H.Robinson, comb. nov. *Eupatorium ignoratum* Hieron., Bot. Jahrb. 40: 379. 1908. Bolivia.

KAUNIA LASIOPHTHALMA (Griseb.) R.M.King & H.Robinson, comb. nov. *Eupatorium lasiophthalmum* Griseb., Plant. Lorentz. 119. 1874. Argentina, Bolivia. We include here material seen in herbaria under the name *Eupatorium hyemale* Lillo, nom. nud.

KAUNIA LONGIPETIOLATA (Sch.Bip. ex Rusby) R.M.King & H.Robinson, comb. nov. *Eupatorium longipetiolatum* Sch.Bip. ex Rusby,

Mem. Torrey Bot. Club 3 (3): 52. 1893. *Ageratina longipetiolata* (Sch.Bip. ex Rusby) R.M.King & H.Robinson, Phytologia 24: 92. 1972. Bolivia.

KAUNIA PACHANOI (B.L.Robins.) R.M.King & H.Robinson, comb. nov.
Eupatorium pachanoi B.L.Robins., Contr. Gray Herb. n.s. 60: 25. 1919. Ecuador. The species is at the northern limit of the geographic range of the genus. It differs from all others in the genus by the few flowers in the head (ca. 10) and by the small elliptical leaves with very short petioles.

KAUNIA RUFESCENS (Lund ex DC.) R.M.King & H.Robinson, comb. nov.
Eupatorium rufescens Lund ex DC., Prodr. 5: 168. 1836. Bolivia, southern Brasil.

KAUNIA SALTENSIS (Hieron.) R.M.King & H.Robinson, comb. nov.
Eupatorium saltense Hieron., Bot. Jahrb. 22: 786. 1897.
Eupatorium eucosmum B.L.Robins., Contr. Gray Herb. n.s. 61: 6. 1920. Argentina, Bolivia. The branches of this and the closely related *K. eucosmoides* of Peru are glabrous, smooth, and dark reddish brown in dried specimens. A specimen of the species grown from seed shows that the branches are whitish in the living condition.

KAUNIA UBER (B.L.Robins.) R.M.King & H.Robinson, comb. nov.
Eupatorium uber B.L.Robins., Contr. Gray Herb. n.s. 60: 37. 1919. Bolivia.

Literature Cited

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

_____ and _____. 1980. Studies in the Eupatorieae (Asteraceae). CXCVI. A new genus *Jaramilloa*. Phytologia 47: 117-120.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XXVII.

A NEW SPECIES OF *CALEA* FROM BRASIL.

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A new species of *Calea* is described from the Federal District of Brasil. The first collection seen made nearly a year ago was overaged and was unsuitable for adequate description, though the status as a new species seemed certain. Another collection has now been obtained from Dr. E. P. Heringer of the Instituto Brasileiro de Geografia e Estatística, and the species is named here in his honor.

CALEA HERLINGERI H. Robinson, sp. nov.

Plantae fruticulosae ad 1 m altae mediocriter ramosae. Caules brunnescentes teretes vel subcostati dense breviter sordido-velutini. Folia oppositae, petiolis 2-4 mm longis; laminae ellipticae vel leniter obovatae plerumque 3-7 cm longae et 2-5 cm latae base breviter acutae margine superne dentatae apice obtusae breviter apiculatae supra planae et dense minute asperulae subtus dense prominentiter reticulatae dense hispidulae et glandulopunctatae inferne subtrinervatae, nervis secundariis ascendentius ad marginem subparallelis. Inflorescentiae terminales in ramis corymbosae, ramis plerumque oppositis perdense breviter sordido-velutinis, ramis ultimis 0-3 mm longis. Capitula plerumque dichasialiter disposita cylindracea ca. 12 mm longa et 4 mm lata; squamae involucri subimbricatae ca. 20 ca. 6-seriatae late ovatae vel anguste oblongae 2-9 mm longae et 1-2 mm latae apice obtusae vel rotundatae basilares herbaceae dense puberulae interiores inferne plerumque glabrae ad apicem sparse glandulopunctatae et tomentellae; paleae 0-1 bracteiformes ca. 9 mm longae. Flores 5 in capitulo discoidei; corollae flavae ca. 7 mm longae, tubis ca. 2.5 mm longis superne dense glandulopunctatis; faucibus late campanulatis ca. 1.5 mm longis in ductis resiniferis superne saepe binis; lobis ca. 2.8 mm longis et 0.8 mm latis, faucibus et lobis extus mediocriter glandulopunctatis; thecae antherarum ca. 2.5 mm longae; appendices antherarum extus dense glanduliferae. Achaenia ca. 5 mm longa base leniter angustiora ceterum dense setifera et glandulopunctata, setis leniter flexuosis biseriatis multi-cellularibus; squamellae pappi ca. 12 anguste oblongae apice breviter acutae ca. 1.5-2.5 mm longae et 0.25-0.35 mm latae extus dense scabridulae interdum spiculiferae et glanduliferae. Grana pollinis in diametro ca. 37 μ m.

TYPE: BRASIL: Distrito Federal: Bacia do Rio São Bartolomeu

Subarbusto; folhas duras e ásperas; capílas amarelos; botões amarelo esverdeados; cerrado. 15-IV-1980. *E.P.Heringer, T.S. Figueiras, R.C.Mendonça, B.A.S.Pereira, A.E.Heringer Salles & F.Chagas e Silva 4383* (Holotype, IBGE; isotype, US). PARATYPE: BRASIL: Distrito Federal: Chapada da Contagem. 24.5 km due NW of the central sector of Brasília. Cerrado vegetation at an elevation of about 3400 ft. Shrub mostly 1 m tall. Inflorescences post-mature. Locally common. Jan. 26, 1980. *R.M.King, F.Almeda & G.Eiten 8311* (UB, US).

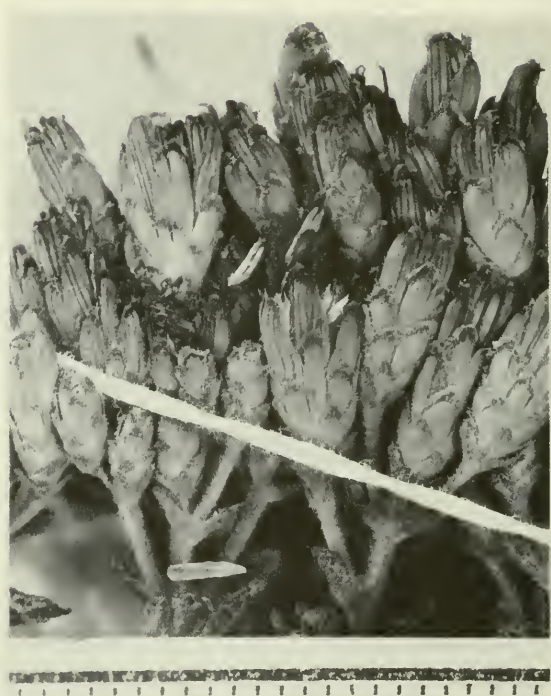
The new species is closely related to the recently described *C. morii* H.Robinson of Bahia (Robinson, 1979), but the two differ in their pubescence and in the form of their leaves. The leaves of *C. morii* have an ovate to oblong-ovate shape with rounded to truncate rather than acute bases, and the upper margins are remotely serrulate rather than dentate. The lower secondary veins are less ascending without a trinervate appearance, and the reticulation of the leaf undersurface is more lax with sparsely tomentose rather than hispidulous pubescence. The pubescence of the stems in *C. morii* is finer and is more tomentose than velutinous. The flowers seem to differ only in comparatively minor points such as the wider and thinner margins of the pappus scales in *C. morii*. The glands noted on the pappus of the new species are also seen in *C. morii*, and the larger pollen grains originally cited for the latter species seem to be an abnormal form found in the holotype but not the paratypes.

Literature Cited

- Robinson, H. 1979. Studies in the Heliantheae (Asteraceae). XXII. Two new species of *Calea* from Brasil. *Phytologia* 44 (7): 436-441.



Calea heringeri H. Robinson, Isotype, United States National Herbarium. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.



Calea heringeri H. Robinson, enlargement of heads-

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ADDITIONS TO THE VOUCHERED RECORDS OF ILLINOIS PLANTS AND
A NOTE ON THE OCCURRENCE OF RUMEX CRISTATUS IN NORTH AMERICA

Paul Shildneck¹, Almut G. Jones² and Viktor Mühlenbach³

ABSTRACT: Vouchers are cited for 941 new county records of Illinois vascular plants. Nine of the 559 species listed are ferns, 550 are angiosperms. Four of these species are reported for the first time from Illinois: Croton lindheimerianus, Rumex cristatus, R. longifolius, and Salsola collina. The occurrence of Rumex cristatus has not been previously reported from this continent. As it is likely that additional North American collections of this species are hidden in herbaria under some other names, a key is presented to selected species of Rumex section Rumex.

The first mapped distribution record of Illinois plants was presented in Vascular Plants of Illinois by Jones and Fuller (1955). This comprehensive work has induced extensive collecting by botanists of the state in an effort to locate additional county and state records. The dot maps of the above book were updated and republished by Winterringer and Evers (1960). A large number of new reports was added in the most recent atlas: Distribution of Illinois Vascular Plants by Mohlenbrock and Ladd (1978). Since then several lists of additional accounts have been published, notably those of Henry, Scott & Shildneck (1978), Scott & Henry (1979) and Solomon (1979).

The principal portion of this report consists of a list of 941 new county records of Illinois vascular plants comprised of 559 species. The number of genera involved is 307, and the number of families 83. Included in these numbers are six fern genera in three families.

Pteridophyta are listed in the beginning, followed by the angiosperms, in an alphabetical sequence of families. In the nomenclature we follow, with a few exceptions, the new Synonymized Checklist of the Vascular Flora of the United States, Canada, and Greenland by Kartesz and Kartesz (1980). Where the names listed differ from those in the two commonly used handbooks on the Illinois flora (Jones, 1963; Mohlenbrock, 1975), the synonyms have been added. Nearly all vouchers are deposited in the Herbarium of the University of Illinois at Urbana-Champaign (ILL); a few are located at ILLS (Urbana) and SIU (Carbondale). In the cases where one of the authors was the collector, the names have been abbreviated: J. = Jones, M. = Mühlenbach, and S. = Shildneck. The names of other collectors are

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written in full. Some specimens, especially those of species uncommon in Illinois, were sent for identification or verification to an expert on the taxonomy of the genus involved.

Four of the adventive species included in the list are reported for the first time from Illinois: Croton lindheimerianus Scheele, Rumex cristatus DC., Rumex longifolius DC., and Salsola collina Pallas. In fact, the report for R. cristatus is the first for North America.

Several collections of this European species, one from Madison County, IL (Mühlenbach 4224), the others from St. Louis, MO (Mühlenbach 725, 3967, 4028, 4060 and 4188), having puzzled the collector, were sent for identification to K. H. Rechinger in Vienna, the acknowledged expert on the genus Rumex. He named the plants and in a letter to the third author wrote that, to his knowledge, the species had not been previously found in the United States.

In manuals of eastern North American plants (Fernald, 1950; Gleason & Cronquist, 1963), the plants key out to Rumex patientia L., a species introduced to this country as a garden vegetable (Fernald & Kinsey, 1958). In Hegi's Illustrierte Flora von Mitteleuropa, Ed. 2 (Rechinger, 1957), and in Flora Europaea (Tutin, et al., 1964), the plants can be identified as R. cristatus. However, the characters separating R. patientia and R. cristatus seem rather tenuous. Among the collections of R. patientia at ILL, ILLS and MO, we found several sheets which perfectly matched the specimens identified by Dr. Rechinger as R. cristatus, e.g. the St. Clair, Stark and Macon County records included in our list and also a collection from New York: Bronx Co., Sound View, New York City, H. E. Ahles 6335 (ILL). Under a broader species concept, one might be inclined to consider the two taxa conspecific, especially in view of the fact that interspecific hybridization between several species of Rumex reportedly is a common occurrence (Clapham, Tutin and Warburg, 1962). We have seen no authenticated specimens of R. cristatus, except the Mühlenbach collections, and we have examined only a limited number of herbarium specimens of R. patientia. For the time being, therefore, we refrain from making a taxonomic judgment.

Under the supposition that additional North American collections of Rumex cristatus may be hidden in herbaria under some other names, most notably R. patientia, we have constructed a synoptical key to selected species of Rumex section Rumex. Characteristics of R. cristatus are compared with and contrasted to those of related species which are indigenous to or have been found adventive in North America.

KEY TO SELECTED SPECIES OF RUMEX L. SECTION RUMEX

1. All fruiting valves lacking tubercles (but the midribs sometimes slightly swollen at the base).
 2. Pedicels not or obscurely jointed; fruiting valves more or less deltoid, as long as or longer than broad (moist ground, indigenous). . . . R. occidentalis S. Wats.
 2. Pedicels distinctly jointed; fruiting valves reniform, broader than long (ruderal, introduced from Europe) R. longifolius DC.
(Syn. R. domesticus Hartm.)
1. At least one of the fruiting valves bearing a conspicuous tubercle.
 3. Pedicels not or obscurely jointed; tubercles 3, their base distinctly above the valve base (bogs and shallow water, indigenous) R. orbiculatus A. Gray
(Syn. R. Britannica sens. auct. non L.)
 3. Pedicels distinctly jointed; tubercles 1-3.
 4. Basal leaves rough-papillose on the lower surface; fruiting valves with a regularly denticulate margin (ruderal, introduced from Europe) R. kernerii Borbas
 4. Basal leaves not rough-papillose on the lower surface.
 5. Fruiting valves 3-4.5 mm long, with a spinulose or long-toothed margin; mature achenes 2-2.5(-3) mm long.
 6. Tubercles 3; basal leaves lanceolate, 4-6(-7) times as long as broad, the base rounded to truncate (ruderal in moist ground, European weed) R. stenophyllus Ledeb.
 6. Tubercle 1; basal leaves elliptic, 2-3 times as long as broad, the base cordate (ruderal, European weed). R. obtusifolius L.
 5. Fruiting valves 5-8(-9) mm long, the margins entire to denticulate; mature achenes 3-4.5 mm long.
 7. Margin of fruiting valves subentire to crenulate-undulate; lateral veins (at mid-lamina) of larger leaves making an angle of 45-60° with the midrib; tubercle 1 (midribs of the other two valves sometimes slightly swollen at base ---ruderal, originally introduced from Europe as a garden vegetable) R. patientia L.

7. Margin of fruiting valves irregularly short-denticulate (the teeth to 1 mm long); lateral veins of larger leaves making an angle of 60-90° with the midrib; tubercles 3, one of them plump, up to $\frac{1}{2}$ as long as the valve, the others smaller but well developed (ruderal, introduced from Europe)
 R. cristatus DC.

LIST OF RECORDS

PTERIDOPHYTA

ASPLENIACEAE

Asplenium platyneuron (L.)

Oakes ex D. C. Eaton

Champaign (Roberts 199)De Witt (S. 11956)Vermilion (S. 12011)Athyrium filix-femina (L.)Roth var. angustum (Willd.)

Lawson

De Witt (S. 12520)Athyrium thelypteroides

(Michx.) Desv.

Vermilion (S. 12264, 12698)Dryopteris intermedia (Muhl.

in Willd.) A. Gray

McLean (J. 3827)Dryopteris spinulosa (O. F.

Mueller) Watt

Vermilion (S. 12265)Polystichum acrostichoides

(Michx.) Schott

De Witt (S. 11887)

DENNSTAEDTIACEAE

Pteridium aquilinum (L.) Kuhnvar. latiusculum (Desv.)

Underwood

Fayette (S. 12135)Jasper (S. 12136)

OPHIOGLOSSACEAE

Botrychium dissectum SprengelEffingham (S. 12640)Vermilion (S. 12628)Botrychium obliquum Muhl. in Willd.Effingham (S. 8520)Fayette (S. 10441)Fulton (S. 11171)ANGIOSPERMAE

AMARANTHACEAE

Amaranthus albus L.St. Clair (M. & Fallen 4246)Shelby (S. 12550)Amaranthus blitoides S.Watson [Syn. A. graecizans
sens. auct. non L.]De Witt (S. 12352)Fayette (S. 12340)Shelby (S. 12341)Amaranthus hybridus L.Christian (S. 12380)De Witt (S. 12369)Fayette (S. 12408)Moultrie (S. 12359)Vermilion (S. 12429)Amaranthus palmeri S. WatsonMadison (M. 4202)St. Clair (M. 4238, 4298)Amaranthus retroflexus L.Christian (S. 12527)De Witt (S. 12515)Fulton (S. 12482)Logan (S. 12480)Vermilion (S. 12475)

Amaranthus spinosus L.

Christian (S. 12378)

De Witt (S. 12370)

Piatt (S. 12363)

Shelby (S. 12383)

Amaranthus tuberculatus (Moq.)Sauer [Syn. A. tamariscinus

Moq.]

De Witt (S. 10453)

Fayette (S. 10435)

Moultrie (S. 12361)

Sangamon (S. 12373)

Shelby (S. 10500)

Torilis japonica (Houtt.) DC.

Effingham (S. 12132)

Madison (M. 4344)

Zizia aurea (L.) W. D. J. Koch

Greene (S. 11921)

APOCYNACEAE

Apocynum androsaemifolium L.

Fulton (S. 11173, 12239)

Marion (S. 12137)

Shelby (S. 12231)

Vermilion (S. 12199, 12263)

AQUIFOLIACEAE

Ilex decidua Walt.

Fayette (S. 11578)

ARACEAE

Acorus calamus L.

Greene (S. 11915)

Moultrie (S. 11865)

Shelby (S. 11864)

ARALIACEAE

Aralia racemosa L.

Vermilion (S. 12426)

Panax quinquefolius L.

De Witt (S. 11958)

McLean (J. 3828)

Conium maculatum L.

Fayette (S. 11950)

Erigenia bulbosa (Michx.) Nutt.

De Witt (S. 11643)

Fayette (S. 11642)

Osmorhiza longistylis (Torr.) DC.

Lawrence (Sivert, s.n.)

Perideridia americana (Nutt.)

Reichenb.

Fayette (S. 11934)

Sanicula trifoliata Bickn.

Vermilion (S. 12699)

Sium suave Walt.

Fayette (S. 10146)

Taenidia integerrima (L.)

Drude

De Witt (S. 11806)

Thaspium barbinode (Michx.) Nutt.

Fayette (S. 9220)

Shelby (S. 7924)

ASCLEPIADACEAE

Asclepias amplexicaulis Sm.

Greene (S. 11916)

Asclepias purpurascens L.

Greene (S. 12104)

Asclepias viridiflora Raf.

Greene (S. 12222)

Moultrie (S. 12150)

ASTERACEAE [COMPOSITAE]

Antennaria neglecta Greene

Christian (S. 11681)

Effingham (S. 11688)

Fulton (S. 11829, 11832)

Moultrie (S. 11672)

Anthemis arvensis L.

Madison (M. 4178)

- Arctium minus Bernh.
Madison (M. 4216)
- Artemisia ludoviciana Nutt.
De Witt (S. 10449)
- Aster anomalus Engelm.
Fayette (S. 12535)
- Aster cordifolius L.
Champaign (J. 2632)
- Aster drummondii Lindl. in Hook.
Christian (S. 12749)
Fayette (S. 12652)
- Aster ericoides L.
Fayette (S. 12637)
Fulton (S. 12689)
Moultrie (S. 12658)
Shelby (S. 12659)
- Aster firmus Nees [Syn. A. lucidulus (A. Gray) Wieg.]
De Witt (J. 4613, S. 10451)
Fayette (S. 11617, 12651)
- Aster lateriflorus (L.) Britt.
Christian (S. 12672)
Clinton (J. 3168)
Effingham (S. 12632)
- Aster ontarionis Wieg.
Fayette (J. 3046, S. 10505)
Gallatin (J. 4086)
Hardin (J. 4410)
Shelby (J. 3403)
Wabash (J. & Nurtjahjo 3522)
- Aster praealtus Poir.
Shelby (S. 12556)
- Aster shortii Lindl. in Hook.
Coles (J. 2454)
Shelby (S. 12670)
- Aster simplex Willd.
Christian (S. 10481)
De Witt (J. 4616, S. 10482)
Edwards (J. 3521)
Jersey (Jelinek 179)
McLean (J. 3124)
- Aster tataricus L. f.
Vermilion (S. 12702)
- Aster turbinellus Lindl. in Hook.
Gallatin (J. 4104, 4105)
Moultrie (S. 12568)
- Aster undulatus L.
Gallatin (J. 4094, 4111)
Pope (Evers 98406)
- Aster urophyllus Lindl. in DC.
[Syn. A. sagittifolius sens. auct. non Wedem. ex Willd.]
Champaign (J. 3587)
Fayette (J. 3053)
Piatt (J. 2483)
Shelby (S. 12663, 12671)
- Bidens bipinnata L.
Christian (S. 12576)
De Witt (S. 12585)
Effingham (S. 12399)
Sangamon (S. 12600)
- Bidens cernua L.
Moultrie (S. 12560, 12656)
Shelby (S. 12616)
- Bidens coronata (L.) Britt.
De Witt (S. 12618)
- Bidens frondosa L.
Effingham (S. 12633)
Logan (S. 12589)
Moultrie (S. 12571)
- Bidens tripartita L. [Syn. B. comosa (A. Gray) Wieg.]
Christian (S. 12574)
Effingham (S. 12660)
Fayette (S. 12617)
Shelby (S. 12657)
- Bidens vulgata Greene
Christian (S. 12580)
Effingham (S. 12638)
Fayette (S. 12534)
Moultrie (S. 12569)
Sangamon (S. 12595)
Shelby (S. 12545)
Vermilion (S. 12610)
- Brickellia eupatorioides (L.) Shinnars [Syn. Kuhnia eupatorioides L.]
Fayette (S. 12403)
Moultrie (S. 12357)

- Cacalia plantaginea (Raf.)
Shinners [Syn. C. tuberosa
Nutt.]
Montgomery (S. 12301)
- Carduus nutans L.
St. Clair (M. 4233)
- Centaurea maculosa Lam.
Fayette (S. 12139)
Madison (M. 4223)
- Cirsium arvense (L.) Scop.
Fulton (S. 12128)
Vermilion (S. 12154)
- Cirsium muticum Michx.
Fayette (S. 10315)
- Conyza ramosissima Cronq. [Syn.
Erigeron divaricatus Michx.]
Christian (S. 10430)
Vermilion (S. 9945)
- Eclipta prostrata (L.) L. [Syn.
E. alba (L.) Hassk.]
Shelby (S. 12549)
- Elephantopus carolinianus
Raeusch.
Fayette (S. 10178)
- Erechtites hieracifolia (L.)
Raf. ex DC.
Effingham (S. 12539)
Moultrie (S. 12570)
Shelby (S. 12552)
- Erigeron philadelphicus L.
Greene (S. 11906)
- Erigeron strigosus Muhl. in
Willd.
Vermilion (S. 9042)
- Eupatorium maculatum L.
De Witt (S. 10450)
Vermilion (S. 10022)
- Eupatorium perfoliatum L.
Shelby (S. 12303)
- Eupatorium sessilifolium L.
Macon (S. 12256)
- Gaillardia pulchella Foug.
Cass (S. 12593)
- Helianthus mollis Lam.
Greene (S. 12326)
- Helianthus rigidus (Cass.) Desf.
Fayette (S. 12496)
- Helianthus tuberosus L.
Vermilion (S. 12474)
- Heliopsis helianthoides (L.)
Sweet
Effingham (S. 12297)
Marion (S. 12296)
- Heterotheca camporum (Greene)
Shinners [Syn. Chrysopsis
camporum Greene]
Fayette (S. 12247)
- Heterotheca latifolia Buckl.
Madison (M. 4203, 4250)
St. Clair (M. 4230)
- Hieracium gronovii L.
Effingham (S. 12396)
Fayette (S. 12411)
Shelby (S. 12389)
- Hieracium longipilum Torr.
Christian (S. 12302)
Shelby (S. 12304)
- Hieracium pratense Tausch.
Vermilion (S. 11052, 12701)
- Hieracium scabrum Michx.
De Witt (S. 12366)
Marion (S. 12417)
Moultrie (S. 12360)
Shelby (S. 12390)
- Iva annua L. [Syn. I. ciliata
Willd.]
Fayette (S. 12335)
- Lactuca saligna L.
Christian (S. 12313)
- Leontodon autumnalis L.
Christian (S. 11269)
- Liatris aspera Michx.
Vermilion (S. 12620)
- Liatris cylindracea Michx.
Vermilion (S. 12611)

Matricaria matricarioides

(Less.) Porter

Shelby (S. 11765)

Prenanthes alba L.

Champaign (J. 3593)

Prenanthes aspera Michx.

Bond (S. 12529)

Prionopsis ciliata Nutt. [Syn.Haplopappus ciliata (Nutt.)

DC.]

St. Clair (M. 4243)

Pyrrhopappus carolinianus

(Walt.) DC.

Shelby (S. 12244)

Rudbeckia laciniata L.

Madison (M. 4249)

Silphium integrifolium Michx.

Jasper (S. 12207)

Silphium perfoliatum L.

De Witt (S. 12210)

Shelby (S. 12208)

Silphium terebinthinaceum Jacq.

Greene (S. 12227)

Solidago flexicaulis L.

Fayette (S. 10437)

Shelby (S. 12553)

Solidago gigantea Sol. in Ait.

Christian (S. 12577)

Solidago missouriensis Nutt.var. fasciculata Holz. [Syn.S. glaberrima Martens]

Fulton (S. 12331)

Solidago patula Muhl. in Willd.

De Witt (S. 12583)

Solidago riddellii Frank

De Witt (S. 10622)

Solidago speciosa Nutt.

De Witt (S. 12615)

Jasper (S. 12542)

Moultrie (S. 12563)

Sonchus asper (L.) Hill

Effingham (S. 12334)

Fayette (S. 12337)

Madison (M. & Solomon 4145)

Sonchus oleraceus L.

Fayette (S. 9805)

Madison (M. 4195)

Taraxacum laevigatum (Willd.)DC. [Syn. T. erythrospermum

Andrz.]

Madison (M. 4314)

Tragopogon dubius Scop.

Fayette (S. 11845)

Madison (M. 4103)

Vermilion (S. 11858)

Tragopogon porrifolius L.

Fayette (S. 9225)

Tragopogon pratensis L.

Fayette (S. 11846)

Fulton (S. 11897)

Verbesina alternifolia (L.)

Britt.

Marion (S. 10143)

Vernonia baldwinii Torr.

Vermilion (S. 9929)

Vernonia gigantea (Walt.) Trel.

ex Branner & Coville [Syn. V.

altissima Nutt.]

Christian (S. 12779)

Macon (S. 12382)

BALSAMINACEAE

Impatiens biflora Walt.

Fulton (S. 12355)

BERBERIDACEAE [incl.

PODOPHYLLACEAE]

Berberis thunbergii DC.

Effingham (S. 11689)

Caulophyllum thalictroides (L.)

Michx.

Fayette (S. 11685)

Jeffersonia diphylla (L.) Pers.

Fayette (S. 11684)

BETULACEAE

Alnus glutinosa (L.) Gaertn.

Piatt (G. N. Jones 21690)

Vermilion (S. 10004)

BORAGINACEAE

Cynoglossum officinale L.
Greene (S. 11913)

Cynoglossum virginianum L.
Vermilion (S. 11998)

Echium vulgare L.
Madison (M. 4351)

Lithospermum arvense L.
Fayette (S. 11686)

BRASSICACEAE [CRUCIFERAE]

Alliaria petiolata (Bieb.)
Cavara & Grande [Syn. A.
officinalis Andrz.]
De Witt (S. 11810)
Madison (M. 4315)

Arabis thaliana (DC.)
Heynh.
Christian (S. 8901)

Arabis hirsuta (L.) Scop. var.
pycnocarpa (Hopkins) Rollins
Sangamon (S. 8908)

Arabis shortii (Fern.) Gleason
De Witt (S. 11737)
Moultrie (S. 11740)
Shelby (S. 11742)

Armoracia aquatica (A. Eaton)
Wieg.
Macon (S. 7890)

Barbarea vulgaris R. Br. in
Aiton
De Witt (S. 11736)
Madison (M. 4312)
Moultrie (S. 11739)

Berteroa incana (L.) DC.
Champaign (Smolecki 46)

Brassica juncea (L.) Czern.
Madison (M. & Bufford 4136)

Brassica nigra (L.) W. D. J.
Koch
Madison (M. 4182)

Brassica rapa L.
Fayette (S. 11722)

Chorispora tenella (Pallas) DC.
Madison (M. 4138, 4313)

Descurainia sophia (L.) Webb ex
Prantl
Madison (M. 4107)

Draba brachycarpa Nutt. ex
Torr. & Gray
Christian (S. 11637)

Draba verna L.
Madison (M. 4309)
Vermilion (S. 11657)

Erysimum repandum L.
Christian (S. 11746)

Lepidium campestre (L.) R. Br.
Madison (M. 4252, 4330)

Nasturtium officinale R. Br.
Fayette (S. 9801)
Moultrie (S. 9655)

Raphanus raphanistrum L.
Madison (M. 4154)

Rorippa palustris (L.) Bess.
ssp. fernaldiana (Butters &
Abbe) Jonsell [Syn. R.
islandica (Oeder) Borbas var.
fernaldiana Butt. & Abbel]
Fulton (S. 11892)

Rorippa sinuata (Nutt.) A. S.
Hitchc.
Madison (M. 4324)

Rorippa sylvestris (L.) Bess.
Christian (S. 12375)

Sibara virginica (L.) Rollins
[Syn. Arabis virginica (L.)
Poir.]
De Witt (S. 11693)
Logan (S. 11696)
Moultrie (S. 11673)
Vermilion (S. 11661)

Sisymbrium altissimum L.
Madison (M. 4175)
Shelby (S. 12106)

Sisymbrium officinale (L.) Scop.
Christian (S. 12117)
Fayette (S. 12123)
Madison (M. 4179)

Thlaspi perfoliatum L.
Hardin (G. N. Jones 46983)

CAMPANULACEAE

Lobelia cardinalis L.
Shelby (S. 12530)

CANNABINACEAE

Humulus lupulus L. var. lupulus
Vermilion (S. 12630)

CAPPARIDACEAE

Polanisia dodecandra (L.) DC.
Fayette (S. 12143)
Madison (M. 4211)

CAPRIFOLIACEAE

Lonicera japonica Thunb.
Madison (M. & Bufford 4142)

Lonicera maackii (Rupr.) Maxim.
De Witt (S. 11880)
Madison (M. 4323)

Lonicera prolifera (Kirchn.)
Rehder
De Witt (S. 11882)
Fulton (S. 10956, 11891)
Greene (S. 11909)

Symphoricarpos orbiculatus
Moench
Vermilion (S. 12607)

Triosteum illinoense (Wieg.)
Rydb.
De Witt (S. 11850)
Fulton (S. 11012)

Triosteum perfoliatum L.
Christian (S. 11854)
Fayette (S. 11847)
Vermilion (S. 11986)

Viburnum prunifolium L.
Fulton (S. 11835)

CARYOPHYLLACEAE

Arenaria serpyllifolia L.
De Witt (S. 11808)
Fayette (S. 11814)
Shelby (S. 12103)
Vermilion (S. 11996)

Cerastium brachypodum (Engelm.)
B. L. Robins.
Fayette (S. 11763)
Madison (M. 4327)

Cerastium viscosum L.
Fulton (S. 11851)
Greene (S. 11912)
Madison (M. 4319)
Vermilion (S. 11659)

Lychnis alba Mill.
Fulton (S. 11838)

Paronychia fastigiata (Raf.)
Fern.
Fayette (S. 12311)
Macon (S. 12312)

Silene cserei Baumg.
Fayette (S. 11939)
Macon (S. 9338)

Silene nivea (Nutt.) Otth.
Fayette (S. 11935)

Silene virginica L.
Macon (S. 11961)

Stellaria longifolia Muhl. in
Willd.
Vermilion (S. 11980)

Vaccaria pyramidata Medic.
[Syn. Saponaria vaccaria L.]
Madison (M. & Solomon 4156)

CHENOPODIACEAE

Atriplex patula L.
Christian (S. 12578)
De Witt (S. 12514, 12588)
Fayette (S. 12494, 12532)
Logan (S. 12591)
Moultrie (S. 12564)
Piatt (S. 12606)
Vermilion (S. 12473, 12608)

Chenopodium ambrosioides L.
Madison (M. 4176)

Chenopodium botrys L.
Madison (M. 4212)

Chenopodium gigantospermum
Aellen
Vermilion (S. 10577)

Chenopodium standleyanum Aellen
De Witt (S. 12351)
Fayette (S. 12336)
Fulton (S. 12354)
Moultrie (S. 12345)

Kochia scoparia (L.) Roth
Fulton (S. 12330)
Madison (M. 4204)
Vermilion (S. 12760)

Salsola collina Pallas
Madison (M. 4272, 4292)

Salsola kali L. var. tenuifolia
Tausch.
Fayette (S. 12305)
Macoupin (S. 12694)
Montgomery (S. 12693)

CISTACEAE

Helianthemum bicknellii Fern.
Fayette (S. 12121)
Fulton (S. 11975)

Lechea minor L.
Greene (S. 12226)

CLUSIACEAE [Syn. HYPERICACEAE]

Hypericum gentianoides (L.)
B. S. P.
Fayette (S. 12493)

Hypericum perforatum L.
Shelby (S. 12243)

Hypericum pyramidatum Ait.
Fayette (S. 12140)

COMMELINACEAE

Tradescantia bracteata Small
Madison (M. & Bufford 4098)

Tradescantia ohiensis Raf.
Effingham (S. 11876)
Shelby (S. 11877)

Tradescantia subaspera Ker-Gawl
Fayette (S. 12133)

CONVOLVULACEAE

Calystegia sepium (L.) R. Br.
subsp. americana (Sims)
Brummitt
Fayette (S. 11948)

Calystegia spithamea (L.)
Pursh
Effingham (S. 12113)
Fayette (S. 12111)
Shelby (S. 12107)

Convolvulus arvensis L.
Fayette (S. 9651)

Cuscuta cephalanthii Engelm.
Madison (M. 4342)

Ipomoea lacunosa L.
De Witt (S. 12365)
Fayette (S. 12416)
Moultrie (S. 12362)
Piatt (S. 12364)

Ipomoea nil (L.) Roth [Syn. I. hederacea (L.) Jacq.]
De Witt (S. 10457)

Ipomoea purpurea (L.) Roth
Christian (S. 12524)
De Witt (S. 12521)
Fayette (S. 12495)
Moultrie (S. 12510)
Shelby (S. 12491)

CORNACEAE

Cornus racemosa Lam.
Effingham (S. 11930)

CUCURBITACEAE

Cucumis melo L.
St. Clair (M. & Fallen 4235)

Cucurbita foetidissima H.B.K.
Madison (M. & Solomon 4159)

Sicyos angulatus L.
Madison (M. 4277)

CYPERACEAE

Bulbostylis capillaris (L.)
C. B. Clarke
Fayette (S. 12144)

Carex aggregata Mackenzie
Fayette (S. 9359)
Fulton (S. 11005, 11006)

Carex albursina Sheldon
Logan (S. 7892)

Carex amphibola Steud. var. amphibola
Vermilion (S. 11984)

- Carex annectens (Bickn.) Bickn.
 Fulton (S. 11895)
 Moultrie (S. 11965)
 Sangamon (S. 11973)
 Vermilion (S. 11982)
- Carex artitecta Mackenzie
 Christian (S. 8716)
 De Witt (S. 8736)
 Fayette (S. 8708)
 Fulton (S. 10853)
 Sangamon (S. 8757)
 Vermilion (S. 10721)
- Carex bicknellii Britt.
 Fulton (S. 11889)
- Carex brevior (Dewey) Mackenzie
 Fayette (S. 11875)
- Carex careyana Dewey
 Effingham (S. 11753)
 Fayette (S. 11754)
 Vermilion (S. 11802)
- Carex communis Bailey
 Effingham (S. 11641)
 Fayette (S. 11760)
 Vermilion (S. 11801)
- Carex conjuncta Boott
 Cass (S. 11890)
 Fayette (S. 11867)
 Vermilion (S. 11983)
- Carex convoluta Mackenzie
 Greene (S. 11900)
- Carex cristatella Britt.
 Shelby (S. 12342)
- Carex crus-corvi Schuttlew. ex Kunze
 Fayette (S. 11949)
- Carex davisii Schwein. & Torr.
 Effingham (S. 11866)
- Carex festucacea Schkuhr in Willd.
 Fayette (S. 12757)
- Carex flaccosperma Dewey var. glaucoidea (Tuckerm.) Kükenth.
 Vermilion (S. 11997)
- Carex frankii Kunth
 Christian (S. 12110)
- Carex gracilescens Steud.
 Fayette (S. 9356, 11723)
- Carex granularis Muhl. in Willd.
 Fulton (S. 11894)
- Carex gravida Bailey
 Fulton (S. 10888)
- Carex hitchcockiana Dewey
 Fayette (S. 9219)
 Vermilion (S. 10799)
- Carex hystricina Muhl. in Willd.
 Fayette (S. 11860)
- Carex interior Bailey
 Vermilion (S. 12005)
- Carex jamesii Schwein.
 Fayette (S. 11761)
- Carex lacustris Willd.
 Fayette (S. 11868)
- Carex lanuginosa Michx.
 Effingham (S. 11822)
 Fulton (S. 11824)
- Carex laxiculmis Schwein.
 Vermilion (S. 10812, 11979)
- Carex leavenworthii Dewey
 Vermilion (S. 11981)
- Carex leptalea Wahlenb.
 Fayette (S. 12007)
 Vermilion (S. 11999)
- Carex meadii Dewey
 Effingham (S. 11862)
 Fayette (S. 11861)
- Carex molesta Mackenzie
 Effingham (S. 11933)
 Fayette (S. 11940)
- Carex normalis Mackenzie
 Fayette (S. 11941)
 Fulton (S. 11926)
- Carex oligocarpa Schkuhr in Willd.
 Fayette (S. 9229)
 Vermilion (S. 9013)

- Carex pennsylvanica Lam.
Christian (S. 8714)
Moultrie (S. 8726)
Sangamon (S. 11682)
- Carex retroflexa Muhl. in Willd.
Greene (S. 11903)
Macon (S. 11888)
- Carex sparganioides Muhl. in Willd.
Greene (S. 11902)
- Carex stipata Muhl. in Willd.
De Witt (S. 11884)
Shelby (S. 11873)
- Carex suberecta (Olney) Britt.
Christian (S. 11972)
Mason (S. 12233)
- Carex swanii (Fern.) Mackenzie
Fayette (S. 11947)
- Carex tribuloides Wahlenb.
Ford (J. 3351)
Shelby (S. 12317)
- Carex trichocarpa Muhl. in Schkuhr
Macon (S. 11885)
- Carex umbellata Schkuhr in Willd.
Christian (S. 11712)
De Witt (S. 11734)
Fayette (S. 11720)
Moultrie (S. 11709)
Sangamon (S. 11716)
Shelby (S. 11710)
Vermilion (S. 11797)
- Carex virescens Muhl. in Willd.
Vermilion (S. 11993)
- Cyperus aristatus Rottb.
Effingham (S. 12648)
Fayette (S. 12649)
- Cyperus erythrorhizos Muhl.
De Witt (S. 12683)
Logan (S. 12685)
Moultrie (S. 12667)
Shelby (S. 12666)
- Cyperus filiculmis Vahl
Fayette (S. 12746)
- Cyperus odoratus L. [Syn. C. ferruginescens Boeckl.]
Christian (S. 12682)
Shelby (S. 12665)
- Cyperus ovularis (Michx.) Torr.
Fayette (S. 9905, 12639)
- Cyperus rivularis Kunth
Fayette (S. 12759)
Logan (S. 12686)
Moultrie (S. 12668)
- Cyperus schweinitzii Torr.
Christian (S. 12349)
- Eleocharis obtusa (Willd.)
Schultes var. detonsa (Gray)
Drapalik & Mohlenbrock
Vermilion (S. 12153)
- Eleocharis smallii Britt.
Fayette (S. 12151)
Fulton (S. 11977)
Vermilion (S. 12152)
- Fimbristylis autumnalis (L.)
Roemer & Schultes
Fayette (S. 10302)
- Hemicarpha micrantha (Vahl) Pax
[Syn. Scirpus micranthus Vahl]
Macon (S. 12674)
- Scirpus americanus Pers.
Fayette (S. 11943)
Moultrie (S. 11964)
Shelby (S. 11970)
- Scirpus cyperinus (L.) Kunth
Shelby (S. 12537)
- Scirpus fluviatilis (Torr.) A. Gray
Fayette (S. 12138)
Macoupin (S. 12696)
- Scirpus pendulus Muhl.
Fulton (S. 11925)
- Scleria triglomerata Michx.
Effingham (S. 12325)

DIPSACACEAE

- Dipsacus sylvestris Huds.
Fayette (S. 12249)

ELAEAGNACEAE

- Elaeagnus umbellata Thunb.
Vermilion (S. 12446)

ERICACEAE

- Monotropa hypopithys L. [Syn.
M. lanuginosa (Michx.) Nutt.]
Vermilion (O'Donnell 60)

EUPHORBIACEAE

- Acalypha ostryifolia Riddell
Christian (S. 12526)
Moultrie (S. 12508)
Sangamon (S. 12523)

- Acalypha virginica L.
Moultrie (S. 12562)

- Chamaesyce humistrata (Engelm.
ex Gray) Small
Effingham (S. 12391)
Fayette (S. 12406)

- Croton lindheimerianus Scheele
Madison (M. 4201)

- Euphorbia cyparissias L.
Effingham (S. 10357)

- Euphorbia marginata Pursh
Fulton (S. 11434)
Madison (M. 4193)

- Euphorbia obtusata Pursh
Fayette (S. 9343)

- Phyllanthus caroliniensis Walt.
Fayette (S. 12307)

FABACEAE [LEGUMINOSAE]

- Amphicarpa bracteata (L.) Fern.
var. comosa (L.) Fern.
Fayette (S. 10319)

- Astragalus canadensis L.
Fayette (S. 12148)

- Cassia obtusifolia L. [Syn. C. tora L.]
Madison (M. 4356)

- Coronilla varia L.

- Vermilion (G. N. Jones 43055)

- Desmodium canadense (L.) DC.
Bond (S. 12506)
Jasper (S. 12507)

- Desmodium canescens (L.) DC.
Fulton (S. 12356)
Vermilion (S. 12463)

- Desmodium ciliare (Muhl.) DC.
Bond (S. 12504)
Effingham (S. 12503)
Fayette (S. 12499)
Vermilion (S. 12472)

- Desmodium cuspidatum (Muhl.)
Loud. var. longifolium (Torr.
& Gray) Schub.
Bond (S. 12419)
Fayette (S. 12413)

- Desmodium glabellum (Michx.)
DC. [Syn. D. dillenii Darl.,
pro parte]
Effingham (S. 10095)

- Desmodium marilandicum (L.) DC.
Effingham (S. 12392)
Fayette (S. 12407)
Vermilion (S. 12428)

- Desmodium sessilifolium (Torr.)
Torr. & Gray
Vermilion (S. 12424)

- Glycyrrhiza lepidota (Nutt.)
Pursh
Madison (M. 4287)

- Gymnocladus dioica (L.) K. Koch
De Witt (S. 11809)

- Lathyrus palustris L.
Fayette (S. 9355)
Macon (S. 11214)

- Lespedeza capitata Michx.
De Witt (S. 12371)

- Lespedeza procumbens Michx.
Bond (S. 12505)
Effingham (S. 12502)

- Lespedeza stipulacea Maxim.
Fayette (S. 12402)

Lespedeza violacea (L.) Pers.
Moultrie (S. 10140)

Psoralea onobrychis Nutt.
Fayette (S. 12112)

Robinia hispida L.
Vermilion (S. 12000)

Robinia pseudoacacia L.
De Witt (S. 11857)

Strophostyles helvola (L.) Ell.
Effingham (S. 12394)
Fayette (S. 12338)

Strophostyles leiosperma (Torr.
& Gray) Piper
Shelby (S. 12384)

Strophostyles umbellata (Muhl.)
Britt.
Effingham (S. 12393)
Fayette (S. 12318)

Stylosanthes biflora (L.)
B. S. P.
Fayette (S. 12141)

Trifolium campestre Schreb. [Syn.
T. procumbens sensu auct. non
L.]
Vermilion (S. 12159)

Trifolium reflexum L.
Shelby (S. 12240)

FAGACEAE

Quercus palustris Muenchh.
Shelby (S. 12316)

FUMARIACEAE

Corydalis flavula (Raf.) DC.
Fayette (S. 11762)

Corydalis micrantha (Engelm.)
A. Gray
Madison (M. & Bufford 4088)

GENTIANACEAE

Bartonia virginica (L.) B. S. P.
Iroquois (J. 703)

Gentiana andrewsii Griseb.
Fayette (S. 12653)

Gentianella quinquefolia (L.)
Small ssp. occidentalis (A.
Gray) Gillett
Macon (S. 12745)

Sabatia campestris Nutt.
Bond (S. 9900)

GERANIACEAE

Geranium pusillum Burm. f.
Madison (M. 4336)

GROSSULARIACEAE

Ribes americanum P. Mill.
Fulton (S. 10972)

Ribes missouriense Nutt. ex
Torr. & Gray
Fayette (S. 8701)

HALORAGIDACEAE

Proserpinaca palustris L.
Fayette (S. 2667, 3156, 6027)

HIPPOCASTANACEAE

Aesculus glabra L.
De Witt (S. 11811)

HYDROPHYLLACEAE

Ellisia nyctelea L.
Madison (M. & Bufford 4085)

Hydrophyllum appendiculatum
Michx.
Greene (S. 11918)

Hydrophyllum canadense L.
Macon (S. 11959)
Vermilion (S. 11992)

Hydrophyllum virginianum L.
Fulton (S. 11834)

IRIDACEAE

Iris brevicaulis Raf.
Shelby (S. 11968)

Iris pseudacorus L.
Macon (S. 11029)

Iris shrevei Small
De Witt (S. 11879)
Shelby (S. 11869)

Sisyrinchium albidum Raf.
Greene (S. 11920)

Sisyrinchium campestre Bickn.
Fulton (S. 11825)

JUGLANDACEAE

Carya tomentosa (Poir.) Nutt.
Vermilion (S. 12268)

Juglans cinerea L.
De Witt (S. 12259)
Vermilion (S. 12157)

Juglans nigra L.
Fulton (S. 12485)

JUNCACEAE

Juncus balticus Willd. var.
littoralis Engelm.
Sangamon (S. 12146)

Juncus dudleyi Wieg.
Fayette (S. 11951)
Shelby (S. 11967)

Juncus interior Wieg.
Greene (S. 11919)

LAMIACEAE [LABIATAE]

Agastache nepetoides (L.)
Kuntze
Christian (S. 12379)
Shelby (S. 12386)
Vermilion (S. 12425)

Agastache scrophulariifolia
(Willd.) Kuntze
Fayette (S. 10164)
Sangamon (S. 12747)

Blephilia hirsuta (Pursh)
Benth.
Shelby (S. 12230)

Cunila origanoides (L.) Britt.
Fayette (S. 12409)

Hedeoma hispida Pursh
Fulton (S. 11976)

Lamium amplexicaule L.
Christian (S. 11713)

Lamium purpureum L.
Christian (S. 11714)
Fayette (S. 11719)
Madison (M. & Bufford 4091)

Leonurus cardiaca L.
Fayette (S. 12122)

Leonurus marrubiastrum L.
Christian (S. 12377)

Lycopus rubellus Moench
Vermilion (S. 12697)

Mentha arvensis L. ssp.
haplocalyx Briq.
Fayette (S. 12421)

Monarda clinopodia L.
Fayette (S. 12202)
Vermilion (S. 12261)

Monarda fistulosa L.
Jasper (S. 12203)

Perilla frutescens (L.) Britt.
Fayette (S. 12536)

Physostegia virginiana (L.)
Benth.
Bond (S. 12624)

Pycnanthemum pilosum Nutt.
Jasper (S. 12206)

Pycnanthemum virginianum (L.)
Durand & Jackson
Bond (S. 12300)
Fulton (S. 9881)

Scutellaria incana Biehler
Marion (S. 12204)

Scutellaria lateriflora L.
De Witt (S. 12519)
Fayette (S. 12497)

Scutellaria parvula Michx. var.
leonardii (Epling) Fern.
Fulton (S. 11828)
Scott (S. 12220)
Shelby (S. 11874)

Stachys tenuifolia Willd.
De Witt (S. 12518)

LAURACEAE

Lindera benzoin (L.) Blume
Fayette (S. 11663)

LILIACEAE

Allium burdickii (Hanes) A. C.
Jones [Syn. A. tricoccum Ait.
var. burdickii Hanes]
Effingham (S. 11640)
Gallatin (J. 5664)

Allium tricoccum Sol. in Ait.
Macon (S. 11820)
Piatt (J. 5462)
Vermilion (S. 11656)

Asparagus officinalis L.
Fulton (S. 11839)

Erythronium americanum Ker-Gawl
De Witt (S. 11668)
Fayette (S. 11662)
Vermilion (S. 11660)

Hemerocallis fulva (L.) L.
Effingham (S. 12126)
Fayette (S. 12124)

Ornithogalum umbellatum L.
Vermilion (S. 8948)

Smilacina stellata (L.) Desf.
Fayette (S. 11944)

Trillium sessile L.
Gallatin (J. 5663)

Veratrum woodii J. W. Robbins
Fayette (S. 12229)

LYTHRACEAE

Ammannia coccinea Rottb.
De Witt (S. 12586)

Lythrum salicaria L.
Fulton (S. 12238)

Rotala ramosior (L.) Koehne
Fayette (S. 2814)

MALVACEAE

Abutilon theophrastii Medic.
Madison (M. 4199)

Hibiscus lasiocarpus Cav.
Fayette (S. 12401)

Hibiscus militaris Cav.
Fayette (S. 12404)

MORACEAE

Broussonetia papyrifera (L.)
Vent.
Madison (M. 4140)

NYCTAGINACEAE

Mirabilis linearis (Pursh)
Heimerl
Madison (M. 4271, 4340)

Mirabilis nyctaginea (Michx.)
MacM.
Jasper (S. 11928)

NYSSACEAE

Nyssa sylvatica Marsh.
Vermilion (S. 12700)

OLEACEAE

Fraxinus nigra Marsh.
Fayette (S. 12250)

Fraxinus quadrangulata Michx.
Vermilion (S. 12003)

ONAGRACEAE

Epilobium coloratum Muhl. in
Willd.

De Witt (S. 12584)
Effingham (S. 12636)
Logan (S. 12675)
Moultrie (S. 12565)
Sangamon (S. 12599)
Shelby (S. 12546)

Ludwigia palustris (L.) Ell.
var. americana (DC.) Fern. &
Grisc.
Bond (S. 9907)
Macon (S. 10169)

Ludwigia polycarpa Short & Peter
Fayette (S. 12308)

Oenothera laciniata Hill
Fayette (S. 11938)
Vermilion (Seigler 5051)

Oenothera pilosella Raf.

Macon (S. 12115)

ORCHIDACEAE

Aplectrum hyemale (Muhl.) Torr.

Fayette (S. 11664)

Moultrie (S. 11671)

Shelby (S. 11678)

Corallorhiza odontorhiza

(Willd.) Nutt.

McLean (J. 4016)

Cypripedium pubescens Willd.

Fayette (S. 11812)

Habenaria peramoena A. Gray

Shelby (J. Nance, s.n.)

Liparis lilifolia (L.) L. C.

Rich. ex Lindl.

Shelby (S. 12548)

Orchis spectabilis L.

Moultrie (S. 11962)

Spiranthes cernua (L.) L. C.

Rich.

Effingham (S. 12655)

Spiranthes magnicamporum Sheviak

Bond (S. 5623)

Christian (S. 12744)

OROBANCHACEAE

Orobanche uniflora L.

Fayette (S. 2478)

PASSIFLORACEAE

Passiflora incarnata L.

Madison (M. 4210)

Passiflora lutea L. var.

glabriflora Fern.

Fayette (S. 12410)

PHRYMACEAE

Phryma leptostachya L.

Vermilion (S. 9696)

POACEAE [GRAMINEAE]

Agropyron repens (L.) Beauv.

Fayette (S. 12306)

Shelby (S. 12488)

Agropyron smithii Rydb.

Vermilion (S. 9781)

Agrostis perennans (Walt.)

Tuckerm.

De Witt (S. 12367)

Effingham (S. 10155)

Fayette (S. 10062)

Logan (S. 12372)

Shelby (S. 12387)

Alopecurus carolinianus Walt.

De Witt (S. 8912)

Fayette (S. 9207)

Logan (S. 8913)

Vermilion (S. 9028)

Andropogon virginicus L.

Christian (S. 12753)

Macon (S. 12755)

Moultrie (S. 12754)

Shelby (S. 12752)

Vermilion (S. 12711)

Aristida basiramea Engelm.

ex Vasey

Winnebago (S. 10634)

Aristida dichotoma Michx.

Fayette (S. 10443)

Aristida longespica Poir.

Moultrie (S. 10525)

Vermilion (S. 12464)

Aristida oligantha Michx.

Effingham (S. 12333)

Fayette (S. 12339)

Shelby (S. 12343)

Avena fatua L.

Madison (M. 4162)

Avena sativa L.

Madison (M. & Bufford 4134)

Bouteloua curtipendula (Michx.)

Torr.

Iroquois (Taft 63)

Vermilion (S. 10585)

Bromus altissimus Pursh [Syn.

B. latiglumis (Shear) A. S.

Hitchc.]

Fayette (S. 12205, 12414)

Bromus japonicus Thunb. ex
Murr.

Effingham (S. 12125)

Greene (S. 11910)

Madison (M. 4122)

St. Clair (M. 4241)

Bromus pubescens Muhl. in Willd.
[Syn. B. purgans sensu auct.
non L.]

Greene (S. 11911)

Calamagrostis canadensis
(Michx.) Beauv.

Shelby (S. 12109)

Chasmanthium latifolium (Michx.)
Yates

Vermilion (S. 12262)

Chloris verticillata Nutt.
Madison (M. 4209)

Danthonia spicata (L.) Beauv.

De Witt (S. 12114)

Greene (S. 11914)

Vermilion (S. 11985)

Diarrhena americana Beauv. var.
obovata Gleason

Fayette (S. 12254)

Sangamon (S. 12750)

Shelby (S. 12232)

Dichanthelium acuminatum (Sw.)

Gould & Clark var. implicatum

(Scribn.) Gould & Clark [Syn.

Panicum lanuginosum Ell. var.

implicatum (Scribn.) Fern.]

Vermilion (S. 11989)

Dichanthelium acuminatum var.

lindheimeri (Nash) Gould &

Clark [Syn. Panicum

lanuginosum var. lindheimeri

(Nash) Fern.]

Vermilion (S. 11990)

Dichanthelium acuminatum var.

villosum (A. Gray) Gould &

Clark [Syn. Panicum praecocius

Hitchc. & Chase]

Effingham (S. 9564)

Dichanthelium clandestinum (L.)

Gould [Syn. Panicum

clandestinum L.]

Effingham (S. 9860)

Jasper (S. 9866)

Shelby (S. 9878)

Dichanthelium depauperatum

(Muhl.) Gould [Syn. Panicum

depauperatum Muhl.]

Fayette (S. 11937)

Vermilion (S. 11991)

Dichanthelium oligosanthos

(Schultes) Gould var.

scribnerianum (Nash) Gould

[Syn. Panicum oligosanthos

Schultes var. scribnerianum

(Nash) Fern.]

Effingham (S. 11932)

Jasper (S. 11929)

Dichanthelium sphaerocarpon

(Ell.) Gould var. isophyllum

(Scribn.) Gould & Clark [Syn.

Panicum microcarpon Muhl.]

Fayette (S. 12120)

Dichanthelium sphaerocarpon var.

sphaerocarpon [Syn. Panicum

sphaerocarpon Ell.]

Fayette (S. 9888)

Digitaria ischaemum (Schreb.

ex Schweig.) Muhl.

Effingham (S. 12400)

Diplachne acuminata Nash [Syn.

Leptochloa acuminata (Nash)

Mohlenbrock]

Christian (S. 12525)

De Witt (S. 12517)

Effingham (S. 12322)

Fayette (S. 12319)

Logan (S. 12478)

Macon (S. 12314)

Montgomery (S. 12758)

Moultrie (S. 12511)

Piatt (S. 12512)

Sangamon (S. 12315)

Shelby (S. 12486)

Diplachne fascicularis (Lam.)

Beauv. [Syn. Leptochloa fascicularis (Lam.) A. Gray]

Fayette (S. 10306)

Macon (S. 11203)

Madison (M. 4219)

Eleusine indica (L.) Gaertn.

Vermilion (S. 12612)

Elymus riparius Wieg.

Madison (S. 7951)

Vermilion (S. 10601)

Eragrostis capillaris (L.) Nees

Fayette (S. 12743)

Iroquois (Taft 62)

Eragrostis minor Host [Syn. E. poaeoides Beauv. ex Roem. &

Schultes]

Madison (M. 4206)

St. Clair (M. 4231)

Eriochloa contracta A. S.

Hitchc.

Effingham (S. 12310, 12398)

Fayette (S. 12309, 12415)

Festuca arundinacea Schreb.

Madison (M. 4186)

Festuca rubra L.

Vermilion (S. 12004)

Hordeum vulgare L.

Madison (M. 4180)

Koeleria cristata (L.) Persoon

[Syn. K. macrantha (Ledeb.) Schultes]

Fayette (S. 3131, 12149)

Leersia lenticularis Michx.

Fayette (S. 10157)

Leersia oryzoides (L.) Sw.

St. Clair (M. 4294)

Shelby (S. 12489)

Leptochloa filiformis (Lam.)

Beauv.

Fayette (S. 2664)

Leptoloma cognatum (Schultes)

Chase

Fayette (S. 12742)

Vermilion (S. 12423)

Lolium multiflorum Lam.

Vermilion (S. 12001)

Muhlenbergia bushii Pohl

De Witt (S. 12614)

Logan (S. 12687)

Shelby (S. 12547)

Vermilion (S. 12609)

Muhlenbergia frondosa (Poir.)

Fern.

Effingham (S. 12650)

Fayette (S. 12498)

Moultrie (S. 12669)

Piatt (S. 12688)

Shelby (S. 12487)

Muhlenbergia glabriflora Scribn.

Fayette (S. 12654)

Muhlenbergia racemosa (Michx.)

B. S. P.

Cass (S. 12594)

Muhlenbergia schreberi J. F.

Gmel.

De Witt (S. 12516)

Logan (S. 12479)

Moultrie (S. 12509)

Shelby (S. 12490)

Muhlenbergia sobolifera (Muhl.)

Trin.

Vermilion (S. 12422)

Muhlenbergia tenuiflora (Willd.)

B. S. P.

Fayette (S. 12644)

Vermilion (S. 12629)

Panicum anceps Michx.

Fayette (S. 12641)

Panicum miliaceum L.

Madison (M. 4181)

Panicum rigidulum Bosc ex Nees

Bond (S. 12543)

Christian (S. 12579)

Effingham (S. 12541)

Fayette (S. 12531)

Sangamon (S. 12596)

Shelby (S. 12559)

Panicum virgatum L.

Madison (M. 4215)

Shelby (S. 12245)

Paspalum pubiflorum Rupr. ex
Fourn. var. glabrum Vasey ex
Scribn.
Fayette (S. 12248)

Paspalum setaceum Michx. var.
ciliatifolium (Michx.) Vasey
[Syn. P. ciliatifolium Michx.]
Cass (S. 12225)
Effingham (S. 12216)
Mason (S. 12328)
Shelby (S. 12217)

Phalaris arundinacea L.
De Witt (S. 11957)
Fayette (S. 11952)

Phragmites australis (Cav.)
Trin. ex Steud.
Fayette (S. 12321)
Fulton (S. 12332)

Poa bulbosa L.
Shelby (S. 11849)

Poa chapmaniana Scribn.
De Witt (S. 11855)
Macon (S. 11856)

Poa palustris L.
Shelby (S. 12108)
Vermilion (S. 11988)

Poa sylvestris A. Gray
Fayette (S. 9199)

Schizachyrium scoparium (Michx.)
Nash [Syn. Andropogon scoparium
Michx.]
Jasper (S. 10148)
Vermilion (S. 11554)

Setaria geniculata (Lam.) Beauv.
Cass (S. 12237)
Effingham (S. 12298)

Setaria italica (L.) Beauv.
Fayette (S. 12412)

Setaria verticillata (L.) Beauv.
Madison (M. 4290)

Setaria viridis (L.) Beauv.
var. major (Gaudin) Pospichal
Madison (M. 4358)

Sorghum halepense (L.) Persoon
Macoupin (S. 12695)
Shelby (S. 12209)

Sphenopholis obtusata (Michx.)
Scribn. var. major (Torr.)
K. S. Erdman
Effingham (S. 9179)

Sporobolus asper (Michx.) Kunth
Effingham (S. 12500)

Sporobolus clandestinus
(Biehler) A. S. Hitchc.
Sangamon (S. 12748)

Sporobolus cryptandrus (Torr.)
A. Gray
Madison (M. & Bufford 4131)
Vermilion (S. 12613)

Sporobolus heterolepis (A. Gray)
A. Gray
Bond (S. 12691)
Fayette (S. 12642)
Shelby (S. 12664)

Sporobolus vaginiflorus (Torr.
ex Gray) Wood
Fayette (S. 12533)
Madison (M. 4284)

Tridens strictus (Nutt.) Nash
St. Clair (M. 4295)

POLYGALACEAE

Polygala senega L.
Fayette (S. 9806)

POLYGONACEAE

Polygonum aviculare L.
Christian (S. 12347)
De Witt (S. 12350)

Polygonum convolvulus L.
Fulton (S. 12329)

Polygonum cuspidatum Sieb. &
Zucc.
Logan (S. 12763)
Sangamon (S. 12762)

Polygonum erectum L.

De Witt (S. 12581)

Logan (S. 12590)

Moultrie (S. 12561)

Piatt (S. 12605)

Sangamon (S. 12598)

Shelby (S. 12555)

Polygonum hydropiperoides Michx.

De Witt (S. 12587)

Effingham (S. 12647)

Moultrie (S. 12567)

Sangamon (S. 12601)

Vermilion (S. 11398)

Polygonum lapathifolium L.

Shelby (S. 12241)

Polygonum persicaria L.

Christian (S. 12528)

Effingham (S. 12501)

Polygonum scandens L.

Effingham (S. 12395)

Moultrie (S. 12358)

Shelby (S. 12385)

Polygonum tenue Michx.

Montgomery (S. 12692)

Polygonum virginianum L.

De Witt (S. 12368)

Rumex altissimus Wood

Greene (S. 11922)

Rumex crispus L.

Fulton (S. 11924)

Rumex cristatus DC.

Macon (S. 3797)

Madison (M. 4224)

St. Clair (Neill 10901, 15261)

Stark (V. H. Chase 70)

Rumex longifolius DC.

Peoria (V. H. Chase 17271)

Richland (Scherer 149)

Rumex orbiculatus A. Gray

Vermilion (S. 11605)

Rumex patientia L.

Madison (M. & Bufford 4099)

Rumex verticillatus L.

Fayette (S. 11936)

PRIMULACEAE

Anagallis arvensis L.

Shelby (S. 9683)

Lysimachia lanceolata Walt.

Christian (S. 12118)

RANUNCULACEAE

Actaea pachypoda Ell.

Greene (S. 12105)

Anemone canadensis L.

Fayette (S. 11848)

Anemonella thalictroides (L.)

Spach

Shelby (S. 11743)

Caltha palustris L.

De Witt (S. 11735)

Clematis terniflora DC. [Syn.C. dioscoreifolia Levl. &

Vaniot]

Macon (S. 2321)

Delphinium consolida L.

Madison (M. & Solomon 4166)

Delphinium tricornis Michx.

Shelby (S. 11741)

Hepatica nobilis P. Mill. var.acuta (Pursh) Steyermark

Moultrie (S. 11636)

Sangamon (S. 11639)

Isopyrum biternatum (Raf.)

Torr. & Gray

De Witt (S. 11669)

Moultrie (S. 11675)

Shelby (S. 11676)

Myosurus minimus L.

De Witt (S. 8735)

Logan (S. 8755)

Ranunculus fascicularis Muhl.

ex Bigelow

Fayette (S. 11813)

Ranunculus micranthus (A. Gray)

Nutt. ex Torr. & Gray

Fayette (S. 8762)

Macoupin (S. 8909)

Vermilion (S. 8854)

Ranunculus pennsylvanicus L. f.
Champaign (Seik 17)

Ranunculus sardous Crantz
Madison (M. 4335)

Ranunculus sceleratus L.
Fayette (S. 11759)
Macon (S. 11883)

Thalictrum revolutum DC.
Shelby (S. 11872)

RHAMNACEAE

Ceanothus americanus L.
Fulton (S. 11978)
Jasper (S. 11927)

ROSACEAE

Agrimonia parviflora Aiton
Shelby (S. 12344, 12558)

Agrimonia rostellata Wallr.
Vermilion (S. 12266)

Amelanchier arborea (Michx. f.)
Fern.
Fayette (S. 8702)
Moultrie (S. 8692)

Crataegus calpodendron (Ehrh.)
Medic.
Macon (S. 11596, 11804)

Crataegus crusgalli L.
De Witt (S. 11821)
Fulton (S. 11837)
Scott (S. 12218)

Crataegus mollis (Torr. & Gray)
Scheele
Fayette (S. 11725)

Crataegus punctata Jacq.
Fulton (S. 11338)

Duchesnia indica (Andr.) Focke
Champaign (McClary 2)
Fayette (S. 2429)
Macon (Mills, s.n.)

Fragaria virginiana Duchesne
Effingham (S. 11690)
Fayette (S. 11687)
Fulton (S. 11833)
Marion (S. 11691)

Potentilla arguta Pursh
Shelby (S. 12201)

Potentilla norvegica L.
Madison (M. 4184)

Rosa multiflora Thunb. ex Murr.
Fayette (S. 11859)
Fulton (S. 11893)
Madison (M. 4331)

Rubus flagellaris Willd.
Effingham (S. 9156)
Madison (M. 4318)

Rubus pennsylvanicus Poir.
Effingham (S. 11844)
Fulton (S. 11840)

RUBIACEAE

Galium obtusum Bigelow
Greene (S. 11917)

Galium triflorum Michx.
Christian (S. 12145)

Houstonia minima Beck
Shelby (S. 8725)

Houstonia purpurea L. var.
calycosa A. Gray
De Witt (S. 11886)

Mitchella repens L.
Vermilion (S. 12002)

RUTACEAE

Zanthoxylum americanum P. Mill.
Fayette (S. 11815)

SALICACEAE

Populus alba L.
Shelby (S. 9911)
Vermilion (S. 8866)

Populus grandidentata Michx.
De Witt (S. 11732)
Fayette (S. 11665)
Fulton (S. 11826)

Populus tremuloides Michx.
Fulton (S. 11827)

Salix amygdaloides Andersson
Fulton (S. 11330)

Salix discolor Muhl.

Shelby (S. 11750)

Salix eriocephala Michx. [Syn.

S. rigida sensu auct. non

Muhl.]

Fayette (S. 11755)

Moultrie (S. 11747)

Shelby (S. 11748)

Salix humilis Marsh.

Effingham (S. 11666, 11823)

Fulton (S. 11841)

Moultrie (S. 11635)

Piatt (S. 11644)

Sangamon (S. 11638)

Vermilion (S. 11658)

Salix sericea Marsh.

Fayette (S. 11756)

Vermilion (S. 11796, 11842)

SANTALACEAE

Comandra umbellata (L.) Nutt.

[Syn. C. richardsoniana Fern.]

Moultrie (S. 11963)

SAPINDACEAE

Cardiospermum halicacabum L.

Madison (M. 4341)

SAXIFRAGACEAE

Saxifraga pennsylvanica L.

Fayette (S. 11945)

Greene (S. 11923)

SCROPHULARIACEAE

Bacopa rotundifolia (Michx.)

Wettst.

Fayette (S. 9853)

Castilleja coccinea (L.)

Spreng.

Fayette (S. 9227)

Chelone glabra L.

De Witt (S. 12626)

Collinsia verna Nutt.

Christian (S. 11745)

Fayette (S. 11731)

Gratiola neglecta Torr.

Vermilion (S. 12155)

Lindernia anagallidea (Michx.)

Pennell

Fayette (S. 12320)

Pedicularis canadensis L.

Fayette (S. 8905)

Tomanthera auriculata (Michx.)

Raf. [Syn. Gerardia auriculata

Michx.]

Fayette (S. 10175)

Verbascum blattaria L.

Fayette (S. 9650, 10628)

Fulton (S. 11183)

Veronica polita Fries

Madison (M. 4307)

SIMAROUBACEAE

Ailanthus altissima (P. Mill.)

Swingle

Fulton (S. 12129)

SOLANACEAE

Datura stramonium L.

Fulton (S. 12353)

Madison (M. & Solomon 4165)

Physalis heterophylla Nees

Madison (M. 4264)

Marion (S. 12142)

Solanum cornutum Lam. [Syn. S.

rostratum Dunal]

Madison (M. 4177)

TYPHACEAE

Typha angustifolia L.

Fayette (S. 11942)

ULMACEAE

Ulmus pumila L.

Fulton (S. 10730)

Vermilion (S. 11995)

URTICACEAE

Boehmeria cylindrica (L.) Sw.

De Witt (S. 12258)

Urtica dioica L. ssp. gracilis VIOLACEAE(Ait.) Selander [Syn. U. gracilis Aiton]Christian (S. 12376)Moultrie (S. 12661)Sangamon (S. 12374)Viola affinis LeConte
Vermilion (S. 10834)Viola fimbriatula Sm.
Fulton (S. 10756)

VALERIANACEAE

Valeriana pauciflora Michx.Fayette (S. 11871)Valerianella radiata (L.) Dufr.Fulton (S. 11830)Viola missouriensis Greene
Vermilion (S. 10715)Viola pedata L.
Vermilion (S. 8817, 8836)

VERBENACEAE

Verbena bracteata Lag. & Rodr.Christian (S. 12673)Fayette (S. 12635)Moultrie (S. 12761)Viola rafinesquii Greene
Christian (S. 11680)De Witt (S. 11694)Fulton (S. 11836)Logan (S. 11695)Moultrie (S. 11674)Piatt (S. 11692)Verbena simplex Lehm.Fayette (S. 3268)Viola striata Ait.
Fulton (S. 10903)

VITACEAE

Vitis vulpina L.Shelby (S. 12213)

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BEGONIA NOMENCLATURE NOTES. 5

Begonia peltata Otto & Dietrich and Related Species

Jack Golding, 47 Clinton Ave., Kearny, N.J. 07032

The Species of the Begoniaceae, edition 2, 1974, by Fred A. Barkley and Jack Golding is a compendium of the published names and the published synonymy for the species and therefore continues the errors from the literature. I have been reviewing the literature to verify or correct the citations and their synonymy. My determinations will be published in this series, "*Begonia* Nomenclature Notes."

This review corrects the confusion in the literature with the names *Begonia peltata*, *Begonia incana*, *Begonia coriacea*, *Begonia hasskarlii* and other related species.

Begonia peltata Otto & Dietrich

The name *Begonia peltata* was given to a species from Mexico by Otto & Dietrich in *Allgemeine Gartenzeitung* 9(8): 58, published Feb. 20, 1841.

This same species was named *Begonia incana* by Lindley in the *Edwards' Botanical Register*, Vol. 27, in "Miscellaneous Notices", page 39, also published in 1841. The first page of "Miscellaneous Notices" is dated January 1841 and this probably is the reason why some authors thought the name *Begonia incana* Lindley had priority over *Begonia peltata* of Otto & Dietrich. But a closer examination of Volume 27 reveals footnotes on the bottom of some pages indicating that the "Notices" were first published in monthly installments. The date May 1841 is on the bottom of page 35, and June 1841 is on the bottom of page 43 establishing the date of publication for *Begonia incana* Lindley on page 39 as May 1841.

Therefore, the correct name for this species is *Begonia peltata* Otto & Dietrich and *Begonia incana* Lindley is a synonym, as suggested by E. J. Alexander in *Addisonia* 23(4): 53, pl. 763 (1959), and cited by

L. B. Smith & B. G. Schubert, *Fieldiana*, Bot. 24(1): 177 (1961).

J. F. Klotzsch in *Monatsbericht der Königl. Preuss. Akademie der Wissenschaften zu Berlin* (1954), and his *Begoniaceen-Gattungen und Arten* (1855) divided the previous genus *Begonia* into forty-one different genera. On page 69, he gave *Rachia peltata* Klotzsch as the new name for *Begonia peltata* Otto & Dietrich, and *Rachia incana* Klotzsch as the new name for *Begonia incana* Lindley with *Begonia auriformis* Van Houtte as a synonym.

A. de Candolle (and other botanists) did not accept the separation of the genus *Begonia* to the many genera proposed by Klotzsch, but he did use his grouping for sections and subgenera.

A. de Candolle, in his *Prodromus* 15 (1): 326 (1864) listed *Begonia incana* Lindley and cited in the synonymy *Begonia peltata* Otto & Dietrich and *Rachia peltata* Klotzsch. On page 327 with this diagnosis [translated] "The exterior of the sepals [tepals] of the masculine flower, glabrous or almost glabrous" he established the new variety *Begonia incana* var. *auriformis*, listing as synonyms: *Begonia auriformis* Hort. Van Houtte and *Rachia incana* Klotzsch.

Since *Begonia incana* is not the correct name for this species, I transfer this variety to *Begonia peltata* var. *auriformis* (A. DC.) Golding *comb. nov.*

Homonyms of *Begonia peltata*

Begonia peltata Sesse & Mocino was published in *Flora Mexicana* ed. 2: 219 (1894). Smith and Schubert in "Studies in the Begoniaceae" *Contributions Gray Herbarium* 154: 27, 30 (1945) identified the *Begonia peltata* Sesse & Mocino as *Begonia nelumbiifolia* Schlechtendahl & Chamisso 1830.

A. D. E. Elmer published the name *Begonia peltata* Elmer for a species from the Philippine Islands in *Leaflets of Philippine Botany* 7: 2556 (1915). E. D. Merrill in *The Philippine Journal of Science Bot.* 13 (1): 39 (1918) following the description of *Begonia tayabensis* Merrill, comments concerning the Philippine *Begonia* species with peltate leaves and gave the new name *Begonia elmeri* Merrill for *Begonia peltata* Elmer, since *Begonia peltata* Otto & Dietrich had priority for the name.

Begonia kellermanii C. DC.

Begonia kellermanii C. DC., *Smithson, Misc. Coll.* 69(12): 1 (1919) was listed by Smith & Schubert, *Fieldiana, Bot.* 24: 177 (1961) as a synonym of *Begonia peltata* Otto & Dietrich.

Casimir de Candolle, in his original citation stated (translated) "It differs from *Begonia incana* Lindl. [*Begonia peltata* O&D] by the much smaller leaves, more ovate and long acuminate, and with smaller capsule and glabrous flowers."

They look similar as dried herbarium material, but having observed both species growing in my garden, I would add that they also differ by their habit. Both have thick stems with short internodes, but *Begonia peltata* O&D is a low-growing plant whose large round leaves and shorter internodes makes it compact. *Begonia kellermanii* C. DC. grows much taller and with smaller ovate leaves appears more slender.

After reading my preliminary manuscript, Dr. L. B. Smith checked the type of *Begonia kellermanii* C. DC. at the U.S.N.H. and noted that it has stout stems and short internodes. He questioned whether there really is enough difference in the living plants to be of specific value, but he did advise that he would reinstate *Begonia kellermanii* C. DC. on the basis of the glabrous tepals noted by C. de Candolle.

Begonia coriacea Hasskarl

A species from Java was named *Begonia peltata* by J. K. Hasskarl in *Tijdschrift* 10: 133 (1843) and he described it on page 192 of *Cat. Hort. Bot. Bogor.* (1844). On page 311 of the same 1844 publication, Hasskarl, having noted the 1841 use of *Begonia peltata* by Otto & Dietrich changed the name of his species to *Begonia coriacea* Hasskarl.

Zollinger and Moritzi in *Systematisches Verzeichniss* 31 (1846) in a list of *Begonia* renamed Hasskarl's *Begonia peltata* to *Begonia hasskarlii* Zoll. & Mor. They and many later authors apparently missed Hasskarl's own correction of the name to *Begonia coriacea*.

B. C. Seemann in *The Botany of the Voyage of H.M.S. Herald* 128 (1854) listed as No. 440, *Begonia hernandiifolia* Hook. *Bot. Mag. t.* 4676, Western Vera-guas.

When Klotzsch in his *Begoniaceen* 74 (1855) transferred *Begonia coriacea* Hasskarl to *Mitscherlichia coriacea* Klotzsch, he listed in the synonymy, *Begonia hernandiifolia* Hooker, Bot. Mag. pl. 4676 (1852) with the note that it was not from Central America as erroneously stated in the *Botanical Magazine*.

In "Further Additions and Corrections," June 8, 1857, on page 254 of the *Botany of the Voyage of H.S.S. Herald*, Seemann noted that the No. 440 *Begonia hernandiifolia* Hooker = *Begonia coriacea* Hasskarl" is a native of Java, to be excluded from the 'Flora of the Isthmus of Panama.' " He stated further that he had not sent seed of this plant from the Isthmus and there are no specimens of it in his collection.

A. de Candolle on page 339 of his *Prodromus* listed as a synonym under *Begonia glandulosa* A. DC., "*Begonia hernandiifolia* Seem. in h. Hook. et in Bot. Herald (sine descr.)." This cannot be correct and the synonym should be deleted.

F. Miquel used the name *Begonia junghuhniana* Miquel, for a species collected in Java, in part 4 of *Plantae Junghuhnianae* on page 418. The date of publication is not clear. It was probably intended to publish part 4 in 1855, the date on the title page, but the actual date of distribution was delayed. Stafleu, *Taxonomic Literature* 319 (1967) reported that early in 1857 part 4 had not yet appeared and that W. J. Hooker reviewed parts 1-4 in Nov. 1857, indicating the date of effective publication for part 4 was 1857. Miquel listed "*Begonia junghuhniana* Miq. in Herb. Jungh." as a synonym of *Mitscherlichia junghuhniana* Miquel in the *Flora Indiae Batavae* 1: 696 (1856). Backer & Van Brink, *Flora of Java* 309 (1963), listed *B. junghuhniana* as a synonym of *Begonia coriacea* Hasskarl.

S. H. Koorders, *Exkursionsflora Von Java* 644 (1912) listed, *B. junghuhniana* Miq. forma *acutifolia* Miq. Msc. in Herb. Lugd. Bat. While Koorders attributed this name to the Miquel manuscript, he did not give any description of this form. This citation cannot be considered effective publication, I have not found this name published anywhere else. Therefore, it is a *nomen nudum*.

A. de Candolle, in his *Prodromus* 15(1): 368, 390 (1864), at first listed the name *Begonia peltata* for two different species: on page 368 for the specimen of Schott in Herb. Vindob. of a species from Brazil, and on page 390 for the specimen from Java described by Hassk., *Cat. Hort. Bot. Bogor.* 192 (1844), non Otto & Dietrich, nec Schott. Later, in his "Addenda et Corrigenda" on page 517, he changed the name of the *Begonia peltata* on page 390 [incorrectly] to *Begonia hasskarlii* Zollinger & Moritzi (1846). The synonymy cited on page 390, included "*Begonia coriacea* Cat. Hort. Bogor. p. 311 (non Schott)." I do not understand why de Candolle did not accept the name change by Hasskarl of *Begonia peltata* to *Begonia coriacea*. Perhaps, since he added "non Schott" after the citation, he thought the name *Begonia coriacea* was used earlier by Schott. But I cannot find any record of Schott using this name.

Begonia coriacea Hasskarl is the correct name for the species from Java.

Begonia concinna Schott

The *Begonia peltata* (Schott in Herb. Vindob.) A. DC. on page 368 of *Prodromus* is not correct because of the earlier *Begonia peltata* Otto & Dietrich and must be changed. De Candolle listed in the synonymy *Begonia concinna* Schott in Spreng. Syst. Veg. (App.) 4: 408 (1827) with a question mark and the note (translated) "from the description with Schott's name published in Sprengel, not present in the herbarium of Vienna." The description of *Begonia concinna* Schott is for Schott's specimen labeled *Begonia peltata*. Even though Schott originally labeled his herbarium specimen *Begonia peltata*, the name he published for it in Sprengel, *Systema Vegetabilium* was *Begonia concinna* Schott, which is the correct name for this species.

Begonia tominana Golding

Begonia coriacea A. DC. was given in *Prodromus* 15(1): 286 (1864) for a species that was collected in the Tomina Province of Bolivia by Weddel. Because of the earlier *Begonia coriacea* by Hasskarl in 1844, this name is not correct. Therefore, I give this species the name *Begonia tominana* Golding, *nomen novum*.

Begonia micranthera var. *hieronymi* Smith & Schubert

A. Grisebach *Symbolae ad Floram Argentinam* 136 (1879) listed as No. 803, a *Begonia* he considered to be *Begonia coriacea* A. DC., but indicated some differences. Lindau in "Supplements No. 48" to the *Botanischen Jahrbuchern* 19: 14 (1894), listed "*Begonia coriacea* Griseb. (non D.C.), Symb. Arg. p. 136" as a synonym of his new species *Begonia hieronymi* Lindau.

After studying considerable herbarium material, Smith and Schubert did not accept *Begonia hieronymi* Lindau as a separate species and in their "Revision de las Especies Argentinas del Genero *Begonia*" in *Darwiniana* 5: 96. pl. 7 (1941), they determined it to be a variety, *Begonia micranthera* Grisebach var. *hieronymi* (Lindau) Smith & Schubert.

Begonia kingiana Irmscher

G. King in "Materials for a Flora of the Malay Peninsula," in the *Journal of the Asiatic Society of Bengal* 71 (2, 1): 62 (1902), used the name *Begonia hasskarlii* Zollinger & Moritzi for several specimens collected in Malay.

H. N. Ridley in the *Flora of the Malay Peninsula* 1: 860 (1922), also used the name *Begonia hasskarlii* for several specimens collected in Malay.

E. Irmscher in "Die Begoniaceen der Malaiischen Halbinsel" published in *Mitteilungen aus dem Institut für Allgemeine Botanik in Hamburg* 106 (1929), explained that both King and Ridley were incorrect in identifying the species collected in Malay as *Begonia hasskarlii* Zollinger & Moritzi and the specimens they had were actually of a new species, which he named *Begonia kingiana* Irmscher.

Begonia ignorata Irmscher

Ridley, Fl. Malay Penin. 1: 860 (1922), named a new variety *Begonia hasskarlii* var. *hirsuta* Ridley. Irmscher, Mitt. Inst. Bot. Hamburg 8: 97 (1929), determined that Ridley's variety was a new species different from his *Begonia kingiana* and he named it *Begonia ignorata* Irmscher.

SUMMARY OF CORRECT CITATIONS AND SYNONYMY

- Begonia auriformis* Van Houtte ex Klotzsch. Monatsb. Berl. Akad. 124. 1854; Begoniac. 69. 1855;
A. D.C. Prodrum 15(1): 327. 1864, pro syn.
= *Begonia peltata* var. *auriformis* (A.DC.) Golding
- Begonia concinna* Schott in Sprengel, Syst. Veg. (App.) 4: 408. 1827. Brazil.
Begonia peltata (Schott in Herb. Vind.) A.DC. 1859.
- Begonia coriacea* Hasskarl, Cat. Hort. Bot. Bogor. 192, 311. 1844; Pl. Jav. Rar. 239. 1848; Hort. Bogor. Descr. 328. 1858. Java.
Begonia peltata Hasskarl 1843, non Otto & Dietrich 1841.
Begonia hasskarlii Zollinger & Moritzi 1846.
Begonia hernandiifolia Hooker 1852.
Begonia hernandiifolia sensu Seemann 1854.
Mitscherlichia junghuhniana Miquel 1856.
Begonia junghuhniana Miquel 1857.
- Begonia coriacea* A. DC. Ann. Sc. Nat. IV. 11: 122. 1859; Prodrum 15(1): 286. 1864, non Hasskarl 1844.
= *Begonia tominana* Golding
- Begonia coriacea* (A.DC.) sensu Grisebach, Symb. Fl. Argent. 136. 1879; [= *Begonia hieronymi* Lindau, Bot. Jahrb. 19 (Beibl. 48): 14. 1894]; Smith & Schubert, Darwiniana 5: 96. pl. 7. 1941, non Hasskarl 1844.
= *Begonia micranthera* var. *hieronymi* (Lindau) Smith & Schubert 1941.
- Begonia hasskarlii* Zollinger & Moritzi, Syst. Verzeich. 31. 1846 [= *Begonia peltata* Hasskarl, Tijdschr. 10: 133. 1843; Cat. Hort. Bot. Bogor. 192, 311. 1844, non Otto & Dietrich 1841].
= *Begonia coriacea* Hasskarl 1844.
- Begonia hasskarlii* sensu King, J. Asia. Soc. Bengal 71 (2,1): 62. 1902; Irmscher, Mitt. Inst. Bot. Ham. 8: 106. 1929, non Zollinger & Moritzi 1846.
= *Begonia kingiana* Irmscher 1929.
- Begonia hasskarlii* sensu Ridley, Fl. Malay, Penins. 1: 860. 1922; Irmscher, Mitt. Inst. Bot. Ham. 8: 106. 1929, non Zollinger & Moritzi 1846.
= *Begonia kingiana* Irmscher 1929.

- Begonia hasskarlii* var. *hirsuta* sensu Ridley, Fl. Malay Penins. 1: 860. 1922; Irmscher, Mitt. Inst. Bot. Ham. 8:97. 1929.
= *Begonia ignorata* Irmscher 1929.
- Begonia hernandiifolia* Hooker, Bot. Mag. pl. 4676. 1852; Klotzsch, Begoniac. 74. 1855.
= *Begonia coriacea* Hasskarl 1844.
- Begonia hernandiifolia* Hort. Berol. ex Klotzsch, Monatsb. Berl. Akad. 125. 1854; Begoniac. 98. 1855, non Hooker 1852. pro syn.
= *Begonia nelumbilifolia* Schlechtendal & Chamisso 1830.
- Begonia hernandiifolia* sensu Seemann, Bot. Herald 128. 1854; 254. 1857.
= *Begonia coriacea* Hasskarl 1844.
- Begonia ignorata* Irmscher, Mitt. Inst. Bot. Hamburg 8: 97. 1929. Malaya.
Begonia hasskarlii var. *hirsuta* sensu Ridley, 1922.
- Begonia incana* Lindley, Bot. Reg. 27 (misc.): 39. May 1941.
= *Begonia peltata* Otto & Dietrich Feb. 1841.
- Rachia incana* Klotzsch, Begoniac. 69. 1855; [= *Begonia incana* var. *auriformis* A. DC. Prodr. 15(1): 327. 1864].
= *Begonia peltata* var. *auriformis* (A.DC.) Golding
- Begonia incana* var. *auriformis* A. DC. Prodr. 15(1): 327. 1864.
= *Begonia peltata* var. *auriformis* (A.DC.) Golding
- Begonia junghuhniana* Miquel, Pl. Jungh. (4, 1855): 418. 1857; Backer & Van Brink, Fl. Jav. 309. 1963.
= *Begonia coriacea* Hasskarl 1844.
- Mitscherlichia junghuhniana* Miquel, Fl. Ind. Bat. 696. 1856.
= *Begonia coriacea* Hasskarl 1844.
- Begonia junghuhniana* f. *acutifolia* (Miquel msc. in Herb. Lugd. Bat.) Koorders, Exkurs. Jav. 644. 1912, nomen nudum.

Begonia kellermanii C.DC. Smithson. Misc. Coll. 69
(12): 1. 1919. Guatemala

Begonia kingiana Irmscher, Mitt. Inst. Bot. Hamburg
8: 106. pl. 3. 1929. Malaya

Begonia hasskarlii sensu King 1902, non
Zollinger & Moritzi, 1846.

Begonia hasskarlii sensu Ridley 1922, non
Zollinger & Moritzi, 1846.

Begonia micranthera var. *hieronymi* (Lindau) Smith &
Schubert, Darwiniana 5: 96. pl. 7. 1941.

Begonia coriacea (A.DC.) sensu Grisebach 1879.

Begonia hieronymi Lindau 1894.

Begonia nelumbiifolia Schlechtendal & Chamisso,
Linnea 5: 604. 1830. Mexico

Begonia derycxiana Lemaire in Hortic. Univ.
5 (misc.): 355. 1844; A. DC. Prodr. 15
(1): 343. 1864.

Gireoudia nelumbiifolia Kl. Monatsb. Berl.
Akad. 125. 1854.

Begonia hernandiifolia Hort. Berol. ex Klotzsch
1854. non Hooker 1852. pro syn.

Begonia peltata Sesse & Mocino 1894, non Otto
& Dietrich.

Begonia caudilimba C. DC. Smithson. Misc. Coll.
69(12): 9. 1919; Smith & Schubert, Caldasia
4(16): 15. pl. 2. 1946.

Begonia peltata Otto & Dietrich, Allg. Gartenz. 9:58.
Feb. 1841; Alexander, Addisonia 23 (4): 53.
pl. 763. 1959; Smith & Schubert, Fieldiana, Bot.
24(1): 177. 1961. Mexico

Begonia incana Lindley May 1841.

Rachia peltata Klotzsch 1854.

Begonia peltata var. *auriformis* (A.DC.) Golding
Phytologia; A. DC. Prodr. 15 (1): 327. 1864.
Mexico

Begonia auriformis Van Houtte ex Klotzsch,
1854, pro syn.

Rachia incana Klotzsch 1855.

Begonia incana var. *auriformis* A.DC. 1864.

Begonia peltata Hasskarl, Tijdschr. 10: 133. 1843;
Cat. Hort. Bot. Bogor. 192, 311. 1844, non Otto
& Dietrich 1841.

= *Begonia coriacea* Hasskarl 1844.

Rachia peltata Klotzsch, Monatsb. Berl. Akad. 124.
1854; *Begoniaceae*. 69. 1955.

= *Begonia peltata* Otto & Dietrich Feb. 1841.

Begonia peltata (Schott in Herb. Vind.) A. DC. Ann.
Sci. Nat. IV. 11: 138. 1859; Prodr. 15 (1):
368. 1864, non Otto & Dietrich 1841.

= *Begonia concinna* Schott in Sprengel 1827.

Begonia peltata Sesse & Mocino, Fl. Mex. ed. 2: 219.
1894; Smith & Schubert, Contr. Gray Herb. 154:
27, 30. 1945, non Otto & Dietrich 1841.

= *Begonia nelumbiifolia* Schlechtendahl & Chamisso
1830.

Begonia peltata Elmer, Leaflets Philipp. Bot. 7: 2556,
1915; Merrill, Philipp. J. Sci. Bot. 13(1): 39.
1918, non Otto & Dietrich 1841.

= *Begonia elmeri* Merrill 1918.

Begonia tominana Golding, Phytologia. Bolivia

Begonia coriacea A. DC. Ann. Sc. Nat. IV. 11:
122. 1859, non Hasskarl 1844.

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AUSTRAL HEPATICAE, VIII. TUYAMAELLOIDEAE

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The Lejeuneaceae subfamily Tuyamaelloideae Schust. & Kachroo was established in Schuster (1963, pp. 82, 91) for genera "intermediate in some respects between the Nipponolejeuneoideae. . . and the Paradoxae." In Schuster (1963a, 1968) the genera Siphonolejeunea Herz., Tuyamaella Hatt., and Austrolejeunea (Schust.) Schust. are referred here; a revised key is given in Schuster (1968) and a further refinement of this appears in Grolle (1973), which includes the new, distinctive, monotypic genus Nephelolejeunea Grolle.

Grolle (l.c.) removed Siphonolejeunea nudipes from that genus, where both Herzog (1948) and I (Schuster, 1963) had placed it and transferred it to Austrolejeunea; he regarded A. olgae (Schust.) as an "extreme f. depauperata" of S. nudipes. In this contribution I shall refute both of these positions and present a diagnosis of a new species of Austrolejeunea, A. hispida.

I. The Distinction of Austrolejeunea and Siphonolejeunea

Austrolejeunea first appears in Schuster (1963, p. 187) as a subg. of Siphonolejeunea, founded for S. olgae Schust. The subgenus (and species) were stated to differ from other taxa assigned to Siphonolejeunea, including, of course, the Australasian S. nudipes in "the non-tubular lobules with 3 sharp, conspicuous teeth; the entally displaced hyaline papilla; the stem with only 3 medullary cell rows; the filiform underleaf lobes." In Kachroo & Schuster (1961) it is shown that the hyaline papilla in Siphonolejeunea s. str. is basically marginal and, on mature lobules, is inserted between two cells, lying side-by-side, forming a very low and blunt vestige of an apical tooth. Only on leaves with reduced lobules -- a feature very common in both S. nudipes and S. neesii (S. nudicalycina Herz.) -- do we find, in common with many other Lejeuneaceae where reduced lobules may occur, a sharper apical tooth with the hyaline papilla terminal thereon. This feature alone suffices to definitively separate the three known species of Austrolejeunea from the three known species of Siphonolejeunea. In fact, Grolle (l.c., p. 252) in his key to genera of Tuyamaelloideae also adopts this as a generic criterion and remarks that in Austrolejeunea the hyaline papilla is "deutlich ental" while in Siphonolejeunea it is stated to be marginal or "kaum ental." In view of the fact that in A. olgae the "hyaline papilla [is] entally displaced and inserted on or at [the] base" of the apical tooth (Schuster, 1968, p. 512; author's original emphasis), it seems incomprehensible that A. olgae was placed as a synonym of S. nudipes.

Furthermore, it is clear from Grolle's own figures (fig. 2:a-c)

that the hyaline papilla in S. nudipes, on leaves with mature and inflated lobules, always arises from the faint notch between two bulging cells, situated side-by-side, jointly forming the faint apical tooth of the lobule. The student is invited to compare the condition in fig. 2:a-c in Grolle with fig. 15:12, 15 (of S. nudicalycina) in Kachroo & Schuster (1961). It is clear that both taxa are immediately similar in the (a) obscure apical tooth formed not by a single projecting cell but by two not or hardly projecting cells situated side-by-side; (b) position of the marginal hyaline papilla in the sinus between these cells; (c) strong variation in lobule development, the weaker lobules often having an apical tooth with a terminal hyaline papilla (as in fig. 15:13-14, in Kachroo & Schust., l.c.). On the basis of the key characters in Grolle (l. c., p. 252) "Lobulus oft + reduziert. . . am apikalen Rand ein undeutliches Zähnchen mit marginaler oder kaum entaler Hyalinpapille. . . ." Siphonolejeunea nudipes keys to Siphonolejeunea, while A. olgae, on the basis of the key characters ("Lobulus stets voll ausgebildet. . . am freien Rand [mit] 2-4 Zähne, von denen der am weitesten distale deutlich ental die Hyalinpapille trägt. . . .") keys clearly to Austrolejeunea in his key.

Other key characters, cited in both Grolle (1973) and Schuster (1963, 1968), exhibit more ambivalence. It was the ambiguity of these features, at several levels, that initially led me to regard Austrolejeunea as a mere subgenus of Siphonolejeunea. (1) in S. nudipes, the lobule is often + reduced, but in the advanced S. schiffneri, lobules are typically uniformly tubularly inflated and well developed. Grolle states that in Austrolejeunea, where he would place S. nudipes, the lobule is "stets voll ausgebildet" when, in actuality, S. nudipes shows excessive variation in lobule development. This criterion is thus ambiguous, although in the three species I here assign to Austrolejeunea the lobule is always inflated and well developed (see, e.g., pl. 64:1,6,7 in Schuster, 1968). (2) In Siphonolejeunea the stem medulla has "+ 5 cell rows" (Schuster, 1968, p. 511) while in Austrolejeunea it has "3 cell rows." In S. nudipes only 3 cell rows occur, although Kachroo & Schuster (1961, fig. 15:8) show 5 cell rows in the medulla of S. nudicalycina. (3) Austrolejeunea almost invariably bears paired innovations, as originally noted in Schuster (1963, p. 83) whereas Siphonolejeunea has single subfloral innovations (Kachroo & Schuster, l.c., figs. 15:1, 16:1; Schuster, 1963, p. 83). However, S. nudipes has mostly single innovations although (at least in RMS 51635, Little Barrier I., N.Z.) occasional gynoecia bear paired innovations. (4) Discoid gemmae are abundant in Siphonolejeunea (both S. nudicalycina and S. schiffneri; see fig. 16:7 in Kachroo & Schuster, l. c.) and may occur in extraordinary abundance in S. nudipes (in, e.g., RMS 51635 they are not only in the "usual" position occupied in Siphonolejeunea, the adaxial, or postical, lobe surface, but also to a lesser extent on some antical lobe surfaces and, exceptionally, even perianth surfaces). By contrast, I have studied numerous individuals of all three species of Austrolejeunea and have seen only rare traces of gemma production -- usually not even the gibbous initials on the lobe surface can be found. This

is true of both corticolous and epiphyllous populations.

Two facts emerge from this discussion: (1) In some respects, S. nudipes -- which I regard as a "synthetic," primitive species -- occupies a middle ground between Siphonolejeunea and Austrolejeunea. This fact -- and especially prolonged study (in 1962, of the material of RMS 51635, collected March 11, 1962; again in 1974) of abundant material of S. nudipes -- has convinced me that one could, with excellent reason, consider Austrolejeunea as a mere subgenus of Siphonolejeunea. In other respects, S. nudipes is sharply distinct from all known taxa of both Austrolejeunea and Siphonolejeunea: it has, e.g., a long-stipitate perianth, while the remaining taxa all have nonstipitate perianths (compare Kachroo & Schuster, l.c., figs. 15-16; Schuster, 1968, pl. 64). In this respect S. nudipes closely approaches Nephelolejeunea (compare figs. 1:a and 2:n in Grolle, 1973). Indeed, if we were to merge Austrolejeunea and Siphonolejeunea, it would then be necessary to also reduce Nephelolejeunea to a mere subgenus. It seems more rational to retain the three genera and recognize the simple fact that with the sole species, S. nudipes, we have a "Bindungsglied" or synthetic species. (2) Using the criteria cited below, one can equally argue that the two groups should be retained, at least as subgenera.

Key to Genera

1. Lobules (often reduced, exc. in the advanced S. schiffneri) with hyaline papilla never entally displaced: on mature lobules situated in the faint notch between two weakly or hardly projecting cells constituting, technically, the obscure apical tooth; on reduced lobules, terminal on a 1-celled apical tooth. Gemmae nearly always abundant. Underleaves with lobes merely acute or even blunt, at base 3-4 cells broad, 2(3) cells broad to within 1(2) cells of apex. Gynoecia normally with 1 subfloral innovation (if, occasionally, with 2, in S. nudipes, the perianth is longly stipitate). Larger plants, with leaves 1.4-2 mm wide or more.

Siphonolejeunea Herz.

1. Lobules (except rarely at branch bases) always inflated and rather uniformly developed, with a sharply distinct 1-celled apical tooth at or near whose ental base the hyaline papilla is inserted. Gemmae nearly constantly lacking. Underleaves with lobes filiform, formed of (3)4-6 or more cells in a single row, at base only 2-3 cells broad. Gynoecia nearly always with paired innovations; perianth never stipitate. Small plants, with leaves 525-875 μ wide.

Austrolejeunea (Schust.) Schust.

II. AUSTROLEJEUNEA (Schust.) Schust.

As I have redefined the genus Austrolejeunea, above, S. nudipes must stay in Siphonolejeunea. In the latter, there is a marked tendency, linked with copious gemma production, for large leaf cells (see infra); in Austrolejeunea leaf cells are much smaller and plants, as a whole, are smaller.

These distinctions, and those of the three species of Austrolejeunea, emerge from the following key.

Key to Species

1. Leaves + uniform and lobulate throughout: each lobule large, 0.45-0.75 area of lobe; hyaline papilla inserted, entally, on inner face of a 1-celled apical tooth. Perianths not or short-stipitate. Mature shoots with underleaf lobes ending in 3-4 moniliform single cells or more. Gemmae rare. Subfloral innovations, at least usually, paired, elongating. 2.
2. Lobular teeth strongly unequal: the largest (median) formed of 2-3 superposed cells, inserted on 2 cells side-by-side. Heteroecious: gynoecia always (or usually) with antheridia in bracts or subfloral bracts, but with accessory separate androecia. Underleaf lobes ending in 4-6 single cells. [New Zealand]. 3.
3. Cells of keel and lobe surfaces, and of perianth keels and surfaces convex but never produced as conoidal, thick-walled papillae. A. olgae (Schust.) Schust.
3. Cells of keel and of lobe surfaces, of perianth keels and (to a lesser extent) intervening surfaces strikingly armed with conoidal, somewhat thick-walled elevations, the leaves subhispid. A. hispida Schust., sp. n.
2. Lobular teeth subequal, the largest usually formed of a single cell inserted on 2 basal cells lying side-by-side. Autoecious. Cells of leaf surfaces, keel, and perianths not conoidally armed. [Fuegia-S. Chile] A. radulaefolia (Massal.) Schust.
1. Leaves strikingly polymorphic: many to most with lobules reduced to a basal, linear fold lacking teeth; larger lobules under 0.45 lobe area; hyaline papilla marginally inserted between 2 cells forming the apical tooth. Perianth becoming long-stipitate. Mature shoots with underleaf lobes 2-4 cells wide at base, ending in 1-2 single cells. Gemmae abundant. Subfloral innovations normally single. S. nudipes (H. f. & T.) Herz.

1. Austrolejeunea olgae (Schust.) Schust.

Described in detail in Schuster (1968, pp. 512-13; pl. 64). In that diagnosis several relevant points are emphasized: (a) lobules with apical tooth formed of a single cell, with hyaline papilla entirely displaced on this cell; (b) median lobular tooth 2-3-celled, sometimes from a 2-cell-wide base; (c) underleaf lobes filiform and 2-3 cells wide only at base, the lobes uniseriate for a length of (3)4-6 cells; (d) gynoecia with 2 widely divergent innovations; (e) lobules large, constantly well developed; (f) perianth merely "emergent" at maturity, but not long-stipitate; (g) plants 770-876 μ wide with leaves; (h) cells firm, with very distinct trigones, small: marginal 16-20, median 17-22 x 16-24 μ .

Grolle (1973), without studying material of this taxon, placed it as a synonym of S. nudipes ("Austrolejeunea nudipes"), regarding it as an "extreme f. depauperata," and expressing astonishment that I had not noted the "engen Beziehungen" between these two taxa. There are no such close similarities between these two taxa, however, and S. nudipes differs from A. olgae in all eight criteria emphasized above, showing in contrast: (a) mature lobules with apical "tooth" a rounded-emarginate protuberance, with hyaline papilla inserted between these two cells; (b) the largest lobular tooth -- often not at all elaborated -- formed at most of 1 or 2 superposed teeth; (c) underleaf lobes typically lingulate or tapered-lingulate, 3-4(5) cells wide at base, the apices ending in 1 or at most 2 single cells; (d) gynoecia nearly constantly with a single subfloral innovation; (e) lobules very variable, often vestigial or reduced to a lingulate lamella, often without marginal teeth distinct -- or the apical tooth, alone, elaborated, often even that vestigial; (f) perianth at maturity strikingly stipitate; (g) plants relatively vigorous, sterile axes 1400-1750 μ wide with leaves; (h) cells leptodermous, much larger; marginal (19)21-25 μ , median from 24-30 x 25-32 to 26-34 x 30-36 μ , the marginal swollen, lobes thus conspicuously crenulate. These distinctions prove, beyond any doubt, that A. olgae is not immediately allied to S. nudipes.

In criteria a-h A. olgae is clearly immediately allied to the new species A. hispida Schust. It differs principally, but not absolutely, in the smooth leaf cells. Nowhere -- on keel, lobe margins or surfaces, or keels and surfaces of the perianth -- does one find a trace of conoidal cell elevation. In this respect A. olgae closely approaches the South American A. radulaefolia. The distinction of these two taxa is clear from the above key.

2. Austrolejeunea hispida Schust., sp. n.

Species A. olgae similis, differens, autem, ut cellulae foliorum sinusulatim tuberculatum.

Plants light yellow-green, epiphyllous or corticolous on small twigs (of Pseudowintera), creeping, Cololejeunea-like, leaves not

closely appressed (in situ, diagnostically somewhat elevated above axis and substrate), irregularly but copiously branched; branches, except for the paired Radula-type innovations all gyrothecal, Lejeunea type, widely patent. Shoots to 770-810 μ wide; stems (48) 50-62 μ in diam., with 7 cortical + 3 medullary cell rows, the cells all firm-walled. Leaves remote to subcontiguous, clearly elevated above substrate, obliquely to widely patent, moderately convex; lobe narrowly obovate, ca. 550 μ long x 375 μ wide (smaller on branches), rounded at apex, the margins faintly crenulate (locally denticulate when cellular tubercles are marginally oriented), strongly narrowed towards base. Lobule strongly inflated, ca. 0.5-0.55 lobe length (310-325 μ long x 165-180 μ wide), widest distally, the inflated sector fusiform-elliptical, but entire apical region plane, appressed to lobe, tridentate; lobular teeth consisting of a distal-most tooth, situated about midway in the oblique sinus between the keel and the large middle tooth, 1-celled, the cell usually inflated and large; middle tooth large, sometimes curved, usually straight, usually of 3 cells in a row, arising from 2 cells lying side-by-side; proximal tooth formed of a single blunt cell inserted usually on 3 cells, side-by-side; hyaline papilla ental. Underleaves oblong to narrowly ovate-lingulate, bifid ca. 0.7-0.8, from ca. 70 x 150 to 75-90 x 155-182 μ , the sinus very narrowly U-shaped to almost slit-like, the erect lobes 2(3) cells wide at base, mostly formed of uniseriate, + moniliform cells; disk short, with conspicuous rhizoid-initial disk, at times appearing almost stalked; rhizoid-initial disks conspicuous, especially on older sectors of leading shoots. Cells rather thin-walled, with + distinct, usually concave-sided trigones; each lobe cell, and cells in distal 0.5-0.65 of keel, elevated as a firm, conspicuous, rather high, + thick-walled tubercle; cuticle otherwise smooth. Marginal cells slightly smaller than inner cells, 12-15(16) μ ; median cells of free lobe ca. 15-18(20) x 15-21(22-25) μ . Asexual reproduction not seen.

Heteroecious [sometimes paroecious, but often with accessory, separate, androecial branches]. Androecia often on + elongated branches [sometimes originating as subfloral innovations], with 2-4 pairs of bracts; bracts leaflike but lobules larger, more inflated, with the apical teeth reduced or vestigial; diandrous; bracteoles present throughout. Gynoecia terminal on branches of the Lejeunea type, of varying length, always with paired innovations; innovations widely spreading, often at nearly right angles to fertile axis. ϕ Bracts narrow, 0.5-0.75 length of mature perianths, highly polymorphous: basically with a lingulate to lingulate-obcuneate lobe, ca. 550-625 μ long x 185-230 μ broad, rounded to bluntly angulate at apex, entire-margined but feebly crenulate through the agency of weakly protuberant cells and, here and there, marginally projecting "tubercles"; lobules linear-lingulate, ca. 400-455 μ long x 115-125 μ wide, free for only the distal 0.2-0.35, the free apex typically 2-3-dentate. Bracteole free, ca. 90-100 μ wide, 250-265 μ long, ca. 0.65-0.75 bifid, with erect, usually closely juxtaposed, linear-subulate lobes only 2-3 cells wide at base, uniseriate for 4-6 cells distally, the cells moniliform. Perianth obovoid, inflated, in

distal 0.35 clearly 5-plicate, ca. 650 μ long x 360 μ in distal diam., shortly rostrate; keels, and locally the intervening surface, roughened with conoidally elevated tubercles, much as on leaves. After fertilization, perianth occasionally rather stipitate and emergent beyond bracts.

Sporophyte very small; capsule ca. 275 μ in diam.; seta ca. 155 μ in diam. (with 12 epidermal + 4 inner cell rows), formed of only ca. 8-9 cell tiers; foot rudimentary, few-celled. Epidermal capsule-wall cells in 1-2 marginal rows, firm-walled, oblong, ca. 13-15 x 21-25 μ ; interior cells larger, polyhedral, irregular, 22-25 x 35-42 to 28-30 x 45 μ , thinner-walled except at angles, where rounded. Inner cell layer of delicate cells, rectangulate on margins, irregularly polyhedral within margins, narrow and elongated in central-basal areas, thin-walled, at angles and along longer walls with hyaline, nodular thickenings [surface view]. Elaters ca. 14 (3 + 4 + 3 + 4), ca. 16-18 x 180-210 μ , colorless, with a nodular-thickened wall [profile]. Spores large, 22-25 x (30)36-48(56) μ to 22-23 x 75-80 μ , with well-spaced, sharply defined, small papillae and, in scattered loci, stellate groups of cuneiform papillae.

Type. New Zealand, South Island: Falls Creek, Upper Hollyford R. valley, along Milford Rd., Fiordland Natl. Park (RMS 48809; Nov. 3, 1961). The type was collected on leaves and twigs of Pseudowintera colorata, in part mixed with Metzgeria, Frullania, and Cololejeunea spp.

In the distinct, conoidally elevated leaf cells (of the lobes, keelar region, perianth keels, and, to some extent, intervening perianth surfaces), this species recalls various taxa of Cololejeunea and Colura. In other respects, A. hispida is exceedingly close to A. olgae and I have hesitated for more than 15 years before becoming convinced that it deserves species status. I have again compared the respective types; aside from the leaf cells, they are indeed exceedingly similar. The similarity extends to the gynoeical bracts which tend to have the free apex (2)3(5)-dentate and irregular in A. hispida -- exactly as shown in pl. 64:6 in Schuster (1968), for A. olgae. In this respect the bracts, which average equal to the leaves in size, are much more leaflike in form. By contrast, the bracts, which in S. nudipes show gross variation from gynoeicum to gynoeicum, always appear to have narrow, lingulate lobules that are blunt to rounded-truncate at the apex and edentate -- as in the other two species assigned to Siphonolejeunea.

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AUSTRAL HEPATICAE XIII.

TWO NEW GENERA OF GEOCALYCEAE (LOPHOCOLEACEAE)*

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The largely Gondwanalandic taxa of the perianth-bearing Geocalyceae--belonging to the subfamilies Lophocoleoideae and Leptoscyphoideae (Schuster, 1980)--have been twice provided with a genus key (Schuster, 1980; a few weeks later by Engel, 1980). Some 15 genera are involved, several of which remain poorly known. In addition, we are currently studying the phylogenetic contact points of two other, apparently monotypic, entities which seem to represent autonomous genera. We project a future detailed contribution dealing with, especially, temperate-Gondwanalandic Geocalyceae; in the meantime the following two generic entities must be provided with Latin diagnoses and preliminary statements as to affiliations.

The two new genera, both highly unusual in their scattered rhizoids, exist in cool sectors of Gondwanaland; in these genera we find common occurrence of a vestigial or very small gynoeceial bracteole (e.g., the gynoeceium is strongly bilateral) linked with a Leptoscyphoid, laterally compressed perianth. The combination of these two criteria suggests an affinity to Pedinophyllum, yet we believe that there is little or no phylogenetic connection to that genus. These two genera share a series of criteria, as follows:

Plants medium-sized, green to brownish. Stem with either a weakly developed, 1-2-layered cortex or a 2-3-layered, rigid cortex. Branches at least in part lateral-intercalary (in Pedinophyllopsis abditus mostly lateral-terminal; in Pseudolophocolea denticulata almost all lateral-intercalary); gynoeceia always with subfloral innovations, which are at least usually ventral-intercalary. Rhizoids long, mostly scattered. Leaves alternate, antically short-decurrent, concave to flat to faintly convex, entire-margined or 2-3-dentate distally. Underleaves very small, remote, narrower than stem, bifid almost to base, lobes linear to setaceous, sometimes with 1(2) small accessory, short teeth. Cells thin-walled and with small trigones (usually concave-sided, rarely faintly bulging); oil-bodies large, finely granular-botryoidal. No asexual reproduction. Dioecious. Androeceia slender, with a few pairs of concave bracts, with or

* The junior author would like to thank Dr. Timothy Plowman for assistance with the Latin diagnoses.

without paraphyses. Gynoecia terminal on leading axes, with ventral-intercalary innovations. Bracteole vestigial or very small, free, irregularly 2-3-4-lobulate-dentate to lacinulate. Perianth Leptoscyphoid: laterally compressed, usually with a narrow, third (ventral) face distinct, bilabiate, very wide at mouth.

For a period exceeding a decade we have pondered whether the two species, that fit the preceding diagnosis, here placed into two genera, should be regarded as subgenera of a single genus, or as autonomous genera. Study of living plants of both entities by one of us [RMS] has, finally, resolved what was a long moot situation. Oil-body criteria suggest two distinct genera are at hand. The basic criteria of these emerge from the subjoined key:

Key to Genera

1. Cells each with 8-14 medium-sized oil-bodies. Branching lateral-intercalary, except for the ventral-intercalary gynoecial innovations; leaves 2-3-denticulate at apex, laterally patent, faintly convex, the plant dorsiventrally flattened; stem with a feebly developed 1-2-stratose cortex; lobule of ♂ bracts without or with a weak tooth. Pseudolophocolea Schust. & Engel, gen. n.
1. Cells each with 1 or 2 exceedingly large oil-bodies, nearly filling lumen. Branching predominantly lateral-terminal, in small part lateral-intercalary, except for the ventral-intercalary gynoecial innovations; leaves edentate and unlobed, antically assurgent, the plant strongly laterally compressed; stem with well-developed 2-3-layered cortex; lobule of ♂ bracts ciliate-dentate. Pedinophylloopsis Schust. & Inoue, gen. n.

Pseudolophocolea Schust. & Engel, gen. nov.

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Planta dorsiventraliter complanata. Folia alternata, lineis insertionis ad medium dorsale caulis non attingentibus, caulina lateraliter patentia, aliquantum convexa, ad apicem 2-3-dentata; cellulae corporibus oleosis mediocribus granularibus 8-14 instructae. Partes vegetativas et involucales valde bilaterales, ambae appendicibus ventralibus reductis instructae; amphigastria caulina libera, parva, ciliis paucis composita; amphigastria involucria admodum reducta, 10% quam area bractearum minora. Rami vegetativi laterales intercalares, sed innovationes gynoeciorum ventrales intercalares. ♂ Lobuli bractearum anteriores edentati vel dente singulari indistincto instructi. Gynoecia lateraliter compressa; perianthia Leptoscyphis similia superficie ventrali angusta reducta.

Typus (species unica): Pseudolophocolea denticulata Schust. & Engel, sp. nov. ~~~~~

The above diagnosis is a descriptio generico-specifica.

The flattened, dorsiventral shoots, the Leptoscyphoid perianth, the very small underleaves and ♂ bracts, and the scattered rhizoids all suggest Pedinophyllum, as does the "leaf-free" dorsal strip. The lack of a well-defined cortex is also as in that genus. Yet the fuscous color, the tridentate lateral leaves, and the much different ♂ bracts suggest that any affinity to Pedinophyllum is remote. The aspect of the plants is Lophocoleoid--yet the scattered rhizoids suggest that no clear affinity to Lophocolea et al. or Leptoscyphus et al. is possible. All in all, a remarkable taxon, with reticulate and disturbing affinities to both Leptoscyphoideae (in Geocalycaceae) and Pedinophyllum (in Plagiochilaceae).

Pedinophyllopsis Schust. & Inoue, gen. nov.<sup>1)</sup>  
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Planta lateraliter compressa, omnino viridula, pigmento fusco destituta. Folia caulina assurgentia, indivisa, margine integra, aliquantum concava. Cellularum corpora oleosa, magna, disciformia, subtiliter granularia, unum vel duo fere lumina cellularum obliterantia. Partes vegetativas et involucales admodum bilaterales, ambae appendicibus ventralibus parvis reductis instructae. Rami vegetativi pro parte maxima terminales laterales, interdum intercalares laterales, sed ♀ innovationes gynoeciorum intercalares ventrales. ♂ Lobuli bractearum anteriores ad marginem perspicue multiciliati. Gynoecia lateraliter compressa superficie ventrali vestigiali vel evidenter absente.

Typus: Plagiochila abdita Sull. Hooker's Jour. Bot. Kew Gardens Misc. 2: 317. 1850 = Leptoscyphus abditus (Sull.) Dugas, Annls. Sci. Nat. X. 11: 8. 1929 = Pedinophyllopsis abditus (Sull.) Schust. & Inoue, comb. nov.

Pedinophyllopsis abditus (Sull.) Schust. & Inoue is a very isolated element within the family.

¹⁾ More than eight years ago, Dr. H. Inoue and the senior author initiated a study of Australasian taxa with Leptoscyphoid perianths. One of us [RMS] already had a manuscript and plates of Pedinophyllopsis; the other taxa, still unclarified, were to be studied by Dr. Inoue; this study has never materialized. For the moment it seems necessary to validate Pedinophyllopsis, since the name has already been used several times in the last eight years, in the literature.

Grolle (1962) placed the type species into an autonomous subgenus of Leptoscyphus, on the basis, i.a., of "die nur terminal-laterale Verzweigung." Actually, many if not most, lateral branches are terminal, Frullania type (the associated hemiphyl is distinctly narrower than a normal leaf). The very few species of Leptoscyphus we have seen have a number of medium-sized, finely to coarsely botryoidal oil-bodies per cell. In Pedinophyllopsis there are only 1-2 gigantic, platelike, ovoid to discoidal oil-bodies, each finely granular, the oil-bodies almost obscuring the cell lumen.

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DICERANDRA CORNUTISSIMA, A NEW WOODY LABIATE FROM FLORIDA

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Until now, four species of *Dicerandra* Benth., have been known from Florida. From a recent study of this endemic genus of the southeastern United States, including a comparison of living specimens and a subsequent examination of types, it is clear that the following species has remained undescribed:

Dicerandra cornutissima, sp. nov.

Planta perennis, suffruticosa, chamaephyta, usque ad 0.5 m alta sed saepe brevior. Rami ascendentes, angulosi apicem versus, foliis oppositis, linearibus, patentibus et aromaticis, marginibus integris. Verticillastri nunc multiflori axillares vel nunc omnes pauciflori. Flores in cyma, pedicelli brevibus, ca. 5 mm longis. Calyx cylindraceus, erectus, ore obliquo bilabiato, labio postico bidentato, labio antico integro et longitudinaliter bialato, intus glaber praeter circulo pilorum erectorum infra ore. Corolla bilabiata tubo basi geniculato (ca. 90°), rosea versus incarnata purpurea maculata, labio postico trilobato, labio antico vix bilobato, intus tubo inferno pilis glanduliferi repletis. Stamina exserta, et tubo corollae supra basin sed infra medium inserta; filamenta graciles, connectivum crassum glabrum cum glandulis paucis, antherarum thecae glabrae, sed cum glandulis numerosis prope basin, divaricatae cum uterque theca in cornu longissimum attenuatum, theca e basi cornus dehiscens. Pistillum ovario 4-lobato in nectario orculiformi inserto, stylo gracili pili patentibus dispersis vel pili desunt, stigma terminale breve bilobum. Specimen typicum: Florida: Marion County, 0.8 mi. w. of intersection of Fl 484 and I-75 on Fl 484, north-south ridge, oak scrub, Sept. 19, 1980, R. B. Huck 2436 legit. (in hb NCU conservatum). Paratypes: Marion County, 2.0 mi. w. of intersection of Fl. 484 and I-75 off Fl 484 on side road, north-south ridge, oak scrub, Sept. 19, 1980, R. B. Huck 2437; Marion County, T17S R20E Sec. 1, 150 m n. of canal diggings, turkey oak community, Sept. 11, 1975, Cooper 848 (FLAS 123050); Sumter County, 5 mi. w. of Wildwood, sandy scrub, Sept. 22, 1938, E. West 361 (FLAS); Sumter County, 7 mi. w. of Wildwood, dry sandy bank, Nov. 8, 1946, West and Arnold 209 (FLAS 45686).

Suffruticose chamaephyte to 0.5 m tall, with erect herbaceous flowering shoots arising from a perennial, ramose woody base. Leaves linear, 1.5 (1.0-2.5) cm long and 1 mm wide, epetiolate; leaves of herbaceous shoots slightly longer than those of vegetative woody base; leaf margins entire; surface glandular pitted. Inflorescence a verticillaster, each axillary cyme on a peduncle 1.25 mm

long with pedicels 5.0 (4.0-6.0) mm long; occasionally with only a solitary flower in each axil on a pedicel \pm 5.0 mm long. Calyx 13-ribbed, bilobed, lower lobe sharply bidentate, upper lobe with two strongly winged ridges meeting at summit. Length 9.0 (8.0-9.5) mm; width at midpoint 2.25 (2.0-2.8) mm. Calyx bordered with an acolorous band, ciliate-margined, glandular pitted, and with an internal annular band of flat, distally appressed, 1 mm long hairs inserted below the mouth. Corolla bilabiate, geniculate to \pm 90°. Corolla tube (a) 7 (7-8.5) mm long flaring in an infundibulum (b) 9 (8-10) mm long. Superior lobe retuse, erect, and set back (c) 5.0 mm from the outer margin of the inferior tripartite lobe. Surface glandular dotted, pubescent. Neck of the corolla tube lined with abundant glandular hairs below the geniculum. Corolla purple-rose with deep purple markings and whitish throat. Stamens four, exserted; each filament slender, terminating in a malleolate connective. Anthers bearing attenuated appendages 1.2 (0.9-1.9) mm long with minute excrescences; anther sacs with nectariferous glands, dehiscing by a slit at the base of the appendage. Pistil with slender, epubescent style and subequally bifid stigma; ovary four segmented, inserted on a barrel-shaped nectariferous rostrum. Nutlets ovoid, brown, 1.25 mm wide. Odor minty. (Figure 1)

With the discovery of *Dicerandra cornutissima*, the strong endemic pattern of *Dicerandra* species is emphasized: *D. immaculata* in east-central Florida, *D. frutescens* in south-central Florida, *D. densiflora* in the Suwanee River basin in northern Florida and, now, *D. cornutissima* in north-central Florida. Following is a provisional key to the Florida species incorporating those described since Shinnars' (1962) *Synopsis*:

KEY TO FLORIDA SPECIES OF *DICERANDRA*

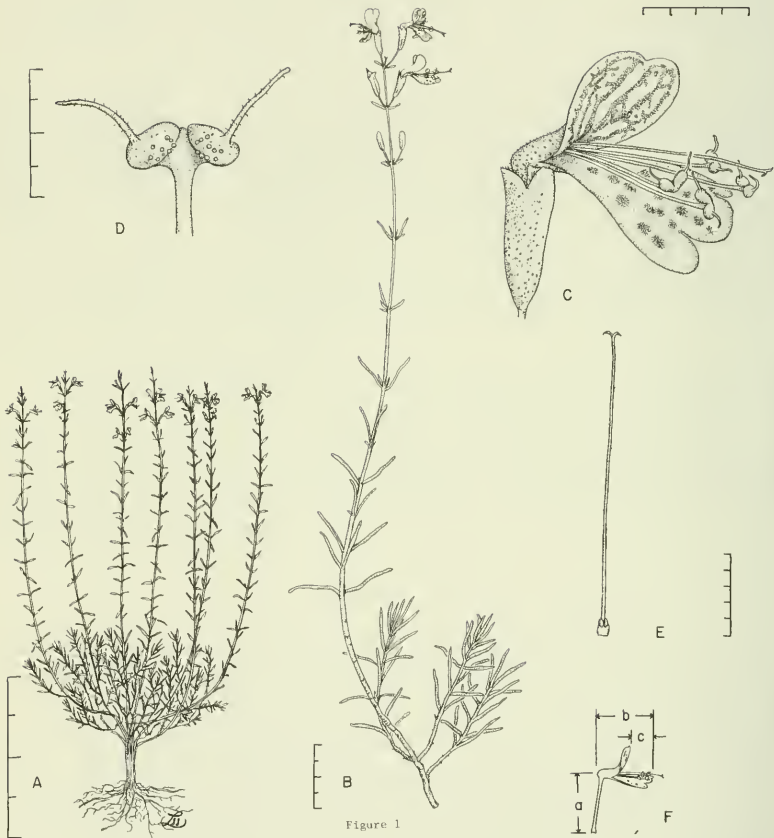
1. Plants herbaceous; habit erect; annuals
 - a. Anther appendages obtuse or barely acute; pollen white to pale yellow; flowers short-pedicelled, verticils packed densely around stems.....*D. densiflora*
 - a. Anther appendages acuminate; pollen bright yellow; verticils open, inflorescence loose.....*D. linearifolia*
1. Plants woody; habit suffruticose; chamaephytic perennials
 - a. Corolla immaculate and not sharply bent; stamens diverging laterally along the sides of the corolla.....*D. immaculata*
 - a. Corolla spotted and patterned, sharply bent; stamens not diverging laterally, but parallel and exserted along the lower edge of the corolla
 - b. Corolla white; style with numerous stiff, conical hairs; anther appendage under 1 mm long.....*D. frutescens*
 - b. Corolla purple-rose; style with few hairs or naked; anther appendage usually over 1 mm long *D. cornutissima*

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Figure 1. *Dicerandra cornutissima* Huck. A. Habit (scale 2 dm); B. flowering branch (scale 2 cm); C. flower, in perspective (scale 4 mm); D. anther (scale 2 mm); E. gynoecium and nectary (scale 5 mm); F. corolla measurements: a = tube length, b = infundibulum length, c = set back of superior lobe from outer margin of inferior tripartite lobe. Drawn from the type.



AUSTRAL HEPATICAE XV.

BREVIANTHACEAE, FAM. NOV. AND BREVIANTHUS, GEN. NOV. FROM TASMANIA *

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The Suborder Geocalycineae (Jungermanniales) contains a number of diverse elements, among them the rather isolated family Chonecoleaceae Schust. Allied to this family, however, is a new, monotypic, quite derived family, Brevianthaceae, which contains Brevianthus, a new genus. Both are described below; a detailed treatment, accompanied by illustrations, will appear at a later date.

BREVIANTHACEAE, Engel & Schust., family nov.

Rami intercalares laterales; stolones et flagellae nulli. Rhizoidea ventraliter dispersa. Folia caulina admodum succuba, indivisa. Foliorum cellulae trigonis magnis prominentibus confluentibus instructae. Amphigastria nulla. Androecia in ramulis brevissimis determinatis lateralibus intercalaribus inserta. Gynoecea in ramulis brevissimis lateralibus intercalaribus inserta; perianthia late ovoidea. Capsula plus minusve globosa, valvulis 3-4-stratosis instructa.

Typus: Brevianthus Engel & Schust.

Brevianthus Engel & Schust. gen. nov.

Planta dioica, prostrata, obscure albiviridis. Caulis cortex simplex e cellulis subaequalibus valde incrassatis efformatus. Rhizoidea incolorata, non septata. Folia caulina libera, fortiter erecta, concava, late ovata vel oblata, ad marginem hyalina, integra, apice rotundata. Foliorum cellulae abaxialiter intramarginales incrassatae protuberantiis tholiformibus vel mamilliformibus instructae et papillis cuticularibus hyalinis dense vestitae; cellulae marginales 1-2(-3) simplices, protuberantiis destitutis.

Androecia minuta, capitata vel breviter spicata; ♂ bractae valde ventricosae; antheridia solitaria, pedicello uniseriato instructa. Perianthia aliquantum bilateraliter compressa, plicis paucis latis, ad orem lata, laciniato-lobata. Setae in sectione transversali cellulis 4-5 in diametro, omnibus sub-

* The senior author would like to thank Dr. Timothy Plowman for assistance with the Latin diagnoses.

aequimagnis constitutae. Sporae irregulariter tuberculatae vel baculatae. Elateres tortuosi, bispirales.

Typus: Jackiella flava Grolle.

The following is the only species which belongs here; it is endemic to Tasmania:

Brevianthus flavus (Grolle) Engel & Schust., comb. nov.

Basionym: Jackiella flava Grolle, J. Hattori Bot. Lab. 33: 222. 1970.

Holotype: Tasmania, Recherche, Catamaran, 14 January 1911, W. A. Weymouth 1232 as Jamesoniella occlusa (NY!).

NOTULAE HEPATICARUM POLYNESIAE

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Preparation of the catalogue of species for the *Prodromus Florae Hepaticarum Polynesianae* resulted in discovery of nomenclaturally unacceptable names. Many were presented as *nomina nuda* and could be listed without further attention. Others, however, were assigned generic names now considered invalid and revisions were necessary in order that correct names could be provided for each taxon, as well as synonyms. Several later homonyms required new names.

The area included in the *Prodromus Florae Hepaticarum Polynesianae* extends from Hawaii to the Bonin Islands, southward east of the Philippines and New Guinea to Lord Howe, eastward north of New Zealand to Easter. Thus, all tropical Pacific islands outside the indomalayan archipelagoes have been treated with synonyms cross-referenced to the page number of the original report as well as to the source document itself. The following list provides acceptable names for liverwort taxa lacking them in the Pacific area.

Anthoceros javanicoides nom. nov.

Anthoceros javanicus Steph. 1916. Spec. Hep. 5: 988.
nec *Anthoceros javanicus* Nees 1830. Enum. Pl. Crypt. Javae: 1.
Type specimen: Java, Dien Gbze, Ernst 18 in hb G.

Asterella boryana (Mont.) comb. nov.

Fimbriaria boryana Mont. 1838. Ann. Sci. Nat. 9: 41.

Asterella coronata (Steph.) comb. nov.

Fimbriaria coronata Steph. 1917. Spec. Hep. 6: 12.

Asterella dioica (Steph.) comb. nov.

Fimbriaria dioica Steph. 1914. Jour. Proc. Roy. Acad. New South Wales 48: 104.

Asterella dognyensis nom. nov.

Fimbriaria umbonata Steph. 1917. Spec. Hep. 6: 17.
nec *Fimbriaria umbonata* (Wallr.) Wallr. in Gott. et al. 1846. Syn. Hep.: 559.
Type specimen: Nova Caledonia, in jugo Dogny, 1060 m., IX 1909, Le Rat 219 ex hb Gen. Paris, in hb G.

Asterella heteroflora (Steph.) comb. nov.

Fimbriaria heteroflora Steph. 1917. Spec. Hep. 6: 14.

Asterella latifrons (Steph.) comb. nov.

Fimbriaria latifrons Steph. 1917. Spec. Hep. 6: 15.

Asterella levispora (Steph.) comb. nov.

Fimbriaria levispora Steph. 1917. Spec. Hep. 6: 15.

Asterella longebarbata (Steph.) comb. nov.

Fimbriaria longebarbata Steph. 1889. Hedwigia 28: 156.

Asterella tenerrima (Steph.) comb. nov.

Fimbriaria tenerrima Steph. 1917. Spec. Hep. 6: 17.

Bazzania confertissima (Steph.) comb. nov.

Mastigobryum confertissimum Steph. 1911. Denkschr. K. Akad. Wiss., Math.-Nat. Kl. Wien 88: 32.

Bazzania conistipula (Steph.) comb. nov.

Mastigobryum conistipulum Steph. 1924. Spec. Hep. 6: 458.

Bazzania consociata (Steph.) comb. nov.

Mastigobryum consociatum Steph. 1924. Spec. Hep. 6: 458.

Bazzania falcifolia (Steph.) comb. nov.

Mastigobryum falcifolium Steph. 1911. Denkschr. K. Akad. Wiss., Math.-Nat. Kl. Wien 88: 33.

Bazzania gunniana (Steph.) comb. nov.

Mastigobryum gunnianum Steph. 1914. Journ. Proc. Roy. Soc. New South Wales 48: 123.

Bazzania hamatifolia (Steph.) comb. nov.

Mastigobryum hamatifolium Steph. 1908. Spec. Hep. 3: 486.

Bazzania hebridensis (Steph.) comb. nov.

Mastigobryum hebridense Steph. 1914. Journ. Proc. Roy. Soc. New South Wales 48: 124.

Bazzania integristipula (Steph.) comb. nov.

Mastigobryum integristipulum Steph. 1911. Denkschr. K. Akad. Wiss., Math.-Nat. Kl. Wien 88: 33.

Bazzania leratii (Beauverd) comb. nov.

Mastigobryum leratii Beauverd in Steph. 1924. Spec. Hep. 6: 477.

Bazzania lessonii (Steph.) comb. nov.

Mastigobryum lessonii Steph. 1909. Spec. Hep. 3: 531.

Bazzania obcuneata (Steph.) comb. nov.

Mastigobryum obcuneatum Steph. 1908. Spec. Hep. 3: 487.

Bazzania paucidens (Steph.) comb. nov.

Mastigobryum paucidens Steph. 1908. Spec. Hep. 3: 484.

Bazzania pulchella (Steph.) comb. nov.

Mastigobryum pulchellum Steph. 1908. Spec. Hep. 3: 442.

Bazzania quadratistipula nom. nov.

Mastigobryum quadratum Steph. 1924. Spec. Hep. 6: 477.

nec *Mastigobryum quadratum* Colenso 1886. Trans. New Zealand Inst. 18: 246.

nec *Bazzania quadrata* (Colenso) Mart. et Hodgs. 1950. Trans. Proc. Roy. Soc. New Zealand 78: 499.

Type specimen: Nova Caledonia, Le Rat legit.

Bazzania squarrosa (Steph.) comb. nov.

Mastigobryum squarrosum Steph. 1908. Spec. Hep. 3: 460.

Bazzania subserifolia (Beauverd) comb. nov.

Mastigobryum subserifolium Beauverd in Steph. 1908. Spec. Hep. 480.

Bazzania temariana (Steph.) comb. nov.

Mastigobryum temarianum Steph. 1908. Spec. Hep. 3: 532.

Bazzania upoluensis (Steph.) comb. nov.

Mastigobryum upoluense Steph. 1911. Denkschr. K. Akad. Wiss., Math.-Nat. Kl. Wien 88: 33.

Chiloscyphus rotundiphyllus nom. nov.

Chiloscyphus rotundifolius Steph. 1895. Hedwigia 34: 236.

nec *Chiloscyphus rotundifolius* Mitt. 1884. Challenger Exped. 1 (3): 85.

Type specimen: New Caledonia, Dent de St. Vincent, VII 1909, Le Rat 189 ex hb Theriot in hb G.

Cololejeunea comptonii (Pears.) comb. nov.

Leptocolea comptonii Pears. 1922. Journ. Linn. Soc. Bot. 46: 40.

Cololejeunea crenulata (Pears.) comb. nov.

Leptocolea crenulata Pears. 1922. Journ. Linn. Soc. Bot. 46: 41.

nec *Cololejeunea crenulata* (Herz.) Benedix 1953.

Cololejeunea mouensis (Tixier) comb. nov.

Campylolejeunea mouensis Tixier 1979. *Nova Hedwigia* 31: 727.

Cololejeunea polyantha (Mitt.) comb. nov.

Lejeunea polyantha Mitt. in Seem. 1871. *Flora Vitiensis*: 416.

Physocolea polyantha (Mitt.) Steph. 1916. *Spec. Hep.* 5: 901.

Cololejeunea retusula (Mitt.) comb. nov.

Lejeunea retusula Mitt. 1871. *Flora Vitiensis*: 416.

Physocolea retusula (Mitt.) Steph. 1916. *Spec. Hep.* 5: 904.

Cololejeunea spathulifolia (Steph.) comb. nov.

Leptocolea spathulifolia Steph. 1916. *Spec. Hep.* 5: 855.

Cololejeunea vitiensis (E. O. Campbell) comb. nov.

Leptocolea vitiensis E. O. Campbell. 1971. *Jour. Roy. Soc. New Zealand* 1: 15.

Colura tutuilana (Pears.) comb. nov.

Colurolejeunea tutuilana Pears. 1924. *Carnegie Inst. Washington Dept. Marine Biol. Publ.* 20: 151.

Frullania matafaoica nom. nov.

Frullania minutissima Pears. 1924. *Carnegie Inst. Washington Dept. Marine Biol. Publ.* 20: 140.

nec *Frullania minutissima* Colenso 1887.

nec *Frullania minutissima* Schiffner 1900.

Type specimen: "Trail to Mount Matafao, M. C. Collarino, June-July 1920 (382a)."

Frullania novopommeriensis nom. nov.

Frullania fauriana Steph. in Reehinger 1909. *Denkschr. K. Akad. Wiss., Math.-Nat. Kl. Wien* 85: 196.

nec *Frullania fauriana* Steph. 1894. *Hedwigia* 33: 144.

Type specimen: "Insel Neu-Pommern...am Wege von Paparatawa nach Toma, nr. 4598." (Leg. Reehinger)

Jungermannia comptonii (Pears.) comb. nov.

Haplozia comptonii Pears. 1922. *Journ. Linn. Soc. Bot.* 46: 20.

Jungermannia dubioides nom. nov.

Jungermannia dubia Nees in Endlicher 1833. *Prodr. Fl. Norfolk*: 5.

nec *Jungermannia dubia* Weber 1815. *Hist. Musc. Hep. Prodr.*: 79.

Type specimen: Norfolk Island, leg. F. Bauer.

Lejeunea alobifolia nom. nov.

Lejeunea aloba Steph. 1915. Spec. Hep. 5: 767.

nec *Lejeunea aloba* Sande Lac. 1856. Syn. Hepat. Jav.: 72.

Type specimen: New Caledonia, "Ile des Pins. Forêt de Kapen, Jun. 1909, Le Rat 53, hb G 14244.

Lejeunea gibbiloba (Steph.) comb. nov.

Eulejeunea gibbiloba Steph. 1923. Spec. Hep. 6: 418.

Lejeunea tutuilana (Pears.) comb. nov.

Eulejeunea tutuilana Pears. 1924. Carnegie Inst. Washington Dept. Marine Biol. Publ. 20: 149.

Lophocolea papulimarginata nom. nov.

Lophocolea papulosa Steph. 1922. Spec. Hep. 6: 286.

nec *Lophocolea papulosa* Steph. 1911. Kungl. Svenska Vet. Akad. Handl. 46: 50.

Type specimen: New Caledonia, Le Rat legit.

Phaeoceros parisii (Steph.) comb. nov.

Aspiromitus parisii Steph. 1916. Spec. Hep. 5: 968.

Riccardia angustissima (Steph.) comb. nov.

Aneura angustissima Steph. 1917. Spec. Hep. 6: 20.

Riccardia breviramosa (Steph.) comb. nov.

Aneura breviramosa Steph. 1911. Kungl. Svenska Vet. Akad. Handl. 46(9): 6.

Riccardia comata (Steph.) comb. nov.

Aneura comata Steph. 1917. Spec. Hep. 6: 22.

Riccardia comptonii (Pears.) comb. nov.

Aneura comptonii Pears. 1922. Journ. Linn. Soc. Bot. 46: 17.

Riccardia flagellaris (Gepp in Gibbs) comb. nov.

Aneura flagellaris Gepp in Gibbs. 1909. Journ. Linn. Soc. Bot. 39: 194.

Riccardia gunniana (Steph.) comb. nov.

Aneura gunniana Steph. 1914. Journ. Proc. Roy. Soc. New South Wales 48: 96.

Riccardia hebridensis (Steph.) comb. nov.

Aneura hebridensis Steph. 1914. Journ. Proc. Roy. Soc. New South Wales 48: 96.

Riccardia hyalina (Steph.) comb. nov.

Aneura hyalina Steph. 1917. Spec. Hep. 6: 31.

Riccardia intricata (Steph.) comb. nov.

Aneura intricata Steph. 1897. Engler's Bot. Jahrb. 23: 301.

Riccardia lichenoides (Steph.) comb. nov.

Aneura lichenoides Steph. 1897. Engler's Bot. Jahrb. 23: 301.

Riccardia macrantha (Pears.) comb. nov.

Aneura macrantha Pears. 1922. Journ. Linn. Soc. Bot. 46: 17.

Riccardia micropinna (Steph.) comb. nov.

Aneura micropinna Steph. 1893. Hedwigia 32: 94.

Riccardia palmatifida (Steph.) comb. nov.

Aneura palmatifida Steph. 1917. Spec. Hep. 6: 36.

Riccardia robusta (Steph.) comb. nov.

Aneura robusta Steph. 1917. Spec. Hep. 6: 40.

Riccardia tutuilana (Pears.) comb. nov.

Aneura tutuilana Pears. 1924. Carnegie Inst. Washington Dept. Marine Biol. Publ. 20: 132.

Influence of Ultraviolet Radiation on Viability of
Saccharomyces cerevisiae recovered from the Apollo 16
Microbial Ecology Evaluation Device

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Abstract: Saccharomyces cerevisiae Hansen was exposed to ultraviolet light radiation, at known wavelengths and intensities, during the deployment of the Microbial Ecology Evaluation Device of Apollo 16. Postflight analysis indicated no variation occurred as a result of weightlessness or splashdown. Survival rates, however, did vary according to ultraviolet irradiation exposure parameters. Reexposure on earth with ultraviolet radiation showed one post-flight isolate to be susceptible to UV reexposure, while other post-flight cells were resistant and demonstrated no change.

Introduction: Numerous studies indicate that use of supersonic transports (Cutchis, 1974; Johnston, 1971), increased use of aerosols and refrigerants (Bassett et al., 1974; Cicerone et al., 1974; Molina and Roland, 1974; Hammond and Maugh, 1974), and large scale nuclear explosions (Hampson, 1974) could dramatically modify the stratosphere, causing a reduction in the ozone level, thereby increasing the level of ultraviolet (UV) radiation reaching the earth's surface. It has been suggested that such a modification could directly and indirectly effect the health of man (Council on Environmental Quality, 1975).

Fungi provide a large species reserve for the selection of studies in medically related fields applicable to man and the environment. Select fungal species serve as research tools for identifying changes at the cellular level incurred as a result of modifications in the environment. The object of this study was to examine the influence of UV radiation on survival rates of fungal cells previously irradiated in deep space.

Materials and Methods: Vegetative yeast cells of Saccharomyces cerevisiae Hansen ATCC y2439 were housed in distilled water or dry in 0.05 ml volume square cuvettes within the Microbial Ecology Evaluation Device (MEED) spaceflight hardware of Apollo 16. Each cuvette contained a quartz window and a series of filters to regulate the UV wavelength and intensity of exposure in space (Taylor, 1970). The MEED was deployed at a 90 degree angle to the sun for 10 min plus 7 sec during the transearth Extra Vehicular Activity of Apollo 16 (Volz, 1975). Fungi in the flight hardware were exposed to 254, 280, and 300 nanometers (nm) UV light at various energy levels during deployment and attachment of the MEED flight hardware on the television campole extension and Command Module hatch (Volz et al., 1974). After exposure, the flight hard-

ware was stowed and returned to the laboratory at splashdown (Volz, 1974). Fungal cells were placed on Sabouraud maltose agar for growth and further study (Volz and Dublin, 1973).

Spaceflight isolates (phenotypes) for the present study were obtained from viable cells collected during postflight analysis. The phenotypes were selected by alterations in colony morphology and growth rate as previously described (Volz, 1973). Phenotypes selected for use in the present study, and the conditions of exposure in the MEED are summarized in Table 1. Stock cultures were maintained on Sabouraud maltose agar slants at 25 C.

Phenotypic strains were reirradiated in sterile distilled water at a distance of 25 centimeters for 10 min. Irradiation was performed with germicidal UV (254 nm) lamps at an intensity of 10^4 ergs/sec/cm². Energy levels were measured with a calibrated radiometer.

Results and Discussion: Return viability rates in the MEED appeared to reflect the exposure parameters of space. Loss of viability in S. cerevisiae was most pronounced in those cells exposed to 254 nm radiation, in cells housed in dry cuvettes as compared with wet cuvettes, and with an increase in energy level at each respective wavelength (Volz et al., 1974). Yashi and Laskowski (1976) and Kowalski and Laskowski (1976) have shown that viability increased in cells exposed to UV radiation at 254 nm if irradiated cells were stored in buffer for up to four days without light. Spaceflight conditions were such that after UV exposure, all fungal cells were stored in the closed MEED hardware until after splashdown. This might account for an increased viability in cells recovered from wet cuvettes. Figure 1 summarizes the survival rates of S. cerevisiae exposed to UV radiation in the MEED.

Phenotypic isolates received varying energy levels and wavelengths of UV light in space, while the reexposure on earth presented equal UV irradiation to each isolate. Variation in viability occurred in the spaceflight phenotypes according to their respective UV exposure parameters. Additional variation was evident after an equal exposure of UV light was given the phenotypes as a second treatment.

Survival rates of the phenotypes to reexposure with UV light are presented in Figure 2. Phenotypes 1440-2 and 7012-4 were the most resistant (80% survival) to UV reexposure, with phenotype 7027-2 showing the lowest viability (30% survival).

Exposure levels received in space produced specific viability rates according to individual phenotypes. A second exposure on earth to the same cells, with an equal amount of UV radiation, again produced viability changes not in the same proportions as identified in the spaceflight exposure. Initial exposure to UV light at varying parameters may have induced diverse changes in the

spaceflight phenotypes, altering their response to reexposure with UV radiation.

Table 1. UV radiation space exposure parameters for yeast strains selected for reexposure studies.

Phenotype	Wavelength (nm)	Intensity (ergs/cuvette/10 min)	Cuvette Moisture
1420-1	280	2.4×10^4	wet
1435-2	300	7.0×10^4	wet
1440-2	254	3.5×10^4	wet
7012-4	280	9.4×10^3	dry
7024-2	300	4.2×10^3	dry
7027-2	254	9.6×10^3	dry

Figure 1. Survival rates and exposure parameters of *S. cerevisiae* exposed to UV radiation in the MEED.

||||| liquid cuvettes, ▨ dry unvented cuvettes, ■ dry vented cuvettes

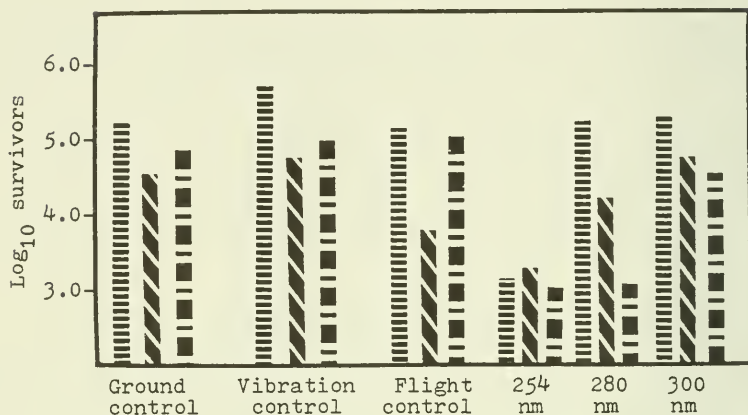
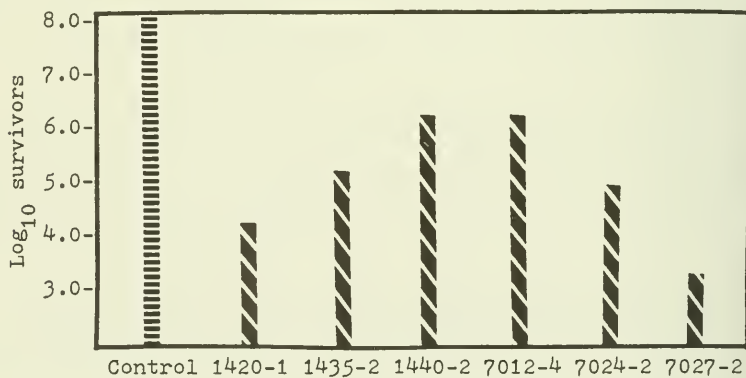


Figure 2. Survival rates of *S. cerevisiae* spaceflight phenotypes to reexposure with UV light.

||||| control cells, ▨ survival rates to UV light



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NOTES ON NEW AND NOTEWORTHY PLANTS. CXLIV

Harold N. Moldenke

ALOYSIA KRAPOVICKASII Mold., sp. nov.

Frutex ramulis gracilibus tetragonis striatis novellis dense pubescentibus; foliis sessilibus ternatis laminis ellipticis 5--6 cm. longis 1.5--2 cm. latis apicaliter acutis marginaliter regulariter serratis basalibus acutis, subtus dense pubescentibus; inflorescentiis axillaribus spicatis 11--15 cm. longis erectis longe pedunculatis dense multifloris; pedunculis dense pubescentibus; corollis albis.

Shrub; branchlets and branchlets slender, distinctly tetragonal and several-sulcate in longitudinal fashion, the younger portions very densely pubescent with brownish-incanous hairs standing at right angles to the axis of the branchlet; leaves ternate, sessile; leaf-scars sharply prominent; leaf-blades rich-green above, lighter beneath, thinly chartaceous, elliptic, 5--6 cm. long when mature and 1.5--2 cm. wide, ascending, apically acute, marginally distinctly serrate with antrorse subacute teeth from almost the base to the apex, rather abruptly narrowed basally to the acute base, densely puberulent and rather distinctly rugulose above with somewhat impressed venation, densely pubescent beneath especially in distichous fashion along all of the venation; inflorescence axillary, 1--3 per axil, spicate, erect, 11--15 cm. long, about 1 cm. wide during anthesis and fruit, long-pedunculate, densely many-flowered; peduncles subfiliform, 3--4 cm. long, densely pubescent like the branchlets; rachis subfiliform, densely pubescent like the peduncles; calyx about 2 mm. long, narrowly campanulate, deeply 4-toothed, densely hispidulous and tomentellous; corolla hypocrateriform, white, the tube about twice as long as the calyx, the lobes small.

The type of this very distinct species was collected by A. Krapovickas (in whose honor it is named), C. L. Cristóbal, A. Schinini, M. M. Arbo, C. Quarin, and J. M. Gonzalez (no. 26439) in pantano on Route 39 about 10 km. from Route 14, dept. Ituzaingó, Corrientes, Argentina, on September 24, 1974, and is deposited in my personal herbarium.

STACHYTARPHETA SINCUINEA var. *GRISEA* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum subtus et ubique novellis dense griseo- vel incano-pubescentibus recedit.

This variety differs from the typical form of the species in having its younger branchlets, twigs, petioles, and lower leaf-surfaces very densely gray- or incanous-pubescent.

The type of the variety was collected by S. A. Mori, T. S. dos Santos, & C. B. Thompson (no. 11102) on rocky granitic cliffs, at 900 m. altitude, at Rod. BA-026 about 6 km. southwest of Maracás, munic. Maracás, Bahia, Brazil, on November 17, 1978, and is deposited in the United States National Herbarium at Washington.

VERBENA CAROLINA f. *HIRSUTA* (Mart. & Gal.) Mold., stat. nov.

Verbena hirsuta Mart. & Gal., Bull. Acad. Brux. 11 (2): 321. 1844.

NOTES ON THE GENUS *PARAVITEX* (VERBENACEAE)

Harold N. Moldenke

PARAVITEX Fletcher, Kew Bull. Misc. Inf. 1937: 74, fig. 2. 1937.

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Climbing shrubs; leaves decussate-opposite, simple, deciduous, exstipulate, marginally entire; inflorescence cymose, the cymes di- or trichotomous, arranged in loose terminal panicles; flowers perfect; calyx inferior, gamosepalous, the rim truncate or sinuate-lobulate; corolla gamopetalous, zygomorphic, the limb bilabiate, the upper (posterior) lip bifid, the lower (anterior) lip trifid with the middle lobe much longer than the others; stamens 4, inserted in the corolla-tube, hardly exerted; filaments basally sparsely pubescent; anthers dorsifixed, longitudinally dehiscent; pistil single, bicarpellary; stigma terminal, bifid; ovary superior, compound, 4-celled, each cell 1-ovulate; fruit drupaceous, globose or obovoid, 4-celled but 1-seeded by the abortion of 3 ovules and cells.

Type species: *Paravitex siamica* Fletcher.

This is, as far as is now known, a monotypic genus endemic to Thailand. It is obviously closely related to *Vitex* Tourn. Fletcher (1937) notes that "The two characters which clearly separate it from this genus are the simple leaves and the structure of the fruit. The ovary of *Vitex* is normally 4-celled and 4-ovuled., although the number varies from 2 to 4. *Paravitex* differs in that, although the ovary is 4-celled and 4-ovuled, only one of the cells develops. Thus the drupe contains one fertile cell with one seed and three seedless rudimentary cells." In these characters the genus is also reminiscent of the arborescent often unifoliolate genus *Teijsmanniodendron*

PARAVITEX SIAMICA Fletcher, Kew Bull. Misc. Inf. 1937: 73--75, fig. 2. 1937.

Bibliography: see that of the genus as a whole (above).

Illustrations: Fletcher, Kew Bull. Misc. Inf. 1937: 73, fig. 2. 1937.

A scandent shrub; branchlets at first tetragonal, later terete,

glabrous, bearing a few amber-colored glands and numerous lenticels; leaves simple; petioles 0.5--1 cm. long, sparsely pubescent and glandular; leaf-blades chartaceous, ovate or elliptic, 3--8 cm. long, 2--4 cm. wide, brownish above and gray-brown beneath in drying, apically acute or obtuse to obtusely apiculate, marginally entire, basally somewhat attenuate or often rounded, glabrous on both surfaces except for the slightly pubescent venation, with sessile amber-colored glands beneath; midrib conspicuous above, prominent beneath; secondaries 7--9 pairs, prominent beneath, parallel, arcuately joined within the margins; inflorescence terminal, 10--22 cm. long, basally 6--10 cm. wide, sparsely spinulose, pubescent, glandular; bracts 1--3 mm. long; calyx 2--5 mm. long, glabrous, the rim truncate or sinuate-lobulate, glandulose; corolla hypocrateriform, externally glabrous and glandular, the tube about 5.5 mm. long, internally glabrous except for the lightly pubescent stamen-insertion area, the limb bilabiate, the posterior lip 2 mm. long and bilobed, the anterior (inferior) lip 5 mm. long, 3 lobed, the lobes apically rounded; stamens 4, inserted 2 mm. above the base of the corolla-tube; filaments 5--7 mm. long; anthers 0.75 mm. long; style 7.5 mm. long; stigma apically bilobed; ovary globose, 1 mm. long and wide, glabrous, apically glandulose; fruit obovoid, about 7 mm. long, glabrous, rugose in drying, apically sparsely glandulose.

The species is based on *Kerr 7002* from riverbanks at Supan Dom Bang, at about 20 m. altitude, Nakawn Chaisi, Thailand. Fletcher cites also *Kerr 19329*, *Marcan 1004*, and *Put 2573* from waste ground and evergreen forests along a stream, at an altitude of 6 m. to "under 50 m.", from Prachinburi and Ayuthia provinces in Thailand. Nothing further is known to me of this species.

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NOTES ON THE GENUS *PETRAEOVITEX* (VERBENACEAE)

Harold N. Moldenke

In view of Munir's excellent review of this genus in 1965, it would be presumptuous on my part now to continue on the detailed monograph of the genus which it was my intention to publish and on which work was begun in 1931. Still, the bibliographic and other notes which have been assembled by my wife and myself over these many years probably should be placed on record. This is the 59th genus so treated by me since the beginning of this series in 1930. The herbarium acronyms employed herein are the same as I have used in all previous installments in this series of notes in this journal since 1931 and are fully explained in my Fifth Summary (1971), pages 795 to 801, and elsewhere.

PETRAEOVITEX Oliv. in Hook., Icon. Pl. 15: 15--16, pl. 1420. 1883.

Synonymy: *Petreovitex* Oliv. apud H. Hallier, Meded. Rijks Herb. Leid. 37: 84. 1918. *Letraeovitex* [Merr.] ex Fedde & Schust., Justs Bot. Jahresber. 59 (2): 417, sphalm. 1939. *Petraeovitex* Sinclair ex Mold., Résumé Suppl. 13: 7, in syn. 1966.

Bibliography: Rumpf, Herb. Amboin. 5: 4, pl. 3. 1747; J. E. Sm. in Rees, Cyclop., ed. 2, 27: *Petrea* no. 2. 1814; Schau. in A. DC., Prodr. 11: 620. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 338. 1858; Hassk., Neue Schl. 89. 1866; Oliv. in Hook., Icon. Pl. 15: 15--16, pl. 1420. 1883; Hemsl. in Thompson & Murray, Rep. Scient. Res. Voy. Challenger 3, Bot. 1: 110. 1885; Fawcett in Forbes, Wander. 2: 225. 1886; K. Schum. & Hollr., Fl. Kais. Wilhelmsl. 122. 1889; Warb., Engl. Bot. Jahrb. 13: [Pl. Pap.] 427. 1891; F. Muell., Bot. Centralbl. 50: 195. 1892; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 497. 1894; Briq. in Engl. & Prantl., Nat. Pflanzenfam. 4 (3a): 177 & 179 (1895) and 4 (3a): 383. 1897; K. Schum., Notizbl. Bot. Gart. Berlin 2: 145. 1898; K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Sddsee 527. 1900; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 322. 1903; Dalla Torre & Harms, Gen. Siphonog., imp. 1, 433. 1904; E. D. Merr., Journ. Philip. Sci. Bot. 2: 425. 1907; Gamble in King & Gamble, Journ. Asiat. Soc. Beng. 74 (2 extra): 858--860. 1908; King & Gamble, Kew Bull. Misc. Inf. 1908: 113--114. 1908; King & Gamble, Mat. Fl. Malay Penins. 4: 1068 & 1069. 1909; Pulle in Lorentz, Nova Guinea 8 (2): 403 (1910) and 8 (4): 687. 1912; Prain, Ind. Kew. Suppl. 4, imp. 1, 177. 1913; Heyne, Nutt. Plant. Nederl. Ind., ed. 1, 4: 123 & xviii. 1917; E. D. Merr., Interpret, Rumph. Herb. Amboin. 453--454. 1917; H. Hallier, Meded. Rijks Herb. Leid. 37: 84--86. 1918; Trelease, Bot. Centralbl. 138: 123. 1918; H. J. Lam, Verbenac. Malay. Arch. 323--329 & 366. 1919; H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 97--99 & xiv. 1921; Fedde, Justs Bot. Jahresber. 45 (1): 552. 1923; Fedde & Schust., Justs Bot. Jahresber. 45 (1): 149. 1923; E. D. Merr., Journ. Malay Br. Roy. Asiat. Soc. 1: 30. 1923; E. D. Merr., Enum. Born. Pl. 518. 1921; E. D. Merr., Enum. Philip. Flow. Pl. 3: 406. 1923; Ridl., Fl. Malay Penins. 2: 611 & 637. 1923; H. J. Lam in Lauterb., Engl. Bot. Jahrb. 59: 97--98. 1924; H. J. Lam in Lam & Bakh., Nova Guinea 14 [Bot. 1]: 172. 1924; Heyne, Nutt. Plant. Nederl. Ind., ed. 2, 4: 1324. 1925; Wangerin, Justs Bot. Jahresber. 53 (2): 644. 1925; A. W. Hill, Ind. Kew. Suppl. 6: 150. 1926; Wangerin, Justs Bot. Jahresber. 46 (1): 717. 1926; Fedde, Justs Bot. Jahresber. 46 (2): 655. 1929; A. W. Hill, Ind. Kew. Suppl. 7: 183. 1929; E. D. Merr., Univ. Calif. Publ. Bot. 15: 267. 1929; Funke, Ann. Jard. Bot. Buitenz. 41: pl. 15, fig. 13. 1930; Wangerin, Justs Bot. Jahresber. 50 (1): 237. 1930; Stapf, Ind. Lond. 5: 39. 1931; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1074--1075. 1932; A. W. Hill, Ind. Kew. Suppl. 8: 178. 1933; Junell, Symb. Bot. Upsal. 1 (4): 95--97 & 202, fig. 145--147. 1934; Bakh., Journ. Arnold Arb. 16: 73. 1935; Mold., Feddes Repert. Spec. Nov. 43: 209. 1938; Fedde & Schust., Justs Bot.

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Usually climbing shrubs, sometimes creeping or scrambling; branches and branchlets tetragonal; leaves decussate-opposite, ex-

stipulate, deciduous, petiolate, usually compound and trifoliate, sometimes twice trifoliate, rarely unifoliate; leaflets usually 3--6, sessile or petiolulate, glabrous or pubescent; inflorescence terminal, compound and pyramidal-paniculate, loose (with long-pedicellate flowers) to densely congested (with very short-pedicellate flowers), or axillary and cymose; bracts and bractlets usually small or even subulate during anthesis, sometimes colored, sometimes later developing into normal green leaves; flowers small and inconspicuous to larger and more conspicuous, subsessile to long-pedicellate; calyx very small, inferior, gamopetalous, short-tubular or campanulate, the rim regularly 5-dentate, the lobes much enlarged, membranous, costate, and reticulate-venose in fruit, finally elongate, rigid, oblanceolate, and usually apically obtuse; corolla gamopetalous, zygomorphic, obliquely hypocrateriform, posteriorly split, the limb expanded, more or less distinctly bilabiate, with 5 subequal apically obtuse and incurved lobes; stamens 4, epipetalous, subequal or subdidynamous, alternate with and longer than the corolla-lobes or sometimes included; anthers small, dorsifixed, 2-celled, the thecae elliptic-oblong (usually on included stamens) or more or less orbicular (usually on exserted stamens); pistil bicarpellary; style single, slender, terminal or excentric; stigma terminal, bilobed or bifid, the lobes equal or unequal; ovary compound, superior, obovoid, imperfectly 2-celled, 2-ovulate; ovules pendulous, attached to a central placenta; fruit capsular, subcylindric or 4-lobed, usually longitudinally striate, apically conic or truncate, sometimes constricted and then produced into a short, truncate, and faintly 4-lobed apex, sometimes much elongated into a long neck (rostrate), basally narrowed, 2- (or by abortion 1-) seeded; seeds 1 to 4, exalbuminous.

Type species: *Petreaovitex riedelii* Oliv. [= *P. multiflora* (J. E. Sm.) Merr.].

This is a small genus of about a dozen species and varieties, native to hot and moist tropical regions from the Philippine Islands and Malaysia to Indonesia, the Bismark Archipelago, the Molucca Islands, New Guinea, and the Solomon Islands; sometimes grown in cultivation as specimen plants.

Hallier (1918) "corrected" the orthography of the generic name to *Petreovitex* because, he maintained, *Petrea*, rather than the later spelling *Petreae*, is the correct orthography of the genus whose name was adopted as the first part of the new name and of whose fruits those of the present genus are reminiscent. Wangerin (1926) went along with Hallier in this contention.

Petreaovitex is usually regarded as a member of Tribe *Caryopterideae* (Schau.) Benth. in Subfamily *Viticoideae* Briq. of the *Verbenaceae* J. St.-Hil. along with *Caryopteris* Bunge, *Garrettia* Fletcher, *Glossocarya* Wall., *Peronema* Jack, and *Hymenopyramis* Wall., But Junell (1934) removes it from this tribe, along with *Peronema* and *Hymenopyramis*, and places it in Tribe *Viticeae* (Bartl.) Benth. To justify this change, he says: "Der Fruchtknotenbau ist gleichartig mit dem bei den übrigen Gattung innerhalb

Viticeae.....Der Fruchtknoten von *P. trifoliata* ist stark abgeplattet.....Die Fruchtknotenwand müsste sicher mit den Fruchtblatträndern in Kontakt stehen. Längsschnitte des Fruchtknotens erhalten natürlich bei dieser Art ganz verschiedenes Aussehen, je nachdem sie median oder transversal verlaufen.....Die Samenanlagen sind, wie auch bei *P. Riedelii*, sehr hoch inseriert.

"Bei *P. trifoliata* verwachsen die Plazenten unmittelbar unter den Samenanlagenbefestigungen. Bei *P. Riedelii* erfolgt die Verwachsung etwas weiter unten. Die eigentlichen Fruchtblattränder bleiben bei dieser Verwachsung frei; sich verwachsen auch nicht mit den mittleren Partien der Fruchtblattränder.

"Wie schon oben erwähnt, weicht diese Gattung von den vorhergehenden dadurch ab, dass die Frucht keine Steinfrucht ist. Meines Erachtens liegen jedoch keine Gründe dafür vor, diese Frucht als kapselartig zu bezeichnen, da das einzige Motiv für diese Bezeichnung darin liegt, dass die Fruchtwand trocken ist. Die Frucht zerfällt aber nicht in vier Klappen, was ja für *Caryopteridoideae* charakteristisch wäre. Die Frucht von *P. trifoliata* ist verhältnismässig gross (etwa 5 mm), zylindrisch bis schwach konisch, oben etwas breiter. An ihrer Oberfläche kann man nicht die Grenzen der einzelnen Klappen sehen oder unterscheiden, wie vielsamig sie ist. Von zwei Früchten, die ich untersuchte, war die eine zwei- und die andere einsamig. King & Gamble.....geben bei der Beschreibung von *P. Scortechinii* und *P. bambusetorum* an, dass die Frucht zwei- bis einsamig ist. Lam.....führt dies als Merkmal für die Gattung an. Bei *P. Riedelii* hingegen glaube ich drei bis vier Samen in jeder Frucht beobachtet zu haben. Bei dieser Art sind die Früchte klein, und obwohl ich mehrere verschiedene Herbarexemplare untersucht habe, konnte ich keine mit gut erhaltenen Früchten finden. Auch bei dieser Art zerfällt die Frucht nicht."

Briquet (1895) and Dalla Torre & Harms (1904) regarded this genus as monotypic; Angely (1956) regards it as having 7 species. Gibbs (1974) reports saponins absent (or probably so) in the genus. Deighton (1958) and Hansford (1961) report a fungus, *Meliola petraeovitidis* Deight. on the leaves of an unidentified species of *Petraeovitex*, based on Johnston 1648 [IMI.63958] from Malaya.

It is perhaps worth noting here that the Schumann & Lauterbach (1900) reference in the bibliography of this genus is often cited as "1901". Similarly, the Briquet (1895) reference is often cited as "1894", but apparently, according to Stafleu, incorrectly so.

The Kodoh & Aban SAN.82030, distributed as a *Petraeovitex* sp., actually is *Sphenodesme involucrata* (Presl) B. L. Robinson, while Ampuria SAN.40828 is *S. stellata* Merr., Lantoh SAN.82390, Meijer SAN.38796, J. Singh SAN.39260, and Tarodop SAN.83610 are *S. triflora* Wight, Talip SAN.68320 is *S. triflora* var. *montana* Munir, and C. B. Robinson 1423 is *Porana volubilis* Burm. f. in the *Convolvulaceae*. Gillespie 2953 & 4164 (nos. 1599951 & 1599952 in the United States National Herbarium), from Viti Levu in the Fiji Islands, distributed as *Vitex negundo* L., are not a *Vitex* and have the general habital aspect of a *Petraeovitex*.

Lam (1924) lists the following as unidentified but possible

collections of *Petracovitex*: Lauterbach 777, Nyman 245, & Wiesen-thal 66, all from New Guinea.

The following key to the accepted taxa is taken, with minor alterations, from Munir (1965):

1. Flowers in cymes borne on specialized floriferous branches, with or without green- or grayish-colored bracts.
2. Leaves twice trifoliolate.
3. Calyx-lobes externally tomentose, internally glabrous (except in var. *pubescens*); corolla villous in the throat; stamens & style subequal; anther thecae rotund.
4. Leaflets glabrous on both surfaces, entire, to 11 cm. long; calyx-lobes internally glabrous...*P. multiflora*.
- 4a. Leaflets pubescent on both surfaces, often irregularly dentate, to 4.5 cm. long; calyx-lobes internally puberulent.....*P. multiflora* var. *pubescens*.
- 3a. Calyx-lobes tomentose on both surfaces; corolla throat glabrous; style nearly twice as long as the stamens; anther thecae oblong or elliptic; leaflets to 4.5 cm. long.....*P. sumatrana*.
- 2a. Leaves 1- or 3-foliolate.
5. Inflorescence with many foliaceous bracts, the ultimate branchlets with many linear bracteoles even without flowers in their axils; pedicels about 5 mm. long; flowers numerous, congested.
6. Fruit apically short-conic or abruptly narrowed into a neck (rostrate); style always terminal; stigma equally bilobed; ovary pubescent only on the upper 1/3, not glanduliferous; stamens & style much exserted; anther thecae orbicular or suborbicular; leaflets glabrous.
7. Leaflets rhombic-elliptic, shiny on both surfaces, generally widest below the middle, apically acuminate, basally cuneate or subcuneate; middle leaflet to 15 cm. long & its petiolule to 3.5 cm. long; fruit abruptly long-rostrate.....*P. kinabaluensis*.
- 7a. Leaflets elliptic-ovate, dull, generally widest below the middle, basally rounded or subcordulate; middle leaflet to 11 cm. long & its petiolule to 2.5 cm. long; fruit apically short-conic.....
P. kinabaluensis var. *agrestis*.
- 6a. Fruit apically rounded when young, later truncate, depressed at the summit; style apical when young, excentric during anthesis; stigma unequally bilobed; ovary pubescent throughout & often glanduliferous; stamens & style only slightly exserted; anther thecae elliptic; leaflets glabrous or somewhat puberulent beneath, rarely irregularly dentate & deciduously pubescent beneath.....*P. trifoliata*.
- 5a. Inflorescence with few or no foliaceous green bracts, its branchlets divaricate; flowers diffuse, not congested; pedicels 5--10 mm. long.

8. Fruit striate.

9. Inflorescence about 12 cm. long; leaflet-blades membranous, dull above, basally rounded, the intramarginal vein obscure; lateral petiolules to 7 mm. long; pedicels about 10 mm. long; fruit glabrous. *P. membranacea*.

- 9a. Inflorescence 30--70 cm. long; leaflet-blades chartaceous or subcoriaceous, dull or shiny on both surfaces, basally rounded-cuneate; intramarginal vein prominent; lateral petiolules to 4 mm. long; pedicels to 5 mm. long; fruit apically sparsely puberulent.....
P. membranacea var. *malesiana*.

8a. Fruit not striate.

10. Leaves 3-foliolate; leaflet-blades ovate, secondaries to 4 pairs; fruit apically arcuate-conic; fruiting-calyx brownish, hairy or glabrous.....*P. bambusetorum*.

- 10a. Leaves 1-foliolate; leaflet-blades elliptic-ovate, secondaries to 6 pairs; fruit apically abruptly and obtusely acuminate; fruiting-calyx green, sparsely puberulent.....*P. bambusetorum* f. *simplicifolia*.

- 1a. Flowers in short axillary cymes toward the ends of growing non-specialized branches; "young axillant leaves" and bracts yellowish.

11. Stamens and style exserted; anther thecae orbicular or sub-orbicular; fruit striate, apically slightly enlarged; leaflets densely pubescent.....*P. scortechinii*.

- 11a. Stamens and style included; anther thecae elliptic; fruit constricted above the middle, striate only below the constriction; leaflets glabrous.....*P. wolfei*.

PETRAEOVITEX BAMBUSETORUM King & Gamble, Kew Bull. Misc. Inf. 1908: 113--114. 1908.

Synonymy: *Petraeovitex bambusetorum* f. *bambusetorum* [King & Gamble] Munir, Gard. Bull. Singapore 21: 232--233. 1965.

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Illustrations: Munir, Gard. Bull. Singapore 21: 248 & 249, fig. 6 & 7. 1965.

A tall woody climber; branches terete, fulvous; branchlets

pale-brown, smooth; leaves decussate-opposite, 1--3-foliolate; petioles 2.5--5 cm. long; leaflets chartaceous or subcoriaceous, ovate or ovate-oblong, apically acuminate, marginally entire, basally rounded or short-cuncate, glabrous on both surfaces, reticulate-veined, usually with 4--6 (rarely 7 or 8) curvate secondaries, the central leaflet 7--10 cm. long and 3--6 cm. wide, on a petiolule 1--2.5 cm. long, the lateral leaflets 6--9 cm. long and 2.5--4.3 cm. wide, on a petiolule 5--10 mm. long; inflorescence axillary and terminal, with or without leaves, or in the axils of fallen leaves a lax cymose-thyrsoid panicle to 30 cm. long, the flowers not congested; bracts foliaceous, lanceolate, apically long-acuminate, early deciduous; bracteoles minute, setaceous; rachis very slender; pedicels about 4 mm. long, puberulent; calyx very small, about 5 mm. long, its tube 3 mm. long, externally puberulent, internally glabrous, the rim 5-lobed, the lobes about 2 mm. long, puberulent on both surfaces; corolla very small, white or greenish-yellow, zygomorphic, bilabiate, about 6 mm. long, internally glabrous, 5-lobed, the upper lip 2-lobed, the lower lip 3-lobed, the lobes elliptic-ovate, about 4 mm. long, incurved, puberulent on the margins and externally in a central band; stamens 4, about 4 mm. long, subequal; filaments glabrous; anther thecae elliptic-oblong; ovary orbicular-ellipsoid, apically sparsely puberulent; style elongate, slightly exserted; stigma unequally 2-lobed; fruiting-calyx 2--2.6 cm. long, the tube 6--8 mm. long, externally faintly ribbed, the lobes membranous, oblong, 3-veined, 1.3--1.9 cm. long, 3--5 mm. wide, reticulate, sparsely puberulent; fruit wedge-shaped (cuneate), about 7 mm. long, broader on the upper 1/3, cuneate toward the base, not striate.

This species is based on *Kunstler 8765*, deposited at Kew, according to the lectotypification of Munir (1965). The type is from a dense bamboo forest near Ulu Kevling in Perak, Malaysia. The other collection cited as a cotype in the original King & Gamble (1908) description -- *Haviland 1913* -- is now regarded as the type collection of *f. simplicifolia* Munir.

Lam (1919) cites only *Haviland & Hose 1913E* from Mt. Sugla, Sarawak, Borneo. In his 1921 work he cites no specimens at all, simply recording the species as from the Malay Peninsula and Borneo. Munir (1965) cites "*King's Collector 8765*" [apparently the same collection as the "*Kunstler 8765*" cited by him on the preceding page as lectotype of the species] from Perak, *Ridley 9065* from Sabah, and *Ridley s.n.* from Sarawak. He regards the *Haviland & Hose 1913E*, cited by Lam (above), as representing *P. membranacea* var. *malesiana* Munir.

Ridley refers to *P. bambusetorum* as a "rare" plant. The Clemenses found it growing at 5000 feet altitude in Sabah.

Material of this species has been misidentified and distributed in some herbaria as *P. trifoliata* Merr.

Citations: GREATER SUNDA ISLANDS: Sabah: *Clemens & Clemens s.n.* [Feb. 27, '32] (N).

PETRAEOVITEX BAMBUSETORUM f. *SIMPLICIFOLIA* Munir, Gard. Bull. 21: 233--234 & 250, fig. 8. 1965.

Bibliography: Munir, Gard. Bull. Singapore 21:215, 227, 233--234, & 250, fig. 8. 1965; Mold., Résumé Suppl. 13: 5. 1966; Mold., Fifth Summ. 1: 325 (1971) and 2: 987. 1971.

Illustrations: Munir, Gard. Bull. Singapore 21: 250, fig. 8. 1965.

This form differs from the typical form of the species in having only unifoliate leaves.

The type and only known collection of this variety is *Haviland 1913* from Mount Po, Sarawak, deposited in the Kew herbarium. It should be noted that *Haviland & Hose 1913B & 1913E*, misidentified and distributed in some herbaria as *P. bambusetorum* f. *simplicifolia*, actually are *P. membranacea* var. *malesiana* Munir, the former being its type collection.

Munir (1965) points out that the secondary veins of each leaflet are usually "up to 6", the "infructescence botryoidal in general appearance", and the "fruit abruptly acuminate, apex obtuse; bracts and bracteoles absent" (in fruiting specimens). He refers to the leaves as "simple", but unifoliate is probably the more accurate term to describe them in this compound-leaved genus.

PETRAEOVITEX KINABALUENSIS Munir, Gard. Bull. Singapore 21: 234--235 & 251, fig. 9. 1965.

Synonymy: *Petraevitex kinabaluensis* var. *kinabaluensis* Munir, Gard. Bull. Singapore 21: 234. 1965.

Bibliography: Munir, Gard. Bull. Singapore 21: 215--220, 222, 226, 227, 234--235, 251, & 252, map 4, fig. 9 & 10. 1965; Mold., Résumé Suppl. 13: 5 & 7. 1966; G. Taylor, Ind. Kew. Suppl. 14: 102. 1970; Mold., Fifth Summ. 1: 325 (1971) and 2: 597 & 897. 1971; Balgooy, Pacif. Pl. Areas 3: 244. 1975.

Illustrations: Munir, Gard. Bull. Singapore 21: 251, fig. 9. 1965.

A woody climber to 16 m. long; branchlets pale-brown, glabrous; leaves 3-foliate; petioles 5--7 cm. long; leaflets chartaceous, elliptic, apically usually acuminate, marginally entire, basally cuneate, shiny, the central leaflet largest, 10--15 cm. long and 3--6 cm. wide, borne on a petiolule 2.5--3.5 cm. long, the lateral leaflets smaller, 8.5--11.5 cm. long and 3--4.5 cm. wide, borne on a petiolule 5--10 mm. long; secondaries 4--6 per side, the lower ones prominent and basally slightly concurrent with the midrib, then porrect, the intramarginal vein faintly visible, confluent above the middle; veinlet reticulation prominent beneath; inflorescence axillary, cymose-paniculate, 15--25 cm. long, 3.5--6 cm. wide, pedunculate, with at least the main rachis puberulent, the floriferous branches shortly and porrectly divided; bracts foliaceous, usually at first spatulate, later elliptic, apically acuminate, puberulent but soon glabrescent, the basal ones larger, 3--4 cm. long, the upper ones 1--2.5 cm. long; bracteoles linear, 2--8 mm. long, puberulent; pedicels short, puberulent; calyx 5-lobed, 4--6 mm. long, puberulent on both surfaces; corolla pure- or lemon-yellow, bilabiate, one lip of deeper yellow color than

the other, externally puberulent, internally sparsely puberulent on the lobes only, the tube very long, 10--12 mm. long, internally glabrous, the upper lip 2-lobed, the lower lip 3-lobed, the lobes 4--5 mm. long, 2--3 mm. wide; stamens 4, subequal, inserted in the corolla-throat, greatly exserted; filaments 15--18 mm. long, basally sparsely pilose; anthers rotund or subrotund, about 0.4 mm. long; style filiform, 2--2.5 cm. long, not excentric, much exserted; stigma bilobed, the lobes equal, porrect; ovary at first oblong, later apically conic; fruiting-calyx with its tube about 8 mm. long, strongly costate, the lobes membranous, oblong-spatulate, 1.5--2 cm. long, 4--5 mm. wide, usually apically rounded, 3-veined, reticulate, shiny; fruit capsular, about 1 cm. long, broadest at the middle, apically narrowly rostrate, longitudinally striate, the upper 1/2 densely puberulent.

This species is based on *Clemens & Clemens 40561* from 5000 feet altitude on Mount Kinabalu, Sabah, Borneo, found flowering in October, deposited in the Kew herbarium. Munir (1965) cites also *Clemens 40772 & 50401*, remarking that in the latter collection the inflorescence appears to be abnormal, completely flowerless or with the flowers "transformed into [replaced by?] bracts and bracteoles". The collectors describe the plant as climbing on trees 40 feet tall "among very great trees" and comment that it has "a few tendrils!". They correctly noted "*Petraeovitex* prob. new" on the labels of the type collection.

Citations: GREATER SUNDA ISLANDS: Sabah: *Clemens & Clemens 40561* (N--isotype).

PETRAEOVITEX KINABALUENSIS var. *AGRESTIS* Munir, Gard. Bull. Singapore 21: 235 & 252, fig. 10. 1965.

Bibliography: Munir, Gard. Bull. Singapore 21: 215, 227, 235, & 252, fig. 10. 1965; Mold., Résumé Suppl. 13: 5. 1966; Mold., Fifth Summ. 1: 325 (1971) and 2: 897. 1971.

Illustrations: Munir, Gard. Bull. Singapore 21: 252, fig. 10. 1965.

This variety differs from the typical form of the species in having its leaflets elliptic or subelliptic to ovate, dull on both surfaces, basally usually rounded or sometimes even subcordate, the central leaflet-blade to 11 cm. long, borne on a petiolule to 2.5 cm. long, the ovary with a slight constriction separating the pilose and ridged apex from the glabrous lower portion, the corollas greenish-yellow, and the fruit apically more shortly conic.

The variety is based on *Gibot 18600* from near a swampy forest at Tawau, Sabah, deposited in the Singapore Botanical Garden herbarium. Munir (1965) cites also *Kostermans 8764* and *Meijer 2301* from Kalimantan. Collectors state that they have also collected the plant in sandy soil habitats.

PETRAEOVITEX MEMBRANACEA Merr., Journ. Malay. Br. Roy. Asiat. Soc. 1: 30. 1923.

Synonymy: *Petraeovitex membranacea* var. *membranacea* [Merr.]

ex Munir, Gard. Bull. Singapore 21: 230. 1965.

Bibliography: E. D. Merr., Journ. Malay. Br. Roy. Asiat. Soc. 1: 30. 1923; A. W. Hill, Ind. Kew. Suppl. 7: 183. 1929; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1074. 1932; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 65 & 97 (1942) and ed. 2, 145 & 192. 1949; Mold., Résumé 192 & 464. 1959; Munir, Gard. Bull. Singapore 21: 215--220, 225, 227, 230--232, & 295, fig. 3. 1965; Mold., Résumé Suppl. 13: 5 & 7. 1966; Mold. in Menninger, Flow. Vines 337. 1970; Mold., Fifth Summ. 1: 325 (1971) and 2: 597 & 897. 1971; Balgooy, Pacif. Pl. Areas 3: 244. 1975.

Illustrations: Munir, Gard. Bull. Singapore 21: 245, fig. 3. 1965.

A slender, woody, climbing vine, mostly (except for the inflorescences) glabrous; branches pale, terete or obscurely tetragonal, mostly 2--4 mm. in diameter; leaves decussate-opposite, 3-foliolate; petioles 4--6 cm. long, glabrous; leaflet-blades membranous, pale-olivaceous, oblong-ovate to ovate-elliptic, apically acuminate or short-acuminate, marginally entire, basally usually rounded, rarely subcuneate or cuneate, glabrous and somewhat shiny on both surfaces, the central leaflet largest, 6--11 cm. long and 3--6 cm. wide, borne on a petiolule 1--2 cm. long, the lateral leaflets 5--8 cm. long and 2.5--4.2 cm. wide, borne on a petiolule 3--7 mm. long; secondaries 4 or 5 on each side, distinct, with a faint intramarginal vein looping upwards from the middle; veinlet reticulation indistinct, especially above the middle, or the tertiaries distinct; inflorescence axillary, pedunculate, paniculate, very lax, 9--25 cm. long, 6--9 cm. wide, glabrous or very obscurely puberulent, the rachis striate, the primary branches few, usually 2 on each side, spreading, the lower ones 2--8 cm. long and usually subtended by a lanceolate foliaceous deciduous bract about 1 cm. long, the upper branches without bracts; bractlets linear, 1 mm. long or less; pedicels 8--10 mm. long; calyx-tube cuneate, 3--3.5 mm. long, glabrous, 5-lobed, the lobes green, oblong, about 3 mm. long and 1 mm. wide, apically acute, obscurely 3-veined, externally very slightly puberulent, internally glabrescent; corolla obscurely bilabiate, 7--8 mm. long, 8--9 mm. wide, white, the tube about 3.5 mm. long, glabrous on both surfaces, the limb subequally 5-lobed, the lobes ovate to elliptic-ovate, about 3.5 mm. long, 2--2.5 mm. wide, apically obtuse, marginally minutely ciliate, puberulent on the back; stamens 4, included, white, subequal; filaments glabrous or with a very few glandular hairs basally; anthers ellipsoid, about 1.7 mm. long; style elongated but not exerted; stigma unequally bilobed; ovary oblong or later basally subcuneate, obscurely puberulent on the upper 1/3; fruiting-calyx with the tube about 8 mm. long, strongly longitudinally striate or costate, glabrous, the lobes oblong, membranous, apically acute, 3-veined, reticulate, 10--15 mm. long, 2--4 mm. wide, minutely puberulent on the back and margins; fruit cuneate, about 8 mm. long, broadest in the upper 1/3, longitudinally striate.

This species is based on *Ramos* 1372 from damp forests along

small streams at low altitudes, Batu Lima, near Sandakan, Sabah, collected in October or November. Merrill cites also *Ramos* 1679 from the same locality and comments that the species is characterized by its very lax, few-flowered cymes and long-pedicellate flowers, but Munir (1965) points out that *P. bambusetorum* has similar inflorescences. Merrill claims that his species differs from the latter "not only in its inflorescence characters....but also in its few-nerved leaflets and in the distinctly ribbed fruits." Munir (1965) cites only the same two *Ramos* collections.

It should be noted that *Ramos*, on the labels of the type collection, says that the "petals" were green, but it may be that he was here referring to the calyx-lobes. The *Clemenses* found the plant "scandent on fig tree" in a jungle at 5000 feet altitude.

Material of *P. membranacea* has been misidentified and distributed in some herbaria as *Sphenodesme* sp. On the other hand, the *Bünne-meijer* 7258 & 7332 and *Slooten* 2299, distributed in some herbaria as *P. membranacea*, actually are *P. trifoliata* Merr.

Citations: GREATER SUNDA ISLANDS: Sabah: *Clemens & Clemens* 50401 (Mi), s.n. [Dec. 10/31] (Bz--23071); *M. Ramos* 1372 [field no. 301] (N--photo of type, Ph--type, Z--photo of type), 1679 (W--1376643).

PETRAEOVITEX MEMBRANACEA var. *MALESIANA* Munir, Gard. Bull. Singapore 21: 231, 246, & 247, fig. 4 & 5. 1965.

Synonymy: *Petraeovitex bambusetorum* sensu Lam ex Munir, Gard. Bull. Singapore 21: 231, in syn. 1965 [not *P. bambusetorum* King & Gamble, 1908].

Bibliography: H. J. Lam, Verbenac. Malay. Arch. 328. 1919; H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 98. 1921; Munir, Gard. Bull. Singapore 21: 215, 222, 227, 231, 246, & 247, fig. 4 & 5. 1965; Mold., Résumé Suppl. 13: 5 & 7. 1961; Mold., Fifth Summ. 1: 305 & 325 (1971) and 2: 597 & 897. 1971.

Illustrations: Munir, Gard. Bull. Singapore 21: 246 & 247, fig. 4 & 5. 1965.

This variety differs from the typical form of the species in having its leaflet-blades slightly thicker in texture, the secondaries up to 7 pairs, the inflorescences more lax, much longer, sometimes bearing foliaceous bracts in their early stages, the calyx pubescent also internally on the tube and lobes, the pedicels slightly shorter, and the fruit apically puberulent.

The variety is based on *Haviland & Hose* 1913B from Mount Singhi, Sarawak, deposited in the herbarium of the British Museum (Natural History) in London. Lam (1919, 1921) regarded this collection as *P. bambusetorum* King & Gamble. It should also be noted here that *Haviland & Hose* 1913 (with no letter following the numerical digits) is the type collection of *P. bambusetorum* f. *simplicifolia* Munir.

Munir (1965) cites for *P. membranacea* var. *malesiana*, in addition to the type collection, also *Symington & Kiah* 27765a from Pahang, *Hume* 7877 from Selangor, and *Haviland & Hose* 1913E from Sarawak.

The corollas are said to have been "pale-yellow" on the Symington & Kiah collection.

Citations; GREATER SUNDA ISLANDS: Sarawak: *Haviland & Hose 1913B* (Bm--type).

PETRAEOVITEX MULTIFLORA (J. E. Sm.) Merr., Interpret. Rumph. Herb. Amb. 453, 1917.

Synonymy: *Funis quadrifidus* Rumpf, Herb. Amboin. 5: 4, pl. 3. 1747. *Petrea multiflora* J. E. Sm. in Rees, Cycl., ed. 2, 27: *Petrea* no. 2. 1814. *Petraeovitex riedelii* Oliv. in Hook., Icon. Pl. 5: 15, pl. 1420. 1883. *Petraeovitex riedelii* F. Muell. ex Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 322. 1903. *Petrea multiflora* Sm. apud Trelease, Bot. Centralbl. 138: 123. 1918. *Petreovitex multiflora* Merr. apud H. Hallier, Meded. Rijks Herb. Leid. 37: 84, in syn. 1918. *Petreovitex riedelii* Oliv. apud H. Hallier, Meded. Rijks Herb. Leid. 37: 84. 1918. *Petraeovitex multiflora* Merr. apud Stapf, Ind. Lond. 5: 39. 1931. *Petraeovitex multiflora* var. *salomonensis* Bakh., Journ. Arnold Arb. 17: 75. 1935. *Petraeovitex sumatrana* var. *salomonensis* (Bakh.) Mold., Résumé 332. 1959. *Petraeovitex sumatrana* var. *solomonensis* (Bakh.) Mold. apud Munir, Gard. Bull. Singapore 21: 239, in syn. 1965. *Petraeovitex multiflora* var. *solomensis* Bakh. ex Munir, Gard. Bull. Singapore 21: 239, in syn. 1965.

Bibliography: Rumpf, Herb. Amboin. 5: 4, pl. 3. 1747; J. E. Sm. in Rees, Cyclop., ed. 2, 27: *Petrea* no. 2. 1814; Schau. in A. DC., Prodr. 11: 620. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 338. 1858; Hassk., Neue Schl. 89. 1866; Oliv. in Hook., Icon. Pl. 15: 15--16, pl. 1420. 1883; Hemsl. in Thomson & Murray, Rep. Scient. Res. Voy. Challenger 3, Bot. 1: 110. 1885; Fawcett in Forbes, Wander. 2: 225. 1886; K. Schum. & Hollr., Fl. Kais. Wilhelmsl. 122. 1889; Warb., Engl. Bot. Jahrb. 13: 427. 1891; F. Muell., Bot. Centralbl. 50: 195. 1892; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 478. 1894; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 179. 1895; K. Schum., Notizbl. Bot. Gart. Berlin 2: 145. 1898; K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 527. 1900; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 322. 1903; Pulle in Lorentz, Nova Guinea 8 (2): 403 (1910) and 8 (4): 687. 1912; Heyne, Nutt. Plant. Nederl. Ind., ed. 1, 4: 123. 1917; E. D. Merr., Interpret. Rumph. Herb. Amboin. 453--454. 1917; H. Hallier, Meded. Rijks Herb. Leid. 37: 84--85. 1918; Trelease, Bot. Centralbl. 138: 123. 1918; H. J. Lam, Verbenac. Malay. Arch. 324, 326--327, 329, & 366. 1919; H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 97 & 98. 1921; Fedde, Justs Bot. Jahresber. 45 (1): 552. 1923; Fedde & Schust., Justs Bot. Jahresber. 45 (1): 149. 1923; H. J. Lam in Lauterb., Engl. Bot. Jahrb. 59: 97--98. 1924; H. J. Lam in Bakh. & Lam, Nova Guinea 14, Bot. 1: 172. 1924; A. W. Hill, Ind. Kew. Suppl. 6: 150. 1926; E. D. Merr., Univ. Calif. Publ. Bot. 15: 267. 1929; Heyne, Nutt. Plant. Nederl. Ind., ed. 2, 4: 1324. 1925; Funke, Ann. Jard. Bot. Buitenz. 41: 39 & 55, pl. 15, fig. 13. 1930; Stapf, Ind. Lond. 5: 39. 1931; Junell, Symb. Bot. Upsal. 1 (4): 95--97, fig. 147. 1934; Mold., Prelim.

Alph. List Inv. Names 26, 34, & 35. 1940; Mold., Suppl. List Comm. Vern. Names 9 & 21. 1940; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 322. 1941; Worsdell, Ind. Lond. Suppl. 2: 214. 1941; Kanehira & Hatusima, Bot. Mag. Tokyo 56: 114--115. 1942; Mold., Alph. List Inv. Names 24 & 35. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 57, 60, 64, 66--68, 70, & 97. 1942; Mold., Phytologia 2: 108. 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 478. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 133, 139, 144, 147--150, 155, 162, & 192. 1949; H. N. & A. L. Mold., Pl. Life 2: 78. 1948; Mold., Biol. Abstr. 25: 3051. 1951; Mold., Phytologia 3: 421. 1951; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 322. 1959; Mold., Résumé 180, 190, 197, 199, 201, 202, 204, 207, 211, 220, 295, 332, 333, & 464. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 478. 1960; Turrill, Curtis Bot. Mag. 173: pl. 355, in textu. 1960; Mold., Résumé Suppl. 3: 24 & 34. 1962; Munir, Gard. Bull. Singapore 21: 215--222, 224, 228, 239--242, 250, & 256, map 2, fig. 13 & 14. 1965; Mold., Résumé Suppl. 13: 5--7. 1966; Whitmore, Guide Forests Brit. Solom. Isls. 152 & 195. 1966; Mold. in Menninger, Flow. Vines 337. 1970; Mold., Fifth Summ. 1: 305, 325, 330, 332, 333, 337, 339, 340, 350, 351, & 366 (1971) and 2: 519, 597--599, & 897. 1971; Balgooy, Pacif. Pl. Areas 3: 244. 1975.

Illustrations: Rumpf, Herb. Amboin. 5: pl. 3. 1747; Oliv. in Hook., Icon. Pl. 15: pl. 1420. 1883; Funke, Ann. Jard. Bot. Buitenz. 41: pl. 15, fig. 13. 1930; Junell, Symb. Bot. Upsal. 1 (4): 95, fig. 147. 1934; Munir, Gard. Bull. Singapore 21: 255 & 256, fig. 13 & 14. 1965.

A slender high-climbing liana or herbaceous scrambler; the stems sometimes to 3 cm. in diameter and with a girth of 7.5 cm.; branchlets tetragonal, dark-brown or coffee-color, at first tomentellous, later glabrescent; leaves decussate-opposite, compound, once or twice (sometimes unequally) trifoliolate; leaflets 3--9, often small, sometimes sessile (var. *salomonensis*); primary petiole 2--10 cm. long, very slender, glabrous; secondary terminal petioles, if any, very slender, 1.2--4.8 cm. long, glabrous; secondary lateral petioles, if any, 2--3 cm. long; petiolules subfiliform, canaliculate above, often grayish-tomentellous, 2--14 mm. long, or absent (var. *salomonensis*); leaflet-blades chartaceous or subcoriaceous, green or light-green above, light-green beneath, ovate-elliptic or ovate-oblong, apically obtusely acuminate-apiculate or retuse, marginally entire, basally obtuse to rounded or subcordate to cuneate or subtruncate, at first pubescent (especially on the venation) beneath, finally glabrescent, the central or intermediate leaflets oblong-lanceolate, often attenuate at both ends and basally decurrent, 3.5--11 cm. long, 4--6.2 cm. wide, borne on petiolules 0.5--1.5 cm. long, the lateral leaflets slightly smaller and borne on slightly shorter stalks, 5--10 cm. long, 3--5 cm. wide, basally sometimes cordulate, borne on petiolules 2--7 mm. long; secondary laterals sometimes sessile; secondary veins 6--9; inflorescence loosely cymose-paniculate, pedunculate, to about 50 cm. long and 40 cm. wide, terminal or

axillary, with the lateral branches foliose beneath, many-flowered; peduncles absent or to 1 cm. long; principal rachis tetragonal, puberulent; cymes short-pedunculate or the upper ones sessile, 3--8 mm. long, puberulent, 0.5--1 cm. wide, 7--15-flowered, tomentellous or puberulent; bracts and bractlets at base of cymes minute, linear, 1--2.5 mm. long, puberulent; bracteoles (prophylla) linear, almost half the length of the bractlets; flowers small, congested, sessile or very shortly pedicellate, scented, borne on "paniculate spikes", 4--6 mm. wide in all; calyx about 1 mm. long, 1--1.5 mm. wide, 5-toothed or 5-lobed, externally gray-tomentellous or -tomentose, internally glabrous, its tube infundibular, the lobes 5, deltoid, about 1/3 as long as the tube, pale-green, accrescent in fruit to 1.2 cm long; corolla white or whitish to yellow, its tube very short, about 2 mm. long, deeply divided posteriorly, unequally 5-lobed, externally sparsely puberulent-pubescent or glabrescent, internally villous in the throat, the lobes 5, apically rounded, slightly incurved or reflexed; stamens 4, alternate with the petals (the dorsal one absent), inserted at the throat of the corolla-tube, subequal, exserted; filaments about 1.2 mm. long; anther thecae more or less rounded; style long-exserted, glabrous; stigma 2-lobed or bifid, the lobes reflexed; ovary ovoid, apically puberulent or gray-tomentellous, otherwise glabrous; fruiting-calyx to 1.5 cm. long, the tube about 2 mm. long, strongly costate, externally puberulent, the lobes oblanceolate, to 1.3 cm. long, about 3 mm. wide, 3-veined, sparsely puberulent; fruit about 1.5 mm. long, apically broad and 4-lobed, basally cuneate, puberulent, striate, often 3- or 4-seeded.

The species is based on a collection made by Christopher Smith on Honimoa island, in the Molucca Islands. Merrill (1917) comments that "Smith's species, which has been previously considered as one of doubtful status, was excluded from the *Verbenaceae* by Schauer [1847], where, however, it manifestly belongs. The only other suggested reduction of *Funis quadrifidus* Rumph. was Teysmann's opinion, quoted by Hasskarl....., that it was in *Illigera* (*Hernandiaceae*) and Hasskarl's own opinion that it was possibly a species of *Vitis*; both of these suggested reductions are manifestly wrong."

Petraeovitex riedelii is based on a Riedel collection from Buru island, while *P. multiflora* var. *salomonensis* is based on *Kajewski* 1687 from the Kupai Goldfield, at 850 m. altitude, on Bougainville island, collected on April 11, 1930. The latter represents a form with the secondary lateral petiolules normally absent.

Smith's (1814) description and discussion of this species are of interest: "Leaves and clusters twice compound. -- Gathered in the island of Honimoa, or Honimao, by the late Mr. Christopher Smith, from whom we have an unnamed specimen. The stem is woody, climbing, branched, quadrangular, with four furrows; downy when young. Leaves opposite, on longish smooth stalks, twice ternate; leaflets on shortish stalks, ovate, undulated, entire, smooth on both sides; shining above; rather opaque and somewhat paler beneath, with a rib and veins like the former species; the terminal ones one

and a half inch long, the rest much smaller. Clusters axillary, twelve or eighteen inches long, twice compound, downy, composed of innumerable, somewhat whorled, flowers, of whose colour we can determine nothing from the dried specimen, but they appear to agree in that respect with the foregoing. Their size is rather smaller. The segments of the calyx are more contracted at the base, and its tube has ten strong ribs; whereas the other species has five principal ribs, far less conspicuous, and a number of minute crowded intermediate ones.

"Such is our plant, which accords precisely with the figure of Rumphius; but his description is less applicable. What he asserts, of the main stems splitting into four parts, and discharging a bitter limpid water, we have no means of verifying. He says the flowers are yellow, or whitish, with six minute petals and as many stamens, having in the middle a cloven pistil, like a lizard's tongue. The germen is said to turn black as it ripens; but of the nature of the fruit he gives no account. -- Notwithstanding this description, his plate exhibits the calyx in five deep segments, with others in an early state, exactly as in our specimen. There is no representation of the stamens or pistil. He describes the leaflets twice as large as we find them, and remarks that their stalks, when old, become claspers. The stems are very tough and pliant, serving for ropes. On the whole there seems little doubt that the plant of Rumphius being the same with our's, nor, though we have often had his plate and description in contemplation, do we find anything so applicable to them as this *Petrea*." He calls the plant "panicled petrea".

Collectors have found this plant growing on riverbanks and ridgetops, in rainforests and high rainforests, primary and secondary forests and swamp forests, at the margins of woods and rainforests, in open country along beaches, in open weedy rocky ground, on flatlands and in flatland woods, and in roadside regrowth, at 5--765 m. altitude, in anthesis from February to May and July to December, and in fruit in May, September, November, and December. Whitmore (1966) states that it is a common woody climber in lowland forests in the Solomon Islands. Pleyte refers to it as a common liana in the swamp forests of New Guinea, while Stone found it climbing over rocks in woody vegetation on rocky open ground in Papua.

The corollas are said to have been "white" on Brass 32643, Kajewski 1686, Pleyte 552 & 721, and Teona s.n., "greenish-white" on Stone 9714, "pale-yellow" on Brass 3998 and Fryar 3998, "yellow" on Streimann & Kairo NGF.21165, and "light-green" on Pulle 1218. On Pleyte 722 the "flowers" are described as "light-brown", but probably it is the fruit that is referred to here.

Vernacular and common names recorded for the species are "hahiat", "harharalamas", "kwalomadiko", "kwalo ngorimadiki", "kwalo ngorimadiko", "panicled petrea", "seroe wari", "seroewari", and "tali boeboe".

Floyd inaccurately describes the leaves as "trifoliate", rather than "trifoliolate", while Stone refers to them as "pinnate-

bipinnate". Munir (1965) consistently refers to them as "ternate or biternate". He elaborates: "When 3, they may be said to be 'pseudoleaflets', for each one will form two lateral leaflets and when 5, the two lower ones are 'pseudoleaflets' and so will form their lateral 'acolytes'."

It is perhaps worth mentioning that the Schumann & Lauterbach (1900) reference in the bibliography of this species (above) is sometimes cited by the incorrect titlepage date of "1901" -- the New York Botanical Garden Library received its copy of the work already on December 7, 1900.. Merrill (1917) erroneously refers to Schauer's (1847) work as published in "1857". The Foreman (1972) reference is often cited by its titlepage date of "1971". The Bakhuizen (1935) work is mis-cited by Munir (1965) as occurring in volume "17" instead of "16".

The record of this species from Duke of York island appears to refer, not to the island of that name in the Union Island of Micronesia nor to the one of that name now belonging to Chile, but, rather, according to Munir (1965) to one in the Bismark Archipelago not listed on atlases immediately available to me.

Junell (1934) observes, regarding the present species: "Bei *P. Riedelii* hingegen glaube ich drei bis vier Samen in jeder Frucht beobachtet zu haben. Bei dieser Art sind die Früchte klein, und obwohl ich mehrere verschiedene Herbarexemplare untersucht habe, konnte ich keine mit gut erhaltenen Früchten finden. Auch bei dieser Art zerfällt die Frucht nicht.....Die Samenanlagen sind... sehr hoch inseriert.....Bei *P. Riedelii* erfolgt die [Plazenten] Verwachsung etwas weiter unten. Die eigentlichen Fruchtblattränder bleiben bei dieser Verwachsung frei; sie verwachsen auch nicht mit den mittleren Partien der Fruchtblattränder."

Warburg (1891) remarks regarding the habitat noted for the species by Hollrung: "Seine Bezeichnung 'am Wasser' ist geeignet, falsche Vorstellungen hervorzurufen; wie die meisten Lianen liebt die Pflanze Waldränder. mithin auch stellen, wo der Wald an den Fluss oder nahe an die See tritt; man findet sie übrigens auch mitten im Walde."

Lam (1924) cites *Schlechter* 16944 and *Weinland* 261 & 1646 from New Guinea, *Peckel* 503, 536, & 743 from New Mecklenburg, and *Schlechter* 13737 from New Pomerania, as well as the doubtful collections: *Lauterbach* 777, *Nyman* 245, and *Wiesenthal* 66 from New Guinea. He gives its overall distribution as "Buru, Amboina, Saparua, Aru, New Guinea, New Mecklenburg, and New Pomerania". Kanehira & Hatusima (1942) cite *Kanehira & Hatusima* 12582 & 12872, giving the species' natural distribution as the Molucca Islands to New Guinea and the Bismark Archipelago.

Hallier (1918) cites *Forsten s.n.* from Amboina and *Versteegh* 1026 from New Guinea, giving the overall distribution as "Buru (nach Oliver); Saparua (nach Forbes); Aruh-inseln, n.o.-Neuguinea u. Bismarck-archipel (nach K. Schum. u. Lauterb.). Auch in 1892 gesehenes Exemplar in Herbar des Wiener Hofmuseums dürfte wohl zu dieser Art gehören". Schumann (1898) cites only *Hollrung* 106, while Schumann & Lauterbach (1900) cite *Hellwig* 387 and *Hollrung*

106 from Territory of New Guinea and Warburg s.n. from Ulu island in the Bismark Archipelago.

The present species is the only one known to Briquet (1895) who refers to it as "poorly known". It is the type species of the genus.

Munir (1965) cites the following collections: MOLUCCA ISLANDS: Amboina: Forsten s.n. Buru: Riedel s.n.; Vriese & Teijsmann s.n. Ceram: Rutten 1870. Mongoli: Atje 45. Honimoa: C. Smith s.n. Kairatu Gemba: Kuswata & Soepadmo 59. NEW GUINEA: Beccari 586; Brass 3998, 32643; Hellwing 387; Henty 10522; Ledermann 6687; Kanehira & Hatusima 12582; Millar 9714; Pleyte 552, 721, 722; Pulle 1218; Pullen 1812; Royen & Sleumer 5807, 6196; Schlechter 13737; Turner s.n.; Versteeg 1026; Weinland 261. BISMARK ARCHIPELAGO: Duke of York: Bradtke 346. New Britain: Floyd 6632; Mc Keel 1559. New Ireland: Peekel 503. SOLOMON ISLANDS: Kajewski 1686.

Lam (1921) record the species from New Zealand, but, as Tur-rill (1960) suggests, this may be an unintentional error for New Ireland in the Bismark Archipelago.

Citations: MOLUCCA ISLANDS: Amboina: Riedel s.n. [Aug. '83] (Pd, Pd). Ceram: Rutten 1870 (Bz--22040, N, Ut--81126). Honimoa: Roxburgh 152 (Mu--1705). Mangole: Atje 45 (Bz--22041, Bz--22042). NEW GUINEA: North East New Guinea: Brass 32643 (W--2392909); Fryar 3998 (Ng--6582); Hellwig 387 (Bz--22048); Streimann & Kairo NGF.21165 (Mu); Weinland 261 (Mu--3948). Papua: Schlechter 16944 (Ca--226632); B. C. Stone 9712 [LAE.53012] (Kl--16227), 9714 [NGF.53014] (Kl--16345, Kl). West Irian: D. Bergman 12 (S), 14 (S); Kanehira & Hatusima 12582 (Bz--22043); Pleyte 552 (Bz--73026), 721 (A, Bz--73025), 722 (Ba, Bz--73016, Bz--73017, Bz--73018, Bz, Ng--16952, Ng); Schlechter 13737 (Bz--22045); Van Römer 122 (Bz--22049); Versteeg 1026 (Bz--22046, Bz--25600). BISMARK ARCHIPELAGO: Duke of York: F. Mueller s.n. (Mg, N). New Britain: Floyd 6632 (Ng--16974, Ng). New Ireland: Peekel 503 (B). SOLOMON ISLANDS: Bougainville: Kajewski 1686 (Bi, Bz--22047, Bz--22048, N, N--photo, Z--photo). Ysabel: Teona s.n. [Herb. Brit. Solom. Isls. Prot. 6355] (W--2578109). CULTIVATED: Java: Herb. Hort. Bot. Bogor. XV.G.3 (Bz--26354, Bz--26355, Bz, Bz, Bz, Bz, Bz, N), XV.G.8 (Bz, N), XV.G.8a (Bz--26356, Bz--26357, Bz, Bz, N), XV.G.46 (Bz--26358, N); Herb. Mus. Bot. Upsal. s.n. [Hort. Bot. 1832] (N, S). MOUNTED ILLUSTRATIONS: Hook., Icon. Pl. 15: pl. 1420 (Ut--73478).

PETRAEOVITEX MULTIFLORA var. *PUBESCENS* (Warb.) Munir, Gard. Bull. Singapore 21: 242 & 257, pl. 17. 1965.

Synonymy: *Petraeovitex pubescens* Warb., Engl. Bot. Jahrb. 13: 467. 1891.

Bibliography: Warb., Engl. Bot. Jahrb. 13: 427. 1891; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 322. 1903; H. J. Lam, Verbenac. Malay. Arch. 324, 328, & 366. 1919; H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 97 & 98. 1921; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 322. 1941; Mold., Known Geo-

gr. Distrib. Verbenac., ed. 1, 67 & 97 (1942) and ed. 2, 148, 149, & 192. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 322. 1959; Mold., Résumé 199, 201, & 464. 1959; Munir, Gard. Bull. Singapore 21: 215, 216, 222, 242, & 257, pl. 15. 1965; Mold., Résumé Suppl. 13: 5 & 7. 1966; Mold., Fifth Summ. 1: 332 & 337 (1971) and 2: 897. 1971.

Illustrations: Munir, Gard. Bull. Singapore 21: 257, pl. 15. 1965.

This variety differs from the typical form of the species in having small, more or less basally rounded or subcordate leaflet-blades, which are sparsely pilose or subglabrous above, pubescent beneath, especially on the venation, and marginally coarsely and irregularly dentate or entire, and the calyx-tube glabrous, but the calyx-lobes puberulent.

The variety is based on *Warburg 21148* from Key island in the Molucca Islands. Munir (1965), who cites only the original collection, comments that Warburg, in his original description of this taxon, "stated that the calyx lobes are glabrous and its tube pubescent (a statement.....also repeated by Lam), but actually the reverse is the case; for, though the calyx is entirely puberulent outside as in *P. multiflora*, the lobes are hairy within and the tube is glabrous." In typical *P. multiflora* "the calyx is glabrous inside but in the fruiting calyx the lobes are often puberulent inside." Not having seen any material of this taxon as yet, I am unable at this time to verify and/or amplify the characters given so ambiguously by Munir.

Munir also admits that "The dentation and hairiness on the leaves are apparently a mark of juvenility, for later leaves tend to become both entire and almost glabrous on both sides, but so far no adult leaves were seen." The same characters, however, not been reported for the typical form of the species.

Warburg (1891) comments that his *P. pubescens* differs from *P. multiflora* "durch die starke Behaarung von Blattstiel und Blattunterseite, durch die andere Form der viel kleineren Blätter, durch die Zahnung, durch die kleineren, schmälere, achselständigen (bei *Riedelii* terminalen) Blütenstände und die kleineren und viel schmälere Zipfel des Fruchtkelches."

PETRAEOVITEX SCORTECHINII King & Gamble, Kew Bull. Misc. Inf. 1908: 113. 1908.

Synonymy: *Petraeovitex scortechini* King & Gamble ex Mold., Alph. List Inv. Names 35. 1942.

Bibliography: King & Gamble, Kew Bull. Misc. Inf. 1908: 113. 1908; King & Gamble, Mat. Fl. Malay Penins. 4: 1068. 1909; Prain, Ind. Kew. Suppl. 4, imp. 1, 177. 1913; H. J. Lam, Verbenac. Malay. Arch. 324, 329, & 366. 1919; H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 97 & 99. 1921; Ridl., Fl. Malay Penins. 2: 637. 1923; Junell, Symb. Bot. Upsal. 1 (4): 97. 1934; Mold., Alph. List Inv. Names 35. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 60, 61, & 97. 1942; Mold., Alph. List Inv. Names Suppl. 1: 18. 1947; H. N. & A. L. Mold., Pl. Life 2: 82. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 148, 149, & 192. 1949;

Prain, Ind. Kew. Suppl. 4, imp. 2, 177. 1958; Mold., Résumé 180, 193, 332, 333, & 464. 1959; Turrill, Curtis Bot. Mag. 173: pl. 355. 1960; Munir, Gard. Bull. Singapore 21: 215--220, 222, 225, 227--229, 233, & 242, map 3, fig. 1. 1965; Mold., Fifth Summ. 1: 305 & 325 (1971) and 2: 597, 599, & 897. 1971; Balgooy, Pacif. Pl. Areas 3: 244. 1975.

Illustrations: Munir, Gard. Bull. Singapore 21: 243, fig. 1. 1965.

A scandent shrub or liana; branches angled, fulvous, puberulent; young branchlets pale-brown, puberulent, the youngest parts tawny-pubescent; leaves decussate-opposite, trifoliate, the young ones yellowish on floriferous branches; petioles very slender, 3.8--6 cm. long, fulvous-pubescent; leaflet-blades membranous, the central one ovate, 5--8 cm. long, 2.5--5 cm. wide, apically shortly and obtusely acute, marginally entire or undulate, basally rounded or slightly cuneate, puberulent or pubescent above, grayish-pubescent beneath, borne on a fulvous-pubescent petiolule 1.2--2 cm. long, the secondaries 4 pairs, sharply antorsely arcuate; lateral leaflet-blades similar but somewhat smaller and basally somewhat unequally cordate, pubescent on both surfaces, borne on a fulvous-pubescent petiolule 0.5--1 cm. long; inflorescence with the flowers borne in short decussate di- or trichotomous cymes on the terminal (15--30 cm. long) portion of the branchlets, fulvous, or solitary in the axils of young pale-green or yellowish leaves, 3--5 cm. long; bracts orbicular or suborbicular when young, eventually elliptic or clavate, 1.3--1.9 cm. long, yellowish; bracteoles yellowish; pedicels short; calyx fulvous-pubescent externally, puberulent within, deeply 4- or 5-lobed or split, the lobes oblong or obovate to spatulate, 0.6--1.2 cm. long; corolla bilabiate, 1.5--2 cm. long, the lobes spatulate, concave, 2--4 mm. long; stamens 4, exserted, the 2 posterior (lower) ones longer than the 2 upper (anterior) ones; filaments 6--8 mm. long; anther thecae at first parallel, later divergent; style exserted, to 15 mm. long; stigma bilobed (or sometimes trilobed when young), the lobes spreading; ovary cylindric, about 2 mm. long and wide, apically obtuse and villous, basally pilose, 2-celled; fruiting-calyx greatly accrescent, 1.9--2.5 cm. long, the tube about 6 mm. long, 3-veined, the venation reticulate, the lobes elliptic-oblong, 1.8--2.5 cm. long, scarious, 3--5-veined, reticulate; fruit capsular, oblong or oblanceolate to cuneate, apically broadest, obtuse, and pubescent, basally narrowed or cuneate, longitudinally costate or striate, 6--7 mm. long, 1- or 2-seeded, the exocarp chartaceous; seeds 1 or 2, attached to a central placenta, the testa membranaceous, the cotyledons obovate, fleshy, 3--4 mm. long, the radicle thick.

This species is based on *Scortechini* "753 or 1753" from Perak, deposited in the Kew herbarium. Collectors have found the plant growing at 1000 feet altitude, in anthesis in October.

Munir (1965) comments that "Among the species that bear yellowish-coloured young leaves, bracts and bracteoles on the flower bearing branches, this species is easily distinguished by its

pubescent leaves, exserted stamens and styles, rounded anther lobes, villous ovary in the upper part, and pubescent, non-constricted fruit which is gradually enlarged towards the apex." He cites *Alvins 1858* from Negri Sembilan, *Scortechini s.n.* from Perak, and *Symington 44092* from Selangor. He notes that "Inflor-escence produced on old wood in the axils of fallen leaves seems to differ somewhat from those described as normal, for the former are apparently specialized, limited branches of about 10--15 cm. long and two or more branches may grow from the same pulvinus." Lam (1919, 1921) cites no specimens, but records the species only from Malacca. Ridley (1923) cites only *Scortechini s.n.* from Perak, referring to the species as "Very rare". He says in his description "nerves 2 to 3 in. long, 1 to 2 in. wide", but this is obviously a stenographic or typographic error for the leaflet-blade dimensions.

Citations: MALAYSIA: Selangor: *Nur 34212* (Ca--3156, N, S, W--2157550). GREATER SUNDA ISLANDS: Kalimantan: *Endert 2426* (Bz--72605, Bz--72606, Er, N).

PETRAEOVITEX SUMATRANA H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 98. 1921.

Synonymy: *Petraeovitex elmeri* Merr., Univ. Calif. Publ. Bot. 15: 267. 1929. *Petraeovitex elmeri* Merr. apud Fedde & Schust., Justs Bot. Jahresber. 59: 417, sphalm. 1939.

Bibliography: H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 97 & 98. 1921; A. W. Hill, Ind. Kew. Suppl. 7: 183. 1929; E. D. Merr., Univ. Calif. Publ. Bot. 15: 267. 1929; Fedde & Schust., Justs Bot. Jahresber. 53: 1075. 1932; A. W. Hill, Ind. Kew. Suppl. 8: 178. 1933; Fedde & Schust., Bot. Jahresber. 59: 417. 1939; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 63, 65, & 97. 1942; H. N. & A. L. Mold., Pl. Life 2: 58. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 143, 145, 146, & 192. 1949; Mold., Résumé 188, 192, 193, 332, & 464. 1959; Mold., Résumé Suppl. 3: 34. 1962; Munir, Gard. Bull. Singapore 21: 215--220, 222, 224, 228, 237--239, 242, & 254, fig. 12. 1965; Mold., Résumé Suppl. 13: 6 & 7. 1966; Mold., Fifth Summ. 1: 325 (1971) and 2: 597 & 897. 1971; Balgooy, Pacif. Pl. Areas 3: 245. 1975.

Illustrations: Munir, Gard. Bull. Singapore 21: 254, fig. 12. 1965.

A climbing or trailing somewhat woody vine; stems pale-brown or gray, acutely tetragonal, about 5 mm. in diameter, smooth, repeatedly rebranched; principal internodes about 11 cm. long; branchlets at first dark-green, later yellowish-brown, glabrous; leaves decussate-opposite, once (on the ultimate branchlets) or twice trifoliolate, in all 10--15 cm. long; primary petioles very slender, 2--5 cm. long, sparsely or densely puberulent; leaflets 3--11, usually 6; leaflet-blades chartaceous to subcoriaceous, ovate-elliptic, apically broadly and obtusely acuminate, marginally entire, basally rounded or acute to subcuneate, mostly inequilateral, rigid, dark-olivaceous when dry, paler beneath, glabrous or often minutely puberulent on the lower surface (especially on the midrib and larger venation) when young, less so in age, 4--7-veined, usually somewhat folded or recurved a-

pically; secondary terminal petioles 1.5--3 cm. long, densely puberulent; central leaflet-blade 3--5 cm. long and 2.8--3.5 cm. wide, borne on a puberulent petiolule 1.5--2 cm. long; lateral leaflet-blades 2--3.8 cm. long and to 2 cm. wide, borne on puberulent petiolules 2--5 mm. long; secondary lateral petioles 5--15 mm. long, densely puberulent; central leaflet-blades to 4.3 cm. long and 2.3 cm. wide, borne on puberulent petiolules to 1 cm. long; lateral leaflet-blades to 2.8 cm. long and 2 cm. wide, borne on petiolules 2--5 mm. long or sometimes sessile; inflorescence erect, pale-green (except for the corollas), axillary and terminal, narrowly cymose-paniculate, 15--30 cm. long, with lateral branches to 15 cm. long, and racemously arranged, the lowermost ones only 1.5 cm. long, densely pubescent; main rachis tetragonal, sparsely puberulent; cymes 0.5--1 cm. long, 2--5- (mostly 3-) flowered, puberulent; bracts at the base of each cyme linear, minute, about 1 mm. long, puberulent; bracteoles linear, about 0.5 mm. long or less; flowers small, congested; pedicels 1--2 mm. long, puberulent; calyx about 2 mm. long, externally puberulent, its tube infundibular, 1--1.5 mm. long, internally glabrous, the lobes 5, oblong, 0.9--1.4 mm. long, apically obtuse, puberulent; corolla yellowish, infundibular, externally glabrous, the tube broad or narrow, apically ampliate, 1.5--2.5 mm. long, sparsely glandular in the throat, the lobes 5, ovate, about 1 mm. long, subequal, slightly shorter than the tube, apically obtuse or rounded, externally glabrous, internally pubescent on the upper half, finally reflexed; stamens 4, inserted at or slightly below the mouth of the corolla-tube, about 2 mm. long, exserted, whitish; filaments slender, laterally compressed, glabrous; anthers elliptic-ovate; style filiform, 4.5--6 mm. long, glabrous; stigma bilobed, the lobes 0.5--1 mm. long; ovary oblong or suboblong, apically puberulent, slightly 4-lobed; fruiting-calyx accrescent, glabrous, the tube 3--5 mm. long, costate, including the fruit, the lobes membranous, oblong-oblancheolate or spatulate, 0.6--1.9 cm. long, 1.5--4 mm. wide, apically obtuse, somewhat 3-veined and reticulate, basally acute.

This species is based on *Ajoeb* 183 from Rimbo Pengadang, Sumatra, deposited in the Buitenzorg herbarium. The type of *P. elmeri* is *Elmer* 21883 from among herbaceous thickets in clearings on the banks of a creek near Tawao, Elphinstone Province, Sabah.

Lam (1921) cites only *Ajoeb* 131 & 183 from Sumatra. Munir (1965) cites *Ajoeb* 183 and *Voogd* 1062 from Sumatra and *Elmer* 21883 from Sabah.

The species has been encountered at 1000 m. altitude, in flower and fruit in June. Munir (1965) comments that the species is closely related to *P. multiflora* (J. E. Sm.) Merr. because of "having biternate leaves, small congested flowers [=inflorescences] [and] exserted stamens and style, but differs in having: calyx lobes almost equal to the tube and conspicuously puberulent within and without, corolla sparsely glandular at the throat, minutely puberulent in the lobes; anther lobes \pm elliptic and style longer.....In *P. multiflora* the calyx lobes are practically

glabrous within, the corolla is villous in the throat, anther lobes rounded." In *P. sumatrana*, he notes, "the leaves are comparatively short even on old stem. In *P. multiflora* small leaves are found only on young apical stems." By "leaves" he here obviously means "leaflets" or leaflet-blades.

Citations: GREATER SUNDA ISLANDS: Sabah: *Clemens & Clemens* 28348 (Bz--22050); *Elmer* 21883 (Bi, Bz--22039, Ca--312134, Du--175304, Mu, N, N--photo, Z--photo). Sumatra: *Ajoeb* 131 (Bz--22053--isotype, N--isotype), 183 (Bz--22052, N--photo, Z--photo); *Voogt* 1062 (Bz--22051).

PETRAEOVITEX TRIFOLIATA Merr., Philip. Journ. Sci. Bot. 2: 425. 1907.

Synonymy: *Petreovitex ternata* H. Hallier, Meded. Rijks Herb. Leid. 37: 85--86. 1918. *Petreovitex trifoliata* Merr. ex H. Hallier, Meded. Rijks Herb. Leid. 37: 84. 1918. *Petraeovitex ternata* var. *typica* H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 97--98. 1921. *Petraeovitex ternata* var. *glabrior* H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 98. 1921. *Petraeovitex ternata* H. Hallier apud A. W. Hill, Ind. Kew. Suppl. 6: 150, 1926. *Petraeovitex trifolia* Merr. ex Mold., R  sum   332, in syn. 1959. *Petraeovitex bambusetorum* "sec Merr." ex Munir, Gard. Bull. Singapore 21: 235, in syn. 1965 [not *P. bambusetorum* King & Gamble, 1908].

Bibliography: E. D. Merr., Philip. Journ. Sci. Bot. 2: 425. 1907; H. Hallier, Meded. Rijks Herb. Leid. 37: 85--86. 1918; H. J. Lam, Verbenac. Malay. Arch. 324--326 & 366. 1919; H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 97--98. 1921; E. D. Merr., Enum. Philip. Flow. Pl. 3: 406. 1923; A. W. Hill, Ind. Kew. Suppl. 6: 150. 1926; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1074--1075. 1932; Junell, Symb. Bot. Upsal. 1 (4): 95 & 97, fig. 145 & 146. 1934; Mold., Alph. List Inv. Names 35. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 62, 65, & 97. 1942; Mold., Alph. List Inv. Names Suppl. 1: 18. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 142, 145, 146, & 192. 1949; Mold., R  sum   184, 187, 192, 193, 332, 333, & 464. 1959; Munir, Gard. Bull. Singapore 21: 215--220, 222, 226, 227, 235--237, 242, & 253, fig. 11. 1965; Mold., R  sum   Suppl. 13: 5 & 7. 1916; Mold., Fifth Summ. 1: 317 & 325 (1971) and 2: 597, 599, & 897. 1971; Mold., Phytologia 23: 434. 1972; Balgooy, Pacif. Pl. Areas 3: 245. 1975; Mold., Phytologia 46: 50 & 171. 1980.

Illustrations: Junell, Symb. Bot. Upsal. 1 (4): 95, fig. 145 & 146. 1934; Munir, Gard. Bull. Singapore 21: 253, fig. 11. 1965.

A large herbaceous or woody vine or liana, to 7 m. long, climbing by means of its older petioles or sometimes "with a few stout tendrils" (sec Clemens), the youngest parts ferruginous-tomentellous; branchlets acutely tetragonal, brown or "dirty-khaki" in color, 2--2.5 mm. thick, at first grayish-fuscos-pubescent or subtomentellous, later glabrescent; principal internodes to 9 cm. long; cambium pale-greenish; leaves decussate-opposite, 3-foliolate, long-petiolate; petioles very slender, 3--7.5 cm. long, often cirrate; leaflets subequal, more shortly petiolulate, the

blades membranous or chartaceous to subcoriaceous, obliquely ovate or oblong-ovate, apically conspicuously acuminate (the acumens to 1 cm. long), marginally entire or slightly undulate, basally cordulate or cordate to subcuneate, dark-green and opaque on both surfaces when dry, glabrous on both surfaces or sometimes plumose-hairy and glandulose-punctate along the midrib toward the base beneath and in the axils of the secondaries, loosely but prominently reticulate-venose above and finally slightly rugose because of the sulcate venation, the secondaries usually 4 pairs, the veinlet reticulum conspicuously prominent beneath and pinnately clathrate-lineate; central leaflet-blade 7.2--14 cm. long and 4.3--7.8 cm. wide, borne on a petiolule 1--2 cm. long; lateral leaflet-blades to 12 cm. long and to 7.5 cm. wide, borne on petiolules 0.5--1.5 cm. long; inflorescence a loose terminal thyrsoïd panicle with the lower branches axillary and also with axillary and terminal cymes; bracts and bracteoles numerous, leafy, usually caducous; flowers congested on shortly subdivided branchlets; pedicels very short, purple; calyx about 8 mm. long, puberulent (in bud externally ferruginous-tomentellous), 4- or 5-lobed, the lobes oblong-lanceolate, about 4 mm. long; corolla yellowish or greenish-white, its tube narrowly infundibular, about 5 mm. long, externally puberulent (in bud externally cinereous-tomentellous), internally glabrous below the stamen insertion, glandular-pilose near and slightly above the stamen insertion, the lobes oblong-ovate, about 3 mm. long, apically rounded; stamens 4, subequal, 4--5 mm. long, subincluded; filaments basally slightly pilose; anthers oblong, about 1 mm. long, the thecae often slightly pilose; style 4--6 mm. long, slightly exserted, at first terminal, later excentric, basally sparsely pilose; stigma unequally bilobed; ovary oblong, 3--5 mm. long, glanduliferous, the upper 1/3 externally pubescent or ferruginous-tomentellous, with 2 pendent ovules attached to the septum in each cell; fruiting-calyx greatly accrescent, its tube turbinate, 5--8 mm. long, about 3 mm. wide, strongly costate, the 4 or 5 lobes spatulate or oblanceolate-spatulate, 1.5--2 cm. long, 5--6 mm. wide, apically obtuse, reticulate-venose, basally 3-veined, puberulent or pulverulent-puberulent on both surfaces; fruit cylindric or subconic to oblong, green, 5--7 mm. long, basally slightly narrowed, apically usually ampliate and at first rounded, later truncate and depressed, longitudinally striate, the upper 1/5 pubescent, 1- or 2-seeded.

This species is based on *Foxworthy s.n.* [Herb. Philip Bur. Sci. 708] from Palawan island, Philippine Islands, originally deposited in the Bureau of Science herbarium at Manila, now destroyed. Hallier's *P. ternata* is based on *Korthals s.n.* from Borneo and Hallier 4613 & 4722 from Mindanao island. Hallier (1918) reports finding the plant growing high in the rainforest canopy and in secondary scrub with/on *Pseuderanthemum*, *Ficus*, *Pterospermum*, and *Vitex co-fassus*, sometimes associated with abundant *Arenga saccharifera*. He describes it as a "Frutex petiolarum ope scandens, passim anisophyllus" and comments that "Zur nämlichen Art gehört wohl auch Winkler no. 2756, am 8.VII.1908 mit Blütenknospen zwischen Kundim baruh und Butuh babie in s.o.-Borneo gesammelt, doch unter-

scheidet sich dieses Exemplar dadurch, dass die verzweigten Haare auf der Blattunterseite schon sehr früh abfallen und das Mittelblattchen zuweilen am Seitenrande einen kurzen Zahn oder Lappen hat."

Lam (1921) keeps *P. ternata* and *P. trifoliata* apart as two separate valid taxa, distinguishing them as follows:

P. trifoliata -- Leaflets (7) 10--12 cm. long, (2.5) 6.5--7.5 cm. wide, glabrous beneath; from Palawan and Mindanao.

P. ternata -- Leaflets only 3--6.5 cm. long, 1.6--4.2 cm. wide, with plumose hairs on the lower surface near the base.

His two varieties of the latter species he distinguishes as follows:

var. *typica* -- "Innovationes dense pubescentes; foliola adulta pilis plumosis prope basin vestita; 3--6 1/2 c.M. longa, 1.6--4.2 c.M. lata; petiolulo 0.2--0.8, petiolo 1.7--5 c.M. longo; calyx fructifer sparse pubescens", citing *Winkler* 2756 from Borneo and *Hallier* 4722 from Mindanao.

var. *glabrior* -- "Innovationes subglabrae; foliola adulta subtus subglabra; 5 1/2 --11 c.M. longa, 3.2--7 c.M. lata; petiolulo 0.4--1.2, petiolo 3.6--6 c.M. longo; calyx fructifer subglaber," citing *Nieuwenhuis* 625 from Sungei Mangn and *Nieuwenhuis* 512 & 1100 from Sungei Blu-u. These three last-mentioned collections are apparently the ones cited as *Jaheri* 512, 625, & 1100 below.

Petraeovitex trifoliata has been found growing along riversides, in logged-over areas on flatland, in primary forests on flatland hills, in jungles and montane rainforests, in dark red-brown or rocky limestone soil, at 95--2030 m. altitude, flowering in February, April, and August to December, and in fruit in February, August, and October. The corollas are described as having been "dull-yellow" on *Clemens* 10246, "lemon-yellow" on *Clemens* & *Clemens* 40772, "dark brown-yellow" on *Sinanggul* SAN.57432, "yellowish-green" on *Gibot* SAN.55366, "greenish-white" on *James* & *Ahan* SAN.65008, and "yellowish with a long green stalk" on *Krispinus* SAN.87359.

Junell (1934) comments that "Bei *P. trifoliata* verwachsen die Plazenten unmittelbar unter den Samenanlagenbefestigungen....Die Frucht....and ihren Oberfläche kann man nicht die Grenzen der einzelnen Klappen sehen oder entscheiden, viel vielsamig sie ist."

Material of *P. trifoliata* has been misidentified and distributed in some herbaria as *P. membranacea* Merr., *Sphenodesme* sp., and even *Lantana* sp. On the other hand, the *Elleh* SAN.37448, distributed as *P. trifoliata*, actually is *Sphenodesme triflora* var. *montana* Munir.

Citations: PHILIPPINE ISLANDS: Mindanao: *Reillo* s.n. [Herb. Philip. Bur. Sci. 16410] (W--714928). Palawan: *Elmer* 12892 (Bi, Bz--22064, Du--174761, N, Um--141, Ut--29140, W--872981). GREATER SUNDA ISLANDS: Kalimantan: *Jaheri* 512 (Bz--22061, N, N--photo, Z--photo), 625 (Bz--22060), 1100 (Bz--22059); *Slooten* 2299 (Bz--22054, Bz--22055, N). Sabah: *Ahwing* 47258 (Ld); *M. S. Clemens* 10246 (Ca--214982, N--photo, Ph, Z--photo), s.n. [27.II.1932] (Bz--

22062); Clemens & Clemens 40772 (Ca--541712); Gibot SAN.31314 (Z), SAN.55366 (Z); James & Aban SAN.65008 (Sn--40707); Krispinus SAN. 87359 (Sn--55153); Nootekhoom 966 (Sn); Sinanggul SAN.54644 (ld, Z), SAN.57432 (ld, Z); Sitiol SAN.33419 (N). Singkep: Bünnemeijer 7258 (Bz--22057, Bz--22058, N), 7332 (Bz--22056, Bz--25601, N).

PETRAEOVITEX WOLFEI Sinclair, Gard. Bull. Singapore 15: 18, fig. 2. 1956.

Bibliography: Sinclair, Gard. Bull. Singapore 15: 18, fig. 2. 1956; Turrill, Curtis Bot. Mag. 172: pl. 355. 1960; Townsend, Excerpt. Bot. A.6: 462. 1963; Munir, Gard. Bull. Singapore 21: 215--220, 222, 225, 227, 229--230, & 244, fig. 2. 1965; G. Taylor, Ind. Kew. Suppl. 13: 102. 1966; Mold., Resume Suppl. 15: 15. 1967; Mold. in Menninger, Flow. Vines 337. 1970; Mold., Fifth Summ. 1: 305 (1971) and 2: 597 & 897. 1971; Balgooy, Pacif. Pl. Areas 3: 245. 1975.

Illustrations: Sinclair, Gard. Bull. Singapore 15: fig. 2 (in color). 1956; Munir, Gard. Bull. Singapore 21: 244, fig. 2. 1965.

A long woody climber; young branches minutely papillose; leaves decussate-opposite, 1--1-foliolate, mostly trifoliolate; petioles very slender, 2--8 cm. long, minutely papillose; petioles 0.5--2 [or 20?] cm. long; leaflet-blades membranous, elliptic or broadly elliptic to ovate-elliptic, 4--17 cm. long, 2.5--8 cm. wide, apically acute or shortly acuminate, marginally entire, basally more or less rounded or subcuneate, glabrous on both surfaces; venation reticulate, the midrib and secondaries, sub-prominent above, prominent beneath, the secondaries 4--6 pairs, mostly diverging at angles of 40°--60°, marginally anastomosing, the young leaves yellowish; veinlet reticulation distinct but rather loose; inflorescence terminal, thyrsoid, handsomely golden-yellow, pendulous, to 50 cm. long; cymes axillary, decussate-opposite, 2--5 cm. long, 2- or 3-flowered, borne in the axils of paired foliose bracts, usually dichotomous at the first division with a central terminal flower/fruit, subsequently more irregularly branched by suppression of some flowers and branches and the persistence of only one bracteole at each division; bracts simple, distinct and leaf-like below, gradually reduced upwards, yellowish, broadly elliptic or elliptic-ovate to narrowly oblong, 8--30 mm. long, 3--13 mm. wide, apically subacute to rounded, basally cuneate, those on the main inflorescence-axis broadest, all minutely puberulent; bracteoles yellowish; lateral peduncles 0.5--1.5 cm. long, densely puberulent; pedicels short or to 3 cm. long; calyx 1.8--2.2 cm. long, densely puberulent on both surfaces, deeply 5-lobed, the lobes oblong, apically subacute to rounded or very shortly apiculate, about 1 cm. long, 4 mm. wide, with a fairly conspicuous midrib and closely reticulate side venation; corolla pale-yellow, early deciduous, 2.2--2.5 cm. long, the tube falcate, constricted about 9 mm. above the base, the lobes 5, subrotund, 4--5 mm. long, 3--4 mm. wide, apically obtuse; stamens 4, included, didynamous, two about 10 mm. long, the other two 12--13 mm. long; filaments 7--10 mm. long, glabrous; anthers

8--15 mm. long, the thecae elliptic; style slender, 1.5--3 cm. long, glabrous; stigma unequally bifid, the lobes 0.75--1 mm. long; ovary ovoid-ellipsoid to ellipsoid-oblong, about 3.5 mm. long and 3 mm. wide, slightly constricted and minutely puberulent in the upper 1/3; fruiting-calyx largest in the genus, 3--4 cm. long, the lobes with a fairly conspicuous midrib and closely reticulate side venation; fruit capsular, about 8 mm. long, conspicuously constricted above the middle, longitudinally costate below the constriction, minutely puberulent and faintly 4-lobed apically.

This species is based on *Wolfe & Kadir 21452* from Sungai Patani on the Selambau to Jeniang road, Kedah, Malaysia, deposited in the Singapore Botanical Garden herbarium. The species, according to Munir (1965), "Allied very closely to *P. scortechinii* in having yellowish young leaves, bracts and bracteoles in flower-bearing branches, puberulous calyx within and without, ovary puberulent towards apex and longitudinally striate fruit, but is distinguished easily by its glabrous leaves, non-exserted stamens, elliptic anther lobes, unequally bilobed stigma and fruit faintly 4-lobed at the apex and prominently constricted above the middle."

Munir also notes that the cultivated specimen, *Furtado 37440*, exhibits leaves somewhat different in shape and texture from the wild material. He further asserts that the petiolules in this species are 5--20 cm. long and the pedicels to 3 cm. long. These dimensions seem questionable to me -- possibly "mm." rather than "cm.", was intended.

Turrill (1960) reports that the plant prefers acid soil and is easily propagated from cuttings, flowering freely "even in a small pot."

Munir (1965) cites the following collections: MALAYSIA: Kedah: *Kiah 35972*, *Munir 1*, *Wolfe s.n.*, *Wolfe & Kadir 21452*. Kelantan: *Symington 37971*. Trengganu: *Sinclair 39901*. CULTIVATED: Singapore: *Furtado 37440*. He refers to *Kiah 35972* and *Sinclair 39901* as "paratype" collections.

ADDITIONAL NOTES ON THE GENUS *CITHAREXYLUM*. XVII

Harold N. Moldenke

CITHAREXYLUM B. Juss.

Additional & emended bibliography: Poir. in Lam., Tabl. Encycl. Méth. Bot. [Illust. Gen.] 3: pl. 545 (1819) and 3: 57 & 95. 1823; Mold., Phytologia 47: 141--143 & 224. 1980; Mold., Phytol. Mem. 2: 5, 21, 48, 60, 61, 70, 71, 73--75, 77, 78, 80, 83, 85--88, 91--104, 107, 114, 121, 124, 125, 127, 132, 140, 173, 177, 180, 185, 193, 204, 218, 256, 259, 267, 291, 310, 341, 347, 348, 368, 371, 375, 380--383, 396, 437, 530--533, & 627. 1980; Wiggins, Fl. Baja Calif. 525--[527], fig. 496. 1980.

CITHAREXYLUM CAUDATUM L.

Additional bibliography: Mold., Phytologia 47: 224. 1980; Mold., Phytol. Mem. 2: 60, 70, 73, 75, 77, 78, 80, 83, 85, 88, 91, 93, 94, 97, 101, 107, 132, 310, 341, 347, 375, 380--383, & 531. 1980.

Additional & emended citations: NICARAGUA: Zelaya: A. *Molina* R. 15022 (N, W--2566902); Vincelli 589 (Z). PANAMA: Canal Zone: Mori & Kallunki 5026 (W--2846407).

CITHAREXYLUM CHARTACEUM Mold.

Additional bibliography: Mold., Phytologia 40: 492. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18. 1979; Mold., Phytol. Mem. 2: 127, 132, 347, & 533. 1980.

CITHAREXYLUM COOPERI Standl.

Additional bibliography: Mold., Phytologia 40: 492 (1978) and 41: 62, 70, 71, & 111. 1978; Hocking, Excerpt. Bot. A.33: 90. 1979; Mold., Phytol. Mem. 2: 60, 70, 73, 75, 83, & 531. 1980.

CITHAREXYLUM COSTARICENSE Mold.

Additional bibliography: Mold., Phytologia 31: 348 & 352. 1975; Mold., Phytol. Mem. 2: 80 & 531. 1980.

Recent collectors describe this plant as a small or medium-sized tree, 5 m. tall, the trunk to 10 cm. in diameter at breast height, the [immature] fruit green, and have found it growing in pastures, on forest edges, and in primary forests, at 760--1550 m. altitude, flowering in December and January, fruiting in July. The corollas are said to have been "white" on *Haber* 247. Material has been misidentified and distributed in some herbaria as *C. macrophyllum* Poir.

Additional citations: COSTA RICA: Alajuela: *Lent* 2014 (Go). Puntarenas: *Haber* 247 (Z); *Lawton* 1136 (N).

CITHAREXYLUM CRASSIFOLIUM Greenm.

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 43. 1948; Mold., Phytologia 41: 62, 63, & 119. 1978; Mukherjee & Chan-

da, Trans. Bose Res. Inst. 41: 40. 1978; Mold., Phytol. Mem. 2: 60, 70, 73, & 531. 1980.

CITHAREXYLUM DECORUM Mold.

Additional bibliography: Mold., Phytologia 41: 62--63. 1978; R. F. Sm., Act. Bot. Venez. 13: 193, 205, & 264, fig. 153. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18. 1979; Mold., Phytol. Mem. 2: 114 & 531. 1980.

Additional illustrations: R. F. Sm., Act. Bot. Venez. 13: 264, fig. 153. 1978.

Smith (1978) describes this plant as "Cuatro filas. Tallo cuando joven con cuatro aristas longitudinales. Flores en espigas. De tierra templado. Arbol secundario."

CITHAREXYLUM DENTATUM D. Don

Additional bibliography: Mold., Phytologia 41: 63. 1978; Mold., Phytol. Mem. 2: 132, 382, & 531. 1980.

CITHAREXYLUM DISCOLOR Turcz.

Additional & emended bibliography: Alain in León & Alain, Fl. Cuba, imp. 1, 4: 299 & 301. 1957; Mold., Phytologia 41: 63. 1978; Mold., Phytol. Mem. 2: 88, 94, & 531. 1980.

CITHAREXYLUM DONNELL-SMITHII Greenm.

Additional bibliography: Mold., Phytologia 41: 62--64, 69, 70, 106, & 119. 1978; Mold., Phytol. Mem. 2: 60, 71, 75, 77, 80, 83, 347, 382, & 531. 1980.

Recent collectors refer to this species as a tree, 4--10 m. tall with "greenish-orange" fruit, and have found it in flower March and November and in fruit in May, growing at 1100--2000 m. altitude. Dziekanowski and his associates found it cultivated as a street tree in Guatemala. The corollas are said to have been "white" on Croat 33499 and Lent 2236.

Material of this species has been misidentified and distributed in some herbaria as *C. macradenium* Greenm. On the other hand, the Mori & Kallunki 5615 & 5618, distributed as *C. donnell-smithii*, are more probably *C. recurvatum* Greenm., while Haber 260 is *C. integerrimum* (Kuntze) Mold.

Additional citations: COSTA RICA: Heredia: Gómez Pompa 1221 (Me--91499); Lent 2236 (Go). PANAMA: Chiriquí: Croat 33499 (W--2846409). CULTIVATED: Guatemala: Dziekanowski, Dunn, Case, Trott, & Thurm 3480 (N).

CITHAREXYLUM DRYANDERAE Mold.

Additional bibliography: Mold., Phytologia 41: 64. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18. 1979; Mold., Phytol. Mem. 2: 107, 132, & 531. 1980.

Berlin found this species growing in primary forests, at 180 m. altitude, describing it as a tree, 20 m. tall, the red-orange fruit arranged in "drooping panicles" [actually racemes!]. He found it fruiting in August and reports its use by Peruvians to make living fences, the vernacular name being "tsáagnum muyuwayu".

Additional citations: PERU: Amazonas: Berlin 3531 (Z).

[to be continued]

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SIGNIFICANT COLLECTIONS OF LOUISIANA PLANTS.
I. MOREHOUSE PARISH.

R. Dale Thomas and Patricia B. Pias Cox. Biology Department, Northeast Louisiana University, Monroe, Louisiana, 71209.

This paper initiates a series of articles reporting uncommon plants in Louisiana. Each article will be based on a Masters of Science Thesis at Northeast Louisiana University by the junior author and under the strict supervision of the senior author. Each article will report those plants new to the state but will also discuss uncommon Louisiana plants that have been collected in that particular parish.

Each thesis project serves a two-fold function. It gives the student a broad background in vascular plant identification in which he or she learns to identify about one thousand species in the field. It also adds detailed information on which plants are in a specific parish. This information along with other studies will be used in writing a checklist, atlas, and eventually a manual of the flora of Louisiana. This flora project was begun at NLU by Dr. R. Dale Thomas in 1966 and it continues today with the help of Dr. Charles M. Allen of Louisiana State University at Eunice. Several duplicates are available for exchange from this flora project.

Four state records were collected from Morehouse Parish (Pias 1978 and Thomas, Cox, Dawson, and Gough 1980). The citations are as follows.

Hypoxis longii Fern. Pine woods south of La. 834 west of Jones, Sec. 14, T23N, R7E. R. Dale Thomas and family. 23285. 4 June 1971. Only one specimen was collected. This plant and another one from Claiborne Parish were determined by Dr. John Taylor of Southeast Oklahoma State University who has collected this species in Oklahoma. Several later trips to the two sites were fruitless.

Asclepias syriacus L. Rights-of-way of U.S. 165 and railroad one mile south of Bonita, Sec. 12, T22N, R7E. R. Dale Thomas and Pat Pias. 55259 & 1941. 15 September 1977. This species was not listed from Louisiana by Woodson (1954). It has also been collected by Thomas from Lincoln Parish.

Polygonum sachaliense F. Schmidt. Large colony beside La. 138, 0.2 miles south of railroad south of Collinston, Sec. 7, T19N, R6W. R. Dale Thomas and Pat Pias. 57545 & 3907. 13 April 1978. This species was not listed from the state by Horton (1972).

Matricaria matricarioides (Less.) Porter. The earliest collection of this plant from Louisiana is from East Carroll Parish: weed along edge of cotton field beside U.S. 65 north of Gassoway at Arkansas State Line. R. Dale Thomas and Carole Crews. 38228. 24 March 1974. The Morehouse site is: Along U.S. 165, 2 miles south of Bonita, Sec. 13, T22N, R7E. R. Dale Thomas and Pat Pias. 16 May 1977. It was collected in an adjoining section in 1978.

Two other rare plants were collected during this study. Hackelia virginiana (L.) I. M. Johnston was collected along the Mississippi River in Madison Parish in 1971. It has recently been collected in Morehouse, Tensas, and East Carroll Parishes. Triosteum angustifolium L. was collected by Thomas in Caddo Parish in 1974. It is now also known from Morehouse and Richland parishes.

Two uncommon Louisiana plants have been destroyed in Morehouse Parish. Castanea dentata (Marsh.) Borhk. was collected from a large tree over 100 years old in the edge of a pine woods in a back yard in Beekman. It has been so severely pruned to prevent the tree from bearing fruit (The owner said the burrs stuck in his daughter's bare feet) that it died. Another tree is known from the state in Webster Parish. Ruellia nudiflora (Gray) Urban grew along La. 134 but was destroyed by the Louisiana Department of Highways while doing bridge construction. This plant is scattered in south Louisiana but no other population is known from the northern part of the state.

Two recent introductions into northeast Louisiana have been collected in Morehouse Parish and show a lot of potential of becoming noxious weeds. Ipomoea turbinata Lag. occurs near Bayou Galion and is an extremely fast growing vine in cotton fields. Malachra capitata L. is becoming a common cotton field weed because of its resistance to the common herbicides used with that crop.

Several other uncommon plants were collected during this study. Erodium cicutarium (L.) L'Her. was collected in a cemetery in Oak Ridge--it also occurs in Natchitoches Parish. Dryopteris celsa (W. Palmer) Small was reported from Morehouse Parish new to Louisiana (Thomas, Wagner, and Mesler 1973) from a cypress swamp near Collinston. The same swamp has Sabatia calycina (Lam.) A. Heller, Habenaria flava (L.) R. Br., Carya leiodermis Sarg., and Carya myristicaeformis Michx. f. in it.

Several uncommon plants were collected in the pine woods and gorges west of Bayou Bartholomew and west of Jones. These include Erigeron pulchellus Michx., Heliopsis gracilis Nutt., Parthenium hispidum Raf., Solidago hispida Muhl., Triosteum angustifolium L., Silene virginica L., Tragia cordata Michx., Obolaria virginica L., Listera australis Lindl., Phlox divaricata L., Hedyotis caerulea (L.) T. & G. and Hedyotis purpurea (L.) T. & G.

Several other uncommon plants were collected in the other pine woods in the parish. These include Salix tristis Ait. (previously reported by Thomas and Pias 1978), Helianthus silphoides Nutt., Rudbeckia subtomentosa Pursh, Silphium integrifolium Michx., Paronychia fastigiata (Raf.) Fern., Bulbostylis capillaris (L.) Clarke, Psoralea simplex T. & G., Trifolium carolinianum Michx., Gentiana saponaria L., Manisuris rugosa (Nutt.) Kuntze, Oenothera pilosella Raf., Lysimachia lanceolata Walt., Agrimonia parviflora Ait., and Gillenia stipulata (Muhl.) Baill. Corylus americana L. occurs along a creek in pine woods near the Arkansas State Line and Uvularia sessilifolia L. and Smilax herbacea L. occur near a small creek at Log Cabin.

Several uncommon plants were collected along the railroads in Morehouse Parish particularly in Bastrop. These include: Alternanthera polygonoides (L.) R. Dr., Froelichia gracilis (Hook.) Moq., Spermolepis echinata (Nutt.) Heller, Helianthus grosse-serratus Martens, Erysimum repandum L., Arenaria serypllifolia L., Suaeda linearis (Ell.) Moq. and Boerhaavia erecta L.

The rarest aquatics collected were in a cypress swamp west of Jones and Bonita and east of Bayou Bartholomew. These included Armoracia aquatica (Eat.) Wieg., Ceratophyllum echinatum Gray, Decodon verticillatus (L.) Ell. and Hottonia inflata Ell.

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SIGNIFICANT COLLECTIONS OF LOUISIANA PLANTS
II. MADISON PARISH

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A preliminary survey of the vascular plants of Madison Parish was initiated in June 1977 and completed in April 1980. During this study, specimens of 114 families, 388 genera, and 720 species or subspecific taxa were collected or found to be on deposit in Louisiana herbaria.

During this study two plants new to Louisiana were collected: Ranunculus arvensis L. and Ammoselinum butleri (Walt.) Coult. & Rose. Citations are:

Ranunculus arvensis L. MADISON PARISH: abundant in unplowed cotton field south of U.S. 80, 1.4 miles east of Quebec, Sec. 27, T17N, R11E. R. Dale Thomas and Nelson Rich. 70382 & 1811. 27 March 1980.

MADISON PARISH: In fallow field west of Willow Bayou Road, 0.3 miles north of U.S. 80, Sec. 21, T17N, R12E. Nelson Rich & Andrew Scurria. 1817. 3 April 1980.

EAST CARROLL PARISH: Fallow field north of paved road at Sondheimer, 0.2 miles west of U.S. 65 behind Dew Drop Inn, Sec. 53, T18N, R13E. Nelson Rich and Andrew Scurria. 1826. 3 April 1980.

DESOTO PARISH: Roadside of U.S. 84, 0.4 miles SW of Radio Station Road at west edge of Mansfield, Sec. 19, T12N, R13W. R. Dale Thomas and David Dixon. 71278 & 3030. 4 May 1980.

This species was not listed by Keener (1976) from the state; his verification of #70382 is appreciated.

Ammoselinum butleri (Walt.) Coult. & Rose

MADISON PARISH: Providence Memorial Park Cemetery beside Brushy Bayou south of U.S. 80 just east of Tallulah, Sec. 5, T16N, R13E. R. Dale Thomas and Nelson Rich. 62637 & 993. 15 March 1979.

BIENVILLE PARISH: Very dry soil in Mt. Mariah Methodist Church Cemetery just south of Claiborne Parish line, La. 9 north of Arcadia, Sec. 3, T18N, R6W. R. Dale Thomas, Larry Lewis, and David Dixon. 70613 & 2745. 10 April 1980.

BOSSIER PARISH: Lawn around vehicle depot of Bossier Base, Barksdale Air Force Base, Sec. 31, T18N, R12W. R. Dale Thomas, Vernon Leggett, Pam Balogh. 48702. 25 March 1976.

DESOTO PARISH: grounds of Mt. Olivet Cemetery just west of Stanley on U.S. 84, Sec. 9, T11N, R15W. R. Dale Thomas, David Dixon, Neil Carroll. 70297 & 2828. 16 March 1980.

CLAIBORNE PARISH: Gilgal Baptist Church lawn and cemetery south of Langston, Sec. 23, T19N, R8W. R. Dale Thomas, Larry Lewis, David Dixon. 70595 & 2727. 10 April 1980.

QUACHITA PARISH: weed in infield of Little League Baseball Field at Forsythe Park in Monroe. R. Dale Thomas & Scott Thomas. 58216. 13 May 1978.

QUACHITA PARISH: weed in lawn and flower bed in front of Brown Hall on NLU Campus in Monroe. R. Dale Thomas. 62658. 17 March 1979.

SABINE PARISH: Noble Cemetery north of La. 1218, one mile west of Noble and U.S. 171, Sec. 10, T8N, R13W. R. Dale Thomas, Neil Carroll, David Dixon. 70182 & 803. 15 March 1980.

The specimens from Bienville, Claiborne, DeSoto, Madison, and Sabine parishes were collected while searching for small Ophioglossum specimens. This carrot is small and easily overlooked or easily confused with young Soliva or Apium plants.

Several uncommon Louisiana plants were collected during the survey of the Madison Parish Flora. These include Amaranthus palmeri Wats., Froelichia gracilis (Hook.) Moq., Eryngium hookeri Walp., Cichorium intybus L., Soliva mutisii H.B.K., Hackelia virginiana (L.) I. M. Johnst., Lithospermum tuberosum Rugel ex DC., Ceratophyllum echinatum Gray, Cycoloma atriplicifolium (Spreng.) Coult., Sicyos angulatus L., Trifolium lappaceum L., Habenaria flava (L.) R. Br., Holcus lanatus L., Hottonia inflata Ell., Ranunculus marginatus d'Urv., Ranunculus trilobus Desf., Verbena bracteata Lag. & Rodr., and Tribulus terrestris L. Vicia ludoviciana Nutt. and Caperonia palustris (L.) St. Hil. are common in southern Louisiana but are rare in the northeast part of it.

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SIGNIFICANT COLLECTIONS OF LOUISIANA PLANTS.
III. DESOTO PARISH

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A survey of the vascular plants of DeSoto Parish was made from September 1978 to October 1980 (Dixon 1980). Plants representing 135 families, 526 genera and 1234 species and varieties were collected or found in literature or in herbaria. Two state records and several rare Louisiana plants were collected.

The state records are both introductions to the state in the Schrophulariaceae and were not attributed to the state by Pennell (1935) or by later writers. The citations follow:

Chaenorrhinum minus (L.) Lange. Along Kansas City Southern Railroad tracks between La. 175 and Friendship Road in Frierson, Sec. 34, T15N, R13W. R. Dale Thomas and David Dixon. 64384 & 1301. 6 May 1979. Specimens were collected again at the same site in 1980. Thomas collected this species from Jefferson, Ouachita, and Caddo parishes in 1979 and Winn Parish in 1980.

Parentucellia viscosa (L.) Caruel. Roadside of La. 172 at Bushneck Bayou, 2.7 miles east of La. 169 west of Keatchie, Sec. 25, T14N, R16W. R. Dale Thomas & David Dixon 71368 & 3118. 30 May 1980.

Numerous uncommon plants were collected along the creeks in the hills of DeSoto Parish. These include Glinus radiatus (R. & P.) Rohrb., Zizia aurea (L.) W. D. J. Koch., Amsonia glaberrima Woods., Aristolochia tomentosa Sims, Solidago auriculata Shuttlew., Cayaponia quinqueloba (Raf.) Shinnars, Forestiera ligustrina (Michx.) Poir., Pentodon pentandrus (Schum. & Thonn.) Vatke., Parietaria pensylvanica Muhl. ex Willd., and Ranunculus carolinianus DC. The northernmost collection of Mikania cordifolia (L.) Willd. ever made in the state was made. Sparganium americanum was collected in one creek.

Although the practice of spraying herbicides on the railroad rights-of-way has probably drastically decreased the populations of many plants, several rare plants still occur along the railroads in the parish. In addition to Chaenorrhinum minus, there are plants of: Eurytaenia texana T. & G., Spermolepis divaricata (Walt.) Raf., Spermolepis echinata (Huds.) Link., Camelina microcarpa Andr. ex DC., Thlaspi arvense L., Agrostemma githago L., Vaccaria pyramidata Medicus, Salsola kali L., Boerhaavia coccinea Mill., Cissus incisa (Nutt.) Des. Moul., Solanum dimidiatum Raf., Solanum eleagnifolium Cav., and Solanum rostratum Dun. Scutellaria drummondii Benth., Boerhaavia erecta L., Plantago wrightiana DCne, and Froelichia gracilis are much more common along Louisiana railroads than originally thought. Camelina microcarpa Andr. ex DC. has been collected in Bossier and Caddo by Thomas, in Sabine by Carroll, and in St. Charles by Glen Montz. Vaccaria pyramidata Medicus (Saponaria vaccaria (L.) Britt.) was reported from Plaquemines Parish by Langlois in 1979 but had not been collected again (?) until recently collected in Caddo Parish by Thomas.

The cemeteries of the parish were searched for small palnts and yielded Ammoselinum butleri (Walt.) Coult. & Rose, Arenaria patula Michx., Trifolium carolinianum Michx., and Phacelia glabra Nutt as well as other more common plants.

Roadbanks yielded Torilis nodosa (Huds.) Link., Artemisia ludoviciana Nutt., Cichorium intybus L., Conyza bonariensis (L.) Cronq., Helianthus grosse-seratus Martens, Rudbeckia nitida Nutt. var. texana Perdue, Silphium laciniatum L., Silene gallica L., Astragalus distortus T. & G., Trifolium arvense L., Phacelia hirsuta Nutt., Anemone caroliniana L., Ranunculus arvensis L., Ranunculus marginatus d'Urv., Ranunculus trilobus Desf.

Five uncommon plants were collected in pastures: Acorus calamus L., Carduus nutans L., Silybium marianum (L.) Gaertn., Sisymbrium officinale (L.) Scopoli, and Petalostemum purpureum (Vent.) Rydb.

One healthy plant of Cannabis sativa L. and several populations of Chenopodium botrys L. and Melochia corchorifolia L. were found in waste areas. Melochia is common in south Louisiana but is rare in the northern part of the state.

Several different uncommon plants were collected in the various wooded habitats of the parish. These include: Solidago ulmifolia Muhl., Burmannia biflora L., Symphoricarpos orbiculatus Moench., Stellaria graminea L., Lathyrus venosus Muhl. ex Willd., Trillium gracile J. D. Freeman, Uvularia perfoliata L., Malaxis unifolia Michx., Huchera americana L., and Ribes curvatum Small.

The Ophioglossaceae is well represented in DeSoto Parish with four of the five species of Botrychium and all five of the Ophioglossum species found in the state occurring there. One cemetery has Ophioglossum nudicaule, O. engelmanni, O. crotalophoroides, Botrychium lunarioides, and B. biternatum in it (See (Thomas 1971, 1972). Botrychium dissectum var. obliquum, B. biternatum, B. virginianum and Ophioglossum vulgatum occur in woods and O. petiolatum grows in moss around rural church buildings.

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LEPIDIDIUM ORBICULARE (CRUCIFERAE) OF KAUAI

HAWAIIAN PLANT STUDIES 105

Harold St. John

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Lepidium orbiculare sp. nov. Fig. 1.

Diagnosis *Honotypi*: Frutex ramosus ultra 33 cm altus est, novellis glabris, ramulis foliosis 1-3 mm diametro obscure purpureis, ramis vetustioribus 3-6 mm diametro subpurpureis, internodis 1-6 mm longis, nodis non incrassatis, cicatricibus foliorum 3-4 mm latis lunatis subalbis fere prostratis, cicatricibus fasciculorum solitariis, foliis in apice caulinis congregatis, petiolis 15-25 mm longis glabris gracilibus supra canaliculatis, laminis 4.5-7.5 cm longis 1.9-2.9 cm latis viridibus crasse chartaceis oblanceolatis apice subacuto basi cuneata marginibus apiculate humiliter crenulatis supra in initio proxima midnervum adpresse hirsutulis sed mox glabratis infra glabris nervis secundariis 7-9 in dimidio quoque crebre adscendentibus, panícula 17 X 10 cm racemis compluribus omnibus minute puberulis, pedicellis 5-7 mm longis, 4 sepalis 0.8 mm longis ovatis varie late oblanceolatis in areola centrali incrassatis et puberulis sed marginibus membranaceis albis, 4 petalis 0.8 mm longis spatulatis albis, 6 staminibus exsertis, filamentis 1 mm longis, antheris 0.2 mm diametro subglobosis, ovario 0.7 mm longo orbiculari, stylo 0.2 mm longo, stigmate 0.2 mm diametro discoideo, capsulis 3.5-4 mm diametro orbicularibus nitidis reticulatis apice rotundato vel paulum emarginato, 2 seminibus 1.3-1.7 mm diametro orbicularibus planatis lucidis subrubribadiis ala pallida membranacea.

Diagnosis of *Holotype*: Branching shrub, more than 33 cm tall; young shoots glabrous; leafy branchlets 1-3 mm in diameter, dark purple; older stems 3-6 mm in diameter, purplish; internodes 1-6 mm long; nodes not enlarged; leaf scars 3-4 mm wide, lunate, whitish, nearly flush; bundle scar single; leaves clustered at the stem apex; petioles 15-25 mm long, glabrous, slender, channeled above; blades 4.5-7.5 cm long, 1.9-2.9 cm wide, green, thick chartaceous, oblanceolate, the apex subacute, the base cuneate, the margins low apiculate crenulate, above at first appressed hirsutulous by the midrib, but early glabrate, below glabrous, secondary veins 7-9 in each half, strongly ascending; panicle 17 X 10 cm, of several racemes, all minutely puberulous; pedicels 5-7 mm long; 4 sepals 0.8 mm long, ovate to broadly oblanceolate, thickened and puberulous in the central area, but the broad margins white and membranous; 4 petals 0.8 mm long, spatulate, white; 6 stamens exserted; filaments 1 mm

long; anthers 0.2 mm in diameter, subglobose; ovary 0.7 mm long, orbicular; style 0.2 mm long; stigmas 0.2 mm in diameter, discoid; capsule 3.5-4 mm in diameter, orbicular, shiny, reticulate, the apex rounded or slightly emarginate; seeds 1.3-1.7 mm in diameter, orbicular, flat, shining, reddish brown, with a pale membranous wing 0.1-0.2 mm wide.

Holotypus: Hawaiian Islands, Kauai Island, Haupu, right hand side of Kipu Kai Gap, rocky cliff, Nov. 3, 1916, C. N. Forbes 755.K. (BISH).

Discussion: The closest relative of this novelty is L. serra Mann, also of Kauai, a species with the petals 1 mm long; style 0.4-0.6 mm long; capsule 3.7-4.5 mm in diameter, oblate orbicular; blades 4-13 X 0.6-4 cm, narrowly lanceolate (or elliptic), the apex acuminate, the margins laciniate serrate.

L. orbiculare has the petals 0.8 mm long; style 0.2 mm long; capsule 3.5-4 mm in diameter, orbicular; blades 4.5-7.5 X 1.9-2.9 cm, oblanceolate, the apex subacute, the margins low apiculate crenulate. It does not fit into any of the described sections of the genus.

The new epithet is the Latin adjective orbiculare, orbicular, and it is given with reference to the shape of the pods.

i Legend

Fig. 1. Lepidium orbiculare St. John, from holotype. a, habit X 1; b, raceme, X 1; c, capsule, X 10; d, e, seed, X 10.

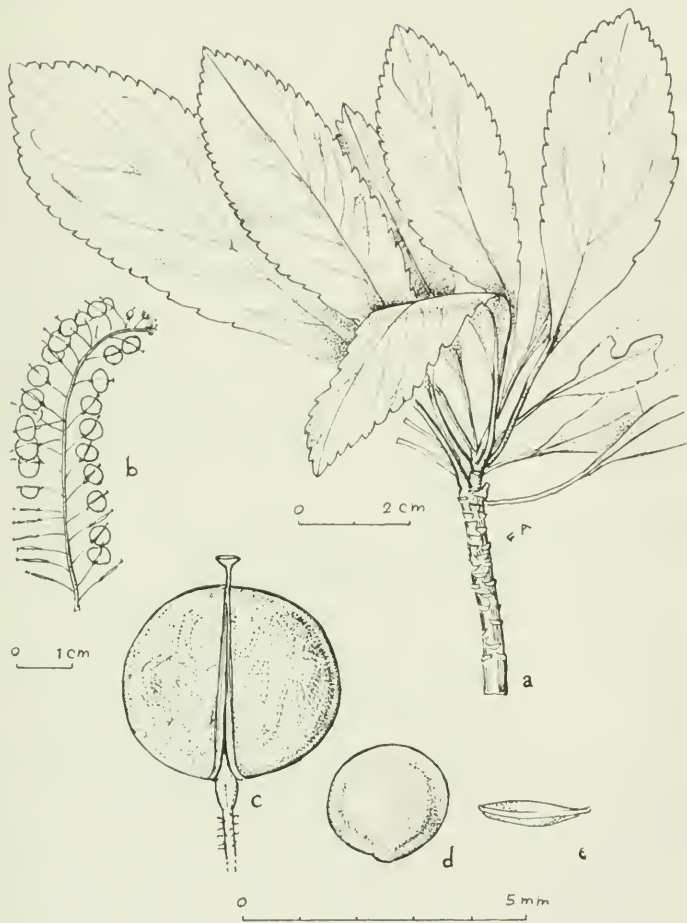


Fig. 1

NOVELTIES IN PANICUM (GRAMINEAE) FROM KAHOO LAWE

HAWAIIAN PLANT STUDIES 102

Harold St. John

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The small arid island Kahoolawe was in the 19th Century exploited for grazing land. It was overgrazed by cattle, sheep, and particularly by goats. The forest and the plant cover was destroyed, and subsequent erosion removed much of the soil. This happened before there was an adequate study of the flora. Only a few endemic plants are known from there. Recently several explorations have been made of the island, and the ones subsequent to rainy spells have discovered a number of novelties.

Previous publications have made known the following species as endemic to Kahoolawe: Neraudia kahoolawensis Hbd., Gouania cucullata St. John, G. Remyi St. John, Lipochaeta bryanii Sherff, and L. kahoolawensis Sherff. The present note adds to this list one new species and one variety of Panicum.

An additional indigenous grass for the island is Panicum ramosius Hitchc., Waikahalulu Bay, 500 ft elev., XI/25/'78, W. Char & L. Yoshida 78.067; and Smuggler's Cove, XI/26/'78, Char & Yoshida 78.078.

Panicum Cornae sp. nov. (sect. Trichoides). Fig. 1.

Diagnosis Holotypi: Planta 23 cm alta annua caespitosa erecta est, radicibus fibrosis, ramis basalibus pluribus, culmis ex nodis inferis 1-4-ramosis, internodis 1-4 cm longis 0.4-0.5 mm diametro adscendente albe minute puberulis, nodis albe pilosis, vaginis 2-2.5 cm longis nervis parallelis multis prominentibus glabris sed intervallis divergente albe pilosis, ligulis circulis pilosis pilis 0.8-1 mm longis, laminis basalibus 2-2.5 cm longis 1.5 mm latis, laminis caulinarum 5-13 cm longis 2 mm latis acutis mox involutis in basi pilosis infra nervis prominentibus et glabris sed intervallis adscendente puberulis supra adpresse adscendente albe pilosis, paniculis 3-11 cm longis 3-40 mm diametro terminalibus parte inclusis vel exsertis angustis et densis sed tarde ramulis divergentibus cum 60-92 spiculis, pedunculo 2-8 cm longo glabro, rhachidi ramis et pedicellis adscendente albe puberulis, pedicellis 1-3.5 mm longis adscendentibus, spiculis 1.3-2 mm longis 0.5 mm latis 0.4 mm crassis pallide viridibus lanceoloides, gluma prima 1.3-2 mm longa paulum longiora in aspectu glabra sed proxima apicem midnervo minute scabre puberulo ovati-lanceolata valde 3-nervosa, gluma secunda 1.5 mm

longa lanceolata 5-nervosa, lemma sterili 1.3 mm longa elliptica acuta 5-nervosa, lemma fertili 1.2 mm longa elliptica cartilaginea alba involuta, palea 0.8 mm longa elliptica cartilaginea pallida, antheris 0.4 mm longis lineari-ellipsoideis subpurpureis.

Diagnosis of Holotype: Plant 23 cm tall, tufted, erect, short lived; roots fibrous; plant several branched from the base; culms 1-4-branched from the lower nodes; internodes 1-4 cm long, 0.4-0.5 mm in diameter, ascending white minute puberulous; nodes white pilose tufted; leaf sheaths 2-2.5 cm long, with many outstanding parallel glabrous nerves, but the concave intervals spreading white pilose; ligule a pilose ring, the hairs 0.8-1 mm long; basal blades 2-2.5 cm long, 1.5 mm wide; cauline blades 5-13 cm long, 2 mm wide, ligulate, acute, becoming involute and appearing 0.3 mm wide, pilose at base, below the veins prominent, glabrous, but the intervals ascending puberulous, above appressed ascending white pilose; panicles terminal, partly included or exserted, 3-11 cm long, 3-40 mm in diameter, narrow and compact, but tardily the branches spreading; peduncle 2-8 cm long, glabrous, bearing 60-92 spikelets; rhachis, branches, and pedicels ascending white puberulous; pedicels 1-3.5 mm long, ascending; spikelets 1.3-2 mm long, 0.5 mm wide, 0.4 mm thick, pale green, lanceoloid; first glume 1.3-2 mm long, slightly the largest, appearing glabrous, but near the apex the midrib minutely scabrous puberulous, ovate lanceolate, strongly 3-nerved; second glume 1.5 mm long, lanceolate, 5-nerved; sterile lemma 1.3 mm long, elliptic, acute, 5-nerved; fertile lemma 1.2 mm long, elliptic, cartilagineous, white, involute; palea 0.8 mm long, elliptic, cartilagineous, pale; anthers 0.4 mm long, linear ellipsoid, purplish.

Expanded Description: Plant 14-37 cm tall.

Holotypus: Hawaiian Islands, Kahoolawe Island, slope between Makaalae Pt. and Lua Kealialoalo, on n. w. side of island, Prosopis scrub, with Heteropogon contortus and Chloris virgatus, the dominant grasses between trees, fine red clay and weathered rocks, in full sun on bare ground, 500 ft elev., 4-21-1980, L. W. Cuddihy & W. P. Char 342 (BISH).

Specimens Examined: Hawaiian Islands, Kahoolawe Island, at type locality, Cuddihy & Char 343 (BISH); on transect C₅, from Smugglerr's Cove to beach 1 mile n. of Kealaikihiki Pt., with scattered Prosopis, Gossypium tomentosum, Merremia, Traquas, and Abutilon incanum, Nov. 26, 1978, W. Char & L. Yoshida 79.079 (BISH); $\frac{1}{2}$ mile n. e. of Kaukaupapa Beach, with scattered Prosopis, 25 ft elev., 25 Nov. 1978, L. Stemmerman & P. K. Higashino 3,677B (BISH).

Molokai Island, Pohakumauliuli, 2/26/74,

N. Pekelo Jr. 31 (BISH); Kawela, along road to Puu Kolehale, open ground, 2,500 ft alt., 4-5-74, Pekelo 51 (BISH).

Discussion: The closest relative of the new species is P. Fauriei Hitchc., of Molokai, Oahu, and its offshore islets, a species with the rhachis and branches of the inflorescence pilosulous; outer glume ascending puberulous on the sides of the midrib near the apex; sheaths and back of blades appressed ascending puberulous between the ribs; blades below appressed ascending puberulous between the ribs; blades 1.3 mm wide; and the nodes puberulous like the culm. P. Cornae, of Kahoolawe Island, has the rhachis and branches of the inflorescence minutely ascending puberulous on the angles; outer glume ascending puberulous on the ridge of the midrib near the apex; sheaths spreading pilose; blades below sparsely pilose near the base, but subglabrous elsewhere; blades 1.5-2 mm wide; and the nodes pilose tufted.

The epithet is chosen to honor Carolyn Corn (1939-), born in Ancon, Canal Zone, educated at Oregon State University, B.S 1962; University of California, M.A. 1967; University of Hawaii, Ph.D, 1979; state botanist, Dept. of Land and Natural Resources, State of Hawaii, 1978-).

Panicum nubigenum Kunth, var. latius var. nov.

Diagnosis Holotypi: A specie differt in laminis 2.5-4 mm lats, spiculis 2.5-3.5 mm longis.

Diagnosis of Holotype: Differing from the species by having the blades 2.5-4 mm wide, and the spikelets 2.5-3.5 mm long.

Holotypus: Hawaiian Islands, Kahoolawe Island, on sea cliff of rocky coast west of Waikahalulu Bay, stony substrate with scattered Heteropogon, Chloris inflata, and low Prosopis, 100 ft elev., 4-21-1980, L. W. Cuddihy & W. P. Char 349 (BISH).

Specimens Examined: Hawaiian Islands, Kahoolawe Island, rocky coast west of Waikahalulu Bay, two low patches, stony ground, with Sida fallax, Atriplex semibaccata, and low Prosopis, 150 ft elev., 4-21-1980, Cuddihy & Char 344 (BISH); ditto 345 (BISH); sea cliff, s. w. of Lae Paki, rocky red clay substrate, with low Prosopis scrub, Atriplex, Chenopodium, etc., 25 ft elev., 4-22-1980, Cuddihy & Char 375 (BISH).

P. nubigenum, var. nubigenum which is more common on the island has the blades 1-2 mm wide and involute; and the spikelets (1.5-) 1.7-2 (-2.5) mm long. It occurs on several of the Hawaiian Islands, and on Kahoolawe it springs up commonly, after a good rain.

Also from Kahoolawe, there is the collection, L. Stemmerman & P. K. Higashino 3,677A (BISH), from

near the coast, 1.5 miles n. e. of Kaukaukapapa Beach, 25 ft elev., 25 Nov. 1978, which has the spikelets 3-3.5 mm long, but the blades 1.5 mm wide. Hence it is intermediate between the new variety and the species.

The new epithet is the Latin adjective *latior*, *latius*, broader, and it is chosen with reference to the broader blades of the new variety.

Legend

Fig. 1. *Panicum Cornae* St. John, from holotype.

a, habit X 1; b, sheath, culm, node, X 10; c, inflorescence, X 4; d, spikelet, X 15; e, first glume, X 15; f, second glume, X 15; g, sterile lemma, X 15; h, fertile lemma, X 15.

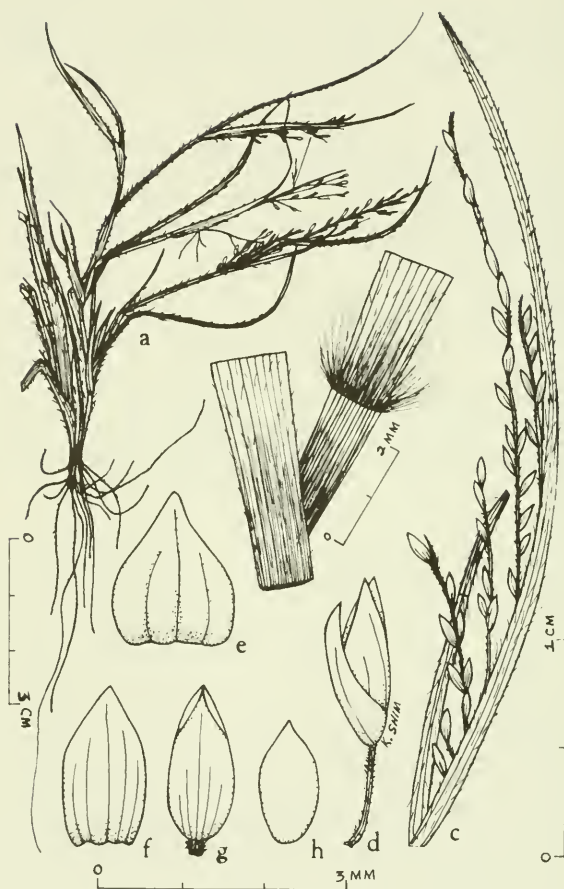


Fig. 1

NOTEWORTHY GRASSES FROM MEXICO VII.

Alan A. Beetle, Comision Tecnico Consultiva para
la Determinacion Regional de los
Coeficientes de Agostadero
A.P.D.O. Postal 284, Hermosillo,
Sonora, Mexico

For previous papers see Phytologia 27 (6):441-444, Jan. 1974; Phytologia 28 (4):313 - 318. Aug. 1974; Phytologia 30 (5):344 - 348, March 1975; Phytologia 35 (3):221 - 223, Feb. 1977; Phytologia 37 (4):317 - 407. Oct. 1977; Phytologia 38 (3):173 - 176, Jan. 1978.

Capillaria as a Section of Panicum was established by A.S.Hitchcock and A. Chase, 1910, The North American Species of Panicum. Contrib. United States National Herbarium 15: 1 - 396.

Annuals with many-flowered and more or less diffuse panicles; spikelets pointed, glabrous, the first glume large and clasping; caryopsis falling free, smooth and shining, usually olive brown. Species primarily North American.

Recently Beetle, 1977, in Phytologia 35: 221. discussed Panicum decolorans HBK and the reasons for considering P. parcum a synonym.

Panicum miliaceum L. is an Old World species commonly introduced in North America.

Panicum capillare L. is the most common and most commonly collected of a group of species centered in the eastern United States. These are in part characterized by panicles which break away at maturity and roll before the wind. Included here are P. flexile (Gattinger) Scribn., P. gattingeri Nash, and P. philadelphicum Bernh.

Finally the Section Capillaria contains species centered in northwestern Mexico in which the panicles do not break away at maturity. Traditionally four species have been recognized (P. hirticaule Presl, P. sonorum Beal, P. stramineum H. & C., and P. pampinosum H. & C.) but after a close study in the field the conclusion is reached that only one species is present although four varieties are recognizable. It appears that a fifth variety is confined to the Galapagos Islands. The Mexican varieties are keyed as follows:

Leaves cordate clasping at base, more than 1 cm. broad;
enlarged panicle often drooping

Nodes and sheaths glabrous P. hirticaule
var. stramineum

Nodes and sheaths hirsute P. hirticaule
var. miliaceum

Leaves not cordate clasping, less than 1 cm. broad,
the panicles erect

Sheaths hirsute; plants sparingly branching at
the base; the terminal panicle often remote
and enlarged

P. hirticaule
var. hirticaule

Sheaths glabrous; plants freely branching from
the base; all panicles similar

P. hirticaule
var. pampinosum

Panicum hirticaule Presl var. hirticaule

P. hirticaule Presl, Rel. Maenk. 1:308. 1830.

P. capillare L. var. glabrum Vasey ex Brandeg. Proc.
Calif. Acad. II 2:211. 1889, nomen nudum.

P. capillare L. var. hirticaule (Presl) Gould, Madrono
10:94. 1949.

Plants erect, sparingly branched, 15 to 70 cm. tall; culms, nodes and sheaths papillose-hispid, but sometimes sparingly so; blades rarely exceeding 1 cm. in width, not cordate at base, sparsely hispid or nearly glabrous, ciliate toward the base.

Panicles exserted, 5 to 15 cm. long, scarcely one-third the entire height of the plant, often a terminal panicle remote and larger than the laterals, branches ascending, the lower narrowly so, bearing rather short-pedicelled spikelets along half to two-thirds their length, the glabrous pulvini inconspicuous; spikelets 2.7 to 3.3 mm. long, 1 to 1.1 mm. wide; spikelets typically reddish brown; first glume half to three-fourths the length of the spikelet; second glume slightly longer than the sterile lemma; the palea small; achene 2 mm. long, a scar sometimes showing on either side at base.

Rocky or sandy soil, Texas to southern California south through Mexico to Nicaragua.

Of this group centered in northwestern Mexico Panicum hirticaule Presl, described from the State of Guerrero, is the earliest name available. According to Hitchcock and Chase (1910) the type collection "represents the medium form of the species, with nearly simple culms, narrowly ascending lower panicle branches and reddish brown spikelets 3 mm. long." This variety is common throughout Mexico.

Panicum hirticaule Presl var. miliaceum (Vasey) comb. Nov.

P. capillare L. var. miliaceum Vasey, Contr. U. S. Nat. Herb. 1:28. 1890.

P. sonorum Beal, Grasses N. Amer. 2:130. 1896.

Robust; culms erect, branching, reported to be 1 m. tall; culms, nodes and sheaths hirsute and blades usually pubescent; blades 15 - 30 cm. long, often 2 cm. wide, ~~cordate~~ clasping at the base.

Panicles diffuse, nodding, with many spikelets, these 3 to 3.3 mm long, 1.1 mm wide, lanceolate, reddish brown; first glume three to five nerved, one half to two thirds as long as the spikelet; second glume and sterile lemma glabrous, seven to eleven nerved, ovate-lanceolate to acuminate; fertile lemma and palea smooth and shining; mature grain about 2 mm. long, globose.

Sonora panic was first described by Vasey in 1890 but given the name Panicum sonorum by Beal in 1896. The original collections were from Sonora and Baja California. Since then the plant has been reported from Chihuahua, Tamaulipas, Nuevo Leon, Tabasco, Sinaloa, Oaxaca, Veracruz and Chiapas in Mexico; also in Arizona and El Salvador.

Its apparent habitat is corn fields and barrancas. Its forage value fortuitous whenever it rains. Sonoran panic (also called sauwi) is reported to have been an indian crop plant of the Cocopa and Wariho tribes. While it seems doubtful that ground was cultivated for this species alone, apparently when land was disturbed for other purposes such as a corn field Sonora panic was a welcome and aggressive weed.

Panicum hirticaule Presl var. pampinosum (H. & C.)
comb. nov.

Panicum pampinosum Hitchc. & Chase, Contrib. U. S.
Nat. Herb. 15: 66. f. 48. 1910.

Panicum capillare L. var. pampinosum (H. & C.) Gould,
Madrono 10:94. 1949.

Short, 2 - 4 dm. tall, freely branching from the base; culms ascending from a decumbent base, branching at the lower and middle nodes, compressed, glabrous, or sparsely pilose below the panicle, the nodes pubescent; sheaths loose, glabrous; ligules of very stiff hairs 2 to 3 mm. long; blades 3 to 10 cm. long, 3 to 6 mm. wide, flat, scarcely narrowed at the base.

Panicles all alike, exserted, 6 to 15 cm. long, half to two-thirds as wide, the branches solitary, the lower as much as 5 to 8 cm. long, stiffly ascending with rather crowded short-pedicelled spikelets about 3 to 4 mm. long, 1.4 mm. wide, very turgid, pointed, typically greenish; first glume more than threefourths the length of the spikelet; second glume and sterile lemma subequal, exceeding the caryopsis; palea short; achene 2.2 mm. long.

Known from New Mexico and Arizona;
the most common variety of P. hirticaule in
Baja California, Mexico, and frequent in Sonora.

Panicum hirticaule Presl var. stramineum (H. & C.)
comb. nov.

Panicum stramineum Hitchc. and Chase, Contrib.
U. S. Nat. Herb. 15: 67, f. 50. 1910.

Panicum capillare L. var. stramineum (H.&C)
Gould, Madrono 10:94. 1949.

Plants ascending, sparingly branched,
2 to 5 dm. tall; glabrous; blades 10 to 30 cm. long,
10 to 15 mm. wide, cordate clasping at the base.

Panicles few, finally exserted, ovoid in
outline; spikelets 3 to 4 mm. long, 1.5 mm. wide,
elliptic, abruptly acuminate, when mature pale
stramineous; first glume one third the length of
the spikelet; second glume and lemma equal.

The type is from Guaymas, Sonora, Mexico.
The plant has also been reported from southern
Arizona and from Sinaloa.

SIGNIFICANT COLLECTIONS OF LOUISIANA PLANTS,

IV. CLAIBORNE PARISH

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A survey and study of the vascular flora of Claiborne Parish, Louisiana was made from March, 1976 through November, 1980 (Lewis 1980). During this study specimens of 132 families, 479 genera and 1074 species and subspecific taxa were collected or found to be on deposit in several Louisiana herbaria.

Because of its location away from all the major roads and railroads, the flora of Claiborne Parish was one of the most poorly collected of the state at the beginning of this study. Probably over half of the species collected were parish records and at least four state records were collected. Citations for these four state records follow.

Belamcanda chinensis (L.) DC. Edge of pasture beside Flat Lick Road north of La. 534 northwest of Langston, Sec. 6, T20N, R8W. R. Dale Thomas and Larry G. Lewis, 74216 & 3009, 16 October 1980. Correll and Johnston (1970) gives the range of this species as "from Ga. to Texas, Kansas and Conn." No specimens from Louisiana are known to the author and this range is typical of those given for several Louisiana plants which leave it open to the reader to interpret whether it is known from the state or not. Manuals are noted for saying things like "Florida to Texas" for plants which are not known to occur in Louisiana.

Cynoglossum zeylandicum (Vahl.) Thunb.
CLAIBORNE PARISH: Edge of pasture along road to Claiborne Lake State Park north of La. 146, Sec. 18, T20N, R5W. R. Dale Thomas, 55262, 17 September 1977. This population is spreading.

UNION PARISH: edge of pine woods at Bird Chapel Methodist Church east of Truxno, Sec. 30, T23N, R1E. R. Dale Thomas, 23480, 11 June 1971. This population is spreading along the edge of pine woods and in the adjoining lawn and cemetery. Plants from this population were transplanted to a flower garden in Ouachita Parish but persisted only two years.

Correll and Johnston (1970) give the range of this species as "rare in e Texas, May; native of India, Ceylon and Malaysia, introduced in various parts of the world."

Polygonum cuspidatum Sieb. & Zucc.

CLAIBORNE PARISH: Along fencerow west of La. 9 just south of Homer, Sec. 24, T21N, R7W. R. Dale Thomas and Larry G. Lewis, 64246 and 2107, 5 May 1979. We have collected it from two other locations in Claiborne Parish.

BIENVILLE PARISH: Beside La 9 near Otter Creek just south of Saline, Sec. 34, T14N, R6W. R. Dale Thomas, 7 September 1978. This population is extensive and spreading. This plant is also an escape in waste areas near DeSiard Street in downtown Monroe, Ouachita Parish, La.

Horton (1972) did not include Louisiana in the range of this plant.

Verbesina encelioides (Cav.) Gray

CLAIBORNE PARISH: edge of roadbank and a pig lot near Cypress Creek, northeast of Homer, Sec. 32, T22N, R6W. R. Dale Thomas and Larry G. Lewis, 52289 and 656, 16 May 1977.

Correll and Johnston (1970) gives the range of this plant as "very frequent in disturbed soils essentially throughout although rare in extreme east Texas, summer; Fla., Tex., s.e. through most of the warmer parts of America, adventive in Old World." This species was not included in the Louisiana flora by Cronquist (1980).

Several other rare plants were collected from Claiborne Parish, including: Ammoselinum butleri (Walt.) Coult., Baptisia sphaerocarpa Nutt., Cuscuta pentagona Engelm., Desmodium perplexum Schub., Evax candida (T. & G.) Gray, Evax verna Raf., Hypoxis longii Fern., Kuhnia eupatorioides L., Lychnis coronaria (L.) Desr., Nicotiana tabaccum L.,

Oenothera sessilis (Penn.) Munz, Panicum clandestinum L., Pennisetum typhoides (Burm.) Stapf. & Hubb., and Sanguinaria canadensis L.

Other rare plants have been collected in the past from Claiborne Parish. Allen (1980) reported Phalaris brachystachys, Phalaris paradoxa, and Poa bulbosa from the parish. A specimen of Smilacina racemosa is in the University of Southwestern Louisiana Herbarium (LAF) and one of Veronicastrum virginicum is in the Tulane University Herbarium (NO). Numerous attempts by the authors to relocate these plants in Claiborne Parish were unsuccessful.

Botrychium lunarioides Michx. is a rare plant throughout its range and occurs in large populations only in Alabama and at one site in DeSoto Parish. Although no really large populations of this plant are known from the parish, several different Claiborne locations of this plant were found during this study.

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SIGNIFICANT COLLECTIONS OF LOUISIANA PLANTS,

V. RICHLAND PARISH

R. Dale Thomas and Nancy Adams Dawson, Department of Biology, Northeast Louisiana University, Monroe, 71209.

a survey of the vascular plants of Richland Parish, La. was made from February 1977 to July 1978 (Dawson 1978; Thomas et. al. 1980). During this study specimens of 127 families, 443 genera and 918 species or subspecific taxa were collected, noted in literature or seen in Louisiana herbaria.

Only one species new to Louisiana was collected:

Heliotropium amplexicaule Vahl.

Beside railroad south of U.S. 80 and west of La. 17 in Delhi, Sec. 13, T17N, R9E. R. Dale Thomas and Scott Thomas, 59237, 2 July 1978. This native of Uruguay and Argentina is now widely adventive and escaped (Correll and Johnston 1970). No other plants of this borage are known from Louisiana. This population is large enough to survive and is spreading although it was partially destroyed recently by two different derailments.

Several other uncommon Louisiana plants were collected during this study including:

Alternanthera caracasana H.B.K.

Froelichia gracilis (Hook.) Moq.

Chrysanthemum leucanthemum L.

Armoracea aquatica (Eat.) Wieg.

Triosteum angustifolium L.

Arenaria lanuginosa (Michx.) Rohrb.

Ceratophyllum echinatum Gray

Evolvulus sericeus Sw.

Astragalus canadensis L.

Vicia tetrasperma (L.) Moench.

Anthoxanthum aristatum Boissier

Hottonia inflata Ell.

Crataegus brachyacantha Engelm. & Sarg.

Lycium carolinianum Walt. is scattered in coastal Louisiana and one population was found in Richland Parish along a rural road. Pontederia cordata L. was found in one large population near Rayville---this plant is rare in north Louisiana and very common in the southern part of the state.

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SIGNIFICANT COLLECTIONS OF LOUISIANA PLANTS,

VI. WEST CARROLL PARISH

R. Dale Thomas and Robert Clayton Gough, Department of Biology, Northeast Louisiana University, Monroe, 71209.

A survey of the vascular plants of West Carroll Parish, Louisiana was conducted from January, 1977 through December, 1979 (Gough, 1979; Thomas et. al 1980). Specimens of 116 families, 374 genera and 749 species or subspecific taxa were collected, noted in literature or examined in other Louisiana herbaria.

Three species previously unreported from the state were collected:

Arctium minus Schkuhr.

West Carroll Parish: Field, 1.5 miles northwest of Oak Grove on the R. C. Gough farm, Ward 4, Sec. 23, T21N, R10W. R. C. Gough, 314, 8 June 1977, and from the same population on 24 June 1978 (Gough 1234). Although Cronquist (1980) says this European native is now established as a common weed of roadsides and waste places throughout most of the U.S., the only plants known from Louisiana were cultivated ones. These are: Ouachita Parish: weed in flower bed, 403 Stevenson Drive north of Monroe, La. R. Dale Thomas, 28771, 2 May 1972. This plant was planted by Thomas and persisted in Ouachita Parish for two years. The West Carroll population has been there for several years and is spreading.

Lathyrus aphaca L.

West Carroll Parish: woods beside La. 589, 2 miles south of La. 2, Carole Crews, s.n., 8 April 1973, and Just south of Poverty Point Commemorative Area, Sec. 24, T19N, R10E. R. C. Gough, 1027, 5 April 1978.

There are also specimens from Ouachita Parish in the Louisiana State Herbarium in Baton Rouge: 3 sheets from Biedenhorn Farn, 8 miles southwest of Monroe, J. A. Moore, 9 May 1972, and another specimen sent to L.S.U. for identification by the Ouachita Parish County Agent, J. J. Joyce in 1951 with the data "spontaneous in crop in Monroe area." This specimen was mistakenly determined as Pisum sativum and so filed. These early collections were overlooked and not included in the Louisiana legumes by Lasseigne (1973) but this species is naturalized and scattered along roadbanks as is characteristic for Vicia, Medicago, and Lathyrus.

Anemone virginica L.

West Carroll Parish: edge of woods east of La. 17, 2.5 miles north of Oak Grove at a small stream, Sec. 17, T22N, R11E. R. C. Gough, 1260, 29 June 1978. Fruiting specimens were collected at the same site on 20 August 1978 (Thomas 60145 and Gough 1531). Keener (1975) included Arkansas but not Louisiana in the range of this species.

Several other uncommon Louisiana plants were collected during this study including:

Andredera basseloides (H.B.K.) Baill.

Brassica hirta Moench.

Armoracea aquatica (Eat.) Wieg.

Froelichia gracilis (Hook.) Moq.

Vicia grandiflora Scop.

Potentilla recta L.

Crataegus brachyacantha Sarg. & Engelm.

Ranunculus flabellaris Raf.

Cinna arundinacea L.

Solanum pseudocapsicum L.

One of the woods with the most variety of herbaceous vegetation in the parish was cleared for cultivation of soybeans during this study. The only population of Phlox divaricata and Salix tristis known in the parish was destroyed. Luckily, one area of wooded vegetation containing several upland species is preserved by the State of Louisiana at the Poverty Point Commemorative Area near Epps.

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WOODY PLANTS OF LOUISIANA

A new publication of The Louisiana Flora is to be available in February, 1981 for \$2.00 each. This publication is a checklist of the woody plants of the state including vines, shrubs, and trees. It contains an alphabetical list of scientific names giving common names, family, and common synonyms including those used by Small. Another list gives the excluded names. The third list is an alphabetical arrangement of families giving the genera and number of taxa in each. The final list is an alphabetical one of common names giving the Latin equivalent of each one.

This publication by Dr. R. Dale Thomas of Northeast Louisiana University and Dr. Charles M. Allen of Louisiana State University at Eunice is to be followed by a checklist and atlas of the vascular plants of the state. Hopefully this atlas can be followed in the future by a manual to the flora by the the authors.

This checklist is the second number of a new series of publications by the Herbarium of Northeast Louisiana University entitled CONTRIBUTIONS OF THE NORTHEAST LOUISIANA UNIVERSITY HERBARIUM. The first number of this series entitled, "A checklist of the vascular plants of Morehouse, Richland, and West Carroll parishes of northeast Louisiana" was published in 1980. This checklist and the woody plant checklist are available for two dollars each from Dr. R. Dale Thomas, Professor of Biology, Director and Curator of the Herbarium, Northeast Louisiana University, Monroe, La. 71209.

CONTRIBUTION TO THE LICHEN FLORA OF URUGUAY XVI.
LICHENS COLLECTED BY MARIANO B. BERRO.

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The present paper is based upon the study of the lichens of Uruguay collected by Mariano B. Berro which are transitorily preserved in the Herbarium, Museo Nacional de Historia Natural, Montevideo. Although they are a small number of samples, the author remarks the importance of making known the results of this study supported by several main reasons: it is the oldest of all the lichens collections from Uruguay preserved in national Herbaria; the dates of his gatherings span the years 1891 and 1919. Among the collections made by Uruguayan botanist it has been only preceded by Arechavaleta's published by J. Müller Argau (1888).

While the later was collected in Montevideo, Berro's collections belongs to several zones of Uruguay including complete data such as locality, date, substrate etc.

About half of Berro's material was collected in the region of Vera in the northwestern corner of Soriano Department. The general characteristics of this zone are described in his work "Las Gramíneas de Vera" (Berro 1906).

In the present paper the names of the localities have been transcribed such as recorded in the original labels. It is important to precise that the so-called Minas Department is the present Lavalleja and the locality known as Independencia in Canelones Department is nowadays La Paz City.

Hitherto four collections of Gladonia belonging to Cl. pyxidata-fimbriata complex and two species of the genus Usnea are yet unidentified. They will be motive of a next report once the study is completed.

Acarospora boliviana Magn.

SCRIBANO: Cerro de Vera, on stones, March 1913.

Caloplaca subnitida (Malme) Zahlbr.

COICONIA: Colonia, on stones of a old wall, April 1913.

Candelaria fibrosa (Fr.) Müll. Arg.

SORIANO: Bizcocho, on branches of Grawoskia, 19 March 1908; Vera, on trees, March 1900; on branches, July 1919.

Cladonia aggregata (Sw.) Ach.

CANELONES: Independencia, substrate unknown, 5 May 1900.

MALDONADO: Sierra de las Lozas, on stones, 30 March 1907.

Cladonia furcata (Huds.) Schrad. var. pinnata Flörk.

MALDONADO: Cerro de las Lozas, on stones, 30 March 1907.

Cladonia sp. nova (det. T. Ahti).

CANELONES: Independencia, on stones, 5 May 1900. With fumarprotocetraric acid and several unknowns, one with chocolate brown spot in TLC. The status of this species is under further study by T. Ahti.

Everniastrum pachydermum (Hue) Hale

MINAS: Verdún, on stones, Dec. 1900.

TREINTA Y TRES: Yermal, on stones, Nov. 1899.

Heterodermia diademata (Tayl.) Awas.

SORIANO: on tree, Oct. 1899.

Lecidea icterica (Mont.) Tayl.

SORIANO: on soil, Oct. 1894, May 1904.

Parmelia microsticta Müll. Arg.

SORIANO: Vera, on tree, March 1894; on trunk, March 1891.

Pertusaria colorans Malme var. rochae (Räs) Magn.

SORIANO: Cerro de Vera, on sandstone, March 1913.

Physcia aipolia (Ehrh.) Hampe.

SORIANO: Cerro de Vera, on sandstone, March 1913.

Ph. alba (Fée) Müll. Arg. var. obsessa (Mont.) Lynge

SORIANO: Vera, on tree, Sept. 1901; on tree, Oct. 1899.

Ph. tribacoides Nyl.

SORIANO: Vera, on tree, March 1900.

Pseudocyphellaria aurata (Ach.) Vain.

MALDONADO: Sierra de las Animas, on stones, 7 March 1915.

Ramalina celastri (Spreng.) Krog & Swinsc.

SORIANO: Vera, on trunks, March 1901.

R. continentalis Malme

MINAS: Arequita, substrate unknown, Dec. 1900.

R. prolifera Tayl.

ARTIGAS: Cuareim, on tree, June 1901.

Teloschistes chrysophthalmus (L.) Th.Fr. var. cinereus Müll. Arg.

SORIANO: Bizcocho, on branches of Grawoskia, 19 March 1908.

T. cymbalifer (Mey. & Flot.) Müll. Arg.

ARTIGAS: Cuareim, on branches, August 1901.

FLORIDA: Río Santa Lucía, 25 de Agosto, on Sebastiania, 10 April 1907.

Usnea amblyoclada (Müll. Arg.) Mot.

MALEDONADO: San Carlos, on stones, 28 Dec. 1906.

MINAS: Arequita, on stones, Dec. 1900.

In a former paper (Osorio 1980) we have reported Usnea pulvinata for Uruguay supported by Swinscow and Krog's opinion (Swinscow and Krog 1976) who considered U. pulvinata and U. amblyoclada as synonyms. In a later publication (Swinscow and Krog 1979) both taxa have been considered as different species. So that the above mentioned record for Uruguay belong to U. amblyoclada; up to the present the occurrence of U. pulvinata has not been quoted for our flora.

U. densirostra Tayl.

MALEDONADO: San Carlos, on stones, 28 Dec. 1906; Sierra de las Animas, on stones, 7 March 1915; Punta Ballena, on stones, 31 March 1908.

MINAS: Cerro Penitente, substrate unknown, Dec. 1900

SORIANO: Vera, substrate unknown, March 1900.

U. sulcata Mot.

SORIANO: Cerro de las Palmas, Perico Flaco, on tree March 1913.

In his work "La Vegetación Uruguaya" Berro (1901) reports Usnea hieronymi for Uruguay for the first time remarking that its vernacular name is "Yerba de la Piedra". He also mentions some of its medical uses. This paper, which was involuntarily omitted in our Catalogue (Osorio 1972), was published in 1901, however its prologue written by Berro is dated January 1899. All the Usneae reported in the present list have been collected after the Berro's paper was issued and no

specimens of U. hieronymi could be identified among them. Any comments as regards the scientific name of the ~~saxicolous~~ Usnea known as "Yerba de la Piedra" will be object of a next communication.

Xanthoparmelia hypopsila (Müll.Arg.) Hale

CANELONES: Independencia, on stones, 5 May 1900;
det. M. Hale.

This Xanthoparmelia, very scarcely quoted in the literature, up to the present is only known from Uruguay (Müller Argau 1887 and 1888) from collections made in the last century.

Xanthoria parietina (L.) Th. Fr.

MALDONADO: San Carlos, on Opuntia, 28 Dec. 1906.

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NOTES ON SOME PROPOSED RARE AND ENDANGERED
VASCULAR PLANT SPECIES IN MARYLAND

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Since the enactment of the Endangered Species Act of 1973 numerous studies have been initiated to effect the preservation and understanding of rare plants. Data collection from herbaria, botanical literature, and local authorities is often the initial task undertaken to evaluate the status of rare and endangered species for conservation programs. Broome et al. (1979) prepared an annotated list of vascular plants, based primarily upon herbarium and literature records, which they considered rare or of special concern within the State of Maryland. As a result of recent field studies I have compiled additional information for twelve of the species listed by Broome et al. (1979).

The taxa are presented alphabetically and include a statement of significance (acronyms adopted from Broome et al. (1979) are: FEW - "Few", three or less vouchered occurrences; DISJ - "Disjunct", a significant disjunction in range; LOCAL - "Local", restricted to specialized habitats; NELR, SELR, SLR - "Northeastern, Southeastern and Southern limit of range"; SMS - "Single Maryland Station"; UNDT - "Undetermined", reported sites not vouchered or material not seen) and county distribution with date of last vouchered collection. Voucher speci-

mens have been deposited in the Towson State University Herbarium (BALT) and the Herbarium of the University of Maryland at College Park (MARY).

Ammania teres Raf. (Lythraceae). Significance FEW; Dorchester 1976, and Worcester 1906, Cos. Additional, contiguous localities have been discovered in Kent Co.; common in marshes at Overton and in Eastern Neck Wildlife Refuge, 10-1-80, Riefner 80448 & 80455.

Asplenium cryptolepis Fern. (Polypodiaceae). Significance UNDT; reportedly from the Hagerstown Valley, Frederick and Washington Cos. by Reed (1953), no specimens seen. A locality discovered in Washington Co.; common in crevices of Conococheague limestone outcrops along the C&O Canal and the Potomac River near Dam No. 5, 10-12-80, Riefner 80526.

Asplenium montanum Willd. (Polypodiaceae). Significance FEW; Allegany 1964, Baltimore 1972, Garrett 1973, and Montgomery 1940, Cos. An additional locality discovered in Allegany Co.; common in sandstone crevices near the lake spillway of Rocky Gap State Park and Polish Mountain Wildlife Management Area, 7-26-80, Riefner 80272.

Asplenium pinnatifidum Nutt. (Polypodiaceae). Significance UNDT; Cecil Co. 1941, reported also in Baltimore, Frederick, Harford and Washington Cos. by Reed (1953), no specimens seen. A locality discovered in Washington Co.; infrequent in crevices of Martinsburg shale outcrops, upper elevations of the highest bluffs along Sandy Hook Rd., W. 1 mi. from Rt. 340, 9-20-80, Riefner 80396.

Carex trichocarpa Muhl. (Cyperaceae). Significance SMS, SELR; Howard Co. 1938. A second report and a new county record for the State; dense swales and bottomlands, discovered along the Big Gunpowder

Falls, Gunpowder Falls State Park, Baltimore Co.,
 $\frac{1}{2}$ mi. upriver from Masemore Rd. crossing, 5-31-80,
Riefner 8083.

Dicentra eximia (Ker.-Gawl.) Torr. (Fumariaceae). Significance FEW; Allegany 1971, and Montgomery 1976, Cos. New localities found in Allegany Co.; sandstone ledges near the lake spillway at Rocky Gap State Park, 7-26-80, Riefner 80268; sandstone ledges and rocky woods on mountainsides 2 mi. N. on Rt. 36 from Rt. 40 junction, E. side of Wills Creek, 9-13-80, Riefner 80375.

Gymnopogon brevifolius Trin. (Poaceae). Significance FEW; Wicomico 1878 and Worcester 1932, Cos. Infrequent populations are extant in Ocean City, Worcester Co. in the vicinity of 100 St. and Coastal Hwy., 9-20-80, Riefner 80384. Increasing pressure for land development in this resort community will probably extirpate the species in the near future at this locality.

Houstonia pusilla Schoepf (Rubiaceae). Significance DISJ, NELR; Anne Arundel 1951 and Harford 1978, Cos. An additional locality has been discovered in Harford Co. $\frac{3}{4}$ mi. downstream along Deer Creek from the Telegraph Rd. crossing, streamside schist outcrops, 4-16-80, Riefner 8029. Rare and not well established in crevices of floodplain rocks only. This species was not found by the author in previous years during extensive collecting of the area for plant-animal interaction studies. H. pusilla is considered by Reed (1980) to be introduced into the State along with grass seed. The recent development of residential communities on agricultural lands in the Deer Creek drainage may have led to the introduction of the species along with grass seed for lawns and roadbanks. There appears to be reasonable doubt that the species is indigenous to Maryland and its occurrence in the State probably represents

an accidental introduction.

Matteuccia struthiopteris (L.) Todaro (Polypodiaceae). Significance UNDT; reportedly from Baltimore and Harford Cos. by Reed (1953), no specimens seen. A large population has been discovered in Baltimore Co. in alluvial woods along the Patapsco River, Patapsco River Valley State Park near the Rt. 70 bridge, 5-2-80, Riefner 8032.

Paronychia fastigiata (Raf.) Fern. var. pumila (Wood) Fern. (Caryophyllaceae). Significance FEW, LOCAL; three localities Allegany 1977 and Washington 1906, Cos. This species is more abundant in Allegany and Washington Cos. than previous data has indicated Core (1941), and is here reported for the first time from Frederick Co. The Virginia whitlow-wort is not restricted to shale barrens and may be found growing in shale outcrop sections in open woods, and barren road banks simulating shale barrens, which are associated with subsurface shale beds. Collection data - Allegany Co.: shale barrens in Green Ridge State Forest, 9-21-80, Riefner et al. 80408; shale barrens near Old Town, 9-21-80, Riefner et al. 80413; dry woods and stony road banks along Wilson Rd. E. from Rt. 51, 10-4-80, Riefner 80491; roadcut exposures of Romney shale, on road banks and wooded slopes, along Rt. 40 E. of Black Valley Rd., 10-13-80, Riefner 80540; Red Hill, shale woods and exposed shaly banks behind LaVale Plaza on Rt. 40 near Rt. 53 junction, 10-13-80, Riefner 80545; shale barrens, Wills Creek shale along Rt. 220 near southern limits of Cumberland City, 10-13-80, Riefner 80549. Frederick Co.: Blue Ridge Mountains, Elk Ridge, brown shale ledges and eroded argillaceous road banks along Rt. 340 between Rt. 180 & Rt. 464, 10-13-80, Riefner 80580. Washington Co.: open woods in red shale outcrop section in Sideling Hill Wildlife Management

Area ca. 2 mi. S. from Rt. 40 along Sideling Hill Creek, 8-9-80, Riefner 80329; Elk Ridge, Martinsburg shale outcrops and high wooded shale slopes along Sandy Hook Rd. 1 mi. W. from Rt. 340, 9-20-80, Riefner 80397; open woods and barren road banks in red shale outcrop section along Catholic Church Rd. 1 mi. E. of Forsythe, 9-21-80, Riefner et al. 80406; shale barrens along High Germany Rd., 9-21-80, Riefner et al. 80407. This species is rather abundant in shale barrens, simulated shale barrens created by the agency of man along road cuts, and shale outcrop sections of Allegany and Washington Cos. in the Valley and Ridge district. Preliminary field reconnaissance of shale formations in Carroll, Garrett and Montgomery Cos. cited by Vokes and Edwards (1974) did not reveal additional populations. In light of the additional habitat data presented herein, P. fastigiata var. pumila may be expected to occur in Garrett Co., although rarely so, as in Frederick Co. This species is in need of further review 1) to verify its association with distinct topographic features, especially in peripheral areas of the Ridge and Valley district as the Blue Ridge Mountains and the Allegheny plateau, and 2) to ascertain the apparent and recent spread of the species into man-made habitats with regard to affording such a species rare status. However, the Virginia whitlow-wort is not of rare occurrence and in addition, the lack of extensive residential and commercial development in two relatively large counties, the species is not in danger of extirpation at this time and perhaps should be considered for deletion from the list.

Prunus maritima Marsh. (Rosaceae). Significance SLR, FEW; Assateague Island, Worcester Co., 1967. Extant in the vicinity of 100 St. and Coastal Hwy., Ocean City, Worcester Co. where previously thought to be extirpated, 9-19-80, Riefner 80384. Increasing pressure for land devel-

opment in this resort community will probably extirpate the species in the near future at this locality.

Woodsia ilvensis (L.) R.Br. (Polypodiaceae). Significance UNDT; reportedly from Allegany Co. by Reed (1953), no specimens seen. Extant in Allegany Co. along Town Creek near Rt. 40 in crevices of exposed Jennings shale, 9-21-80, Riefner et al. 80402.

In review of the significance of these records, collections of special interest are: Carex trichocarpa Muhl., which represents a second report for the State; and Paronychia fastigiata (Raf.) Fern. var. pumila (Wood) Fern. and Houstonia pusilla Schoepf, which are questionable candidates for rare status in the State, are here recommended for deletion from the list. As noted by Broome et al. (1979) extensive field work was not within the scope of their report and it is evident that much additional field study is necessary before their list can be considered definitive.

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NOTES ON THE GENUS *GHINIA* (*Verbenaceae*)

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Time does not now permit me to prepare the detailed monograph of this genus that was originally planned, but it has seemed worthwhile, nevertheless, to place on record the bibliographic and various other notes assembled by my wife and myself over the past 51 years. Full explanation of the herbarium acronyms employed herein and in all my papers on the other 59 genera so far treated by me in this series of papers published in this journal since 1932 will be found in *PHYTOLOGIA MEMOIRS* 2: 463--469 (1980).

GHINIA Schreb., Gen. 19. 1789 [not *Ghinia* Bub., 1901]

Synonymy: *Kempferia* Houst. ex L., Gen. Pl., ed. 1, 334 & [394], in syn. 1737. *Tamonea* Aubl., Hist. Pl. Guian. Fr. 2: 659--660, pl. 268. 1775 [not *Tamonea* Aubl., Hist. Pl. Guian. Fr. 1: 441, pl. 175. 1775]. *Kaempferia* Houst., Reliq. 3: pl. 2. 1781 [not *Kaempferia* Spreng., 1973]. *Leptocarpus* Willd. ex Link in Spreng., Jahrb. Gew. 1 (3): 51. 1820 [not *Leptocarpus* R. Br., 1810]. *Tamonia* Aubl. ex Kunth, Syn. Pl. 2: 65. 1823; Schlecht. & Cham., Linnaea 5: 99. 1830. *Kämpferia* Houst. ex Reichenb., Consp. Reg. Veg. 1: 117, in syn. 1828. *Ghinia* Willd. ex Reichenb., Consp. Reg. Veg. 1: 117, in syn. 1828. *Leptocarpus* Link ex Bartling, Ord. Nat. Pl. 180. 1830. *Ischnia* P.DC. ex Meisn., Pl. Vasc. Gen. 1: 298. 1839. *Tamonia* Kunth apud Meisn., Pl. Vasc. Gen. 2: 200, in syn. 1840. *Kaempferia* Houst. ex Spach, Hist. Nat. Veg. 9: 227, in syn. 1840 [not *Kaempferia* L., 1753]. *Maceria* P.DC. ex Meisn., Pl. Vasc. Gen. 2 [Comm.]: 206, in syn. 1840. *Ghinia* Swartz ex Spach, Hist. Nat. Veg. 9: 227, in syn. 1840. *Ischnia* P.DC. ex Walp., Repert. Bot. Syst. 6: 520. 1847. *Tamona* Aubl. ex A.DC., Prodr. 11: 736, sphalm. 1847. *Ghina* Schreb. apud Wittstein, Etymolog.-bot. Hanswörterb. 387, sphalm. 1852. *Tamone* Schnitzl., Iconogr. Fam. Nat. 2: 137 Verbenac. [2], sphalm. 1856. *Ischnia* Walp. ex Pfeiffer, Syn. Bot. 227, in syn. 1870. *Guinea* Schreb. ex Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4 (3a): 148, in syn. 1895. *Tomonea* Aubl. ex Mold., Prelim. Alph. List Inv. Names 43, in syn. 1940. *Maceria* Sessé & Moc. ex Mold., Prelim. Alph. List Inv. Names 32, in syn. 1940. *Chinia* Reko, Bol. Soc. Bot. Mex. 4: 35, sphalm. 1946. *Chinia* Schreb. apud Pittier, Cat. Fl. Venez. 2: 329 & 331, sphalm. 1947. *Leptocarpus* "Willd. ex Link" apud Angely, Cat. Estat. Gen. Bot. Fan. 17: 4, in syn. 1956. *Ischnia* "P.DC. ex Meisn." apud Angely, Cat. Estat. Gen. Bot. Fan. 17: 4, in syn. 1956. *Maceria* "P.DC. ex Meisn." apud Angely, Cat. Estat. Gen. Bot. Fan. 17: 4, in syn. 1956. *Ischnia* "P.DC. ex Angely, Cat. Estat. Gen. Bot. Fan. 17: 4, in syn. 1956. *Ischnia* "Walp. ex Pfeiffer" apud Angely, Cat. Estat. Gen. Bot. Fan. 17: 4, in syn. 1956. *Guinea* "Schreb. ex Briq." apud Angely, Cat. Estat. Gen. Bot. Fan. 17: 4, in syn. 1956. *Kempferia* Adans. apud

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Erect annual herbs with a woody base or suffrutescent with slender, rigid, tetragonal, striate-sulcate, divaricate stems and branches; leaves small, deciduous, decussate-opposite, sessile or subsessile to distinctly petiolate, marginally entire or dentate to incised-serrate or even subpinnatifid, the larger ones often subplicate-penninerved; inflorescence spicate or racemiform, centripetal, axillary and terminal, indeterminate, generally rather few-flowered, solitary, slender, often unilateral; flowers rather small, sessile or short-pedicellate, mostly remote, solitary in the axil of a very small inconspicuous prophyllum, borne alternately on a slender, angular, often rigid, sulcate rachis, complete, perfect, hypogynous; calyx gamosepalous, tubular or cylindric-tubular during anthesis, in fruit accrescent and campanulate, the rim subtruncate, 5-costate-plicate with elevated ribs which are prolonged into short, acute or subulate, subequal, tooth-like apiculations, membranous between the costae; corolla gamopetalous, usually subinfundibular and somewhat hypocrateriform during full anthesis, somewhat zygomorphic, mostly blue, lilac, or purplish, rarely whitish, the tube slender, cylindric, somewhat ampliate apically, subequaling the calyx, the limb oblique, spreading during anthesis, obtusely and unequally 4- or 5-lobed or -fid, the lobes entire or apically emarginate, the 2 lateral (posterior) lobes slightly smaller and shorter, the anterior lobe much enlarged and erect, the lowermost lobe deflexed; stamens 4, didynamous, inserted at about or below the middle of the corolla-tube, included; filaments very short, filiform; anthers ovate, dorsifixed, with 2 parallel thecae which dehisce longitudinally; connective on the 2 anterior (superior) stamens prolonged into a short, thick or club-shaped, glanduliferous appendage not present on the inferior pair of stamens; pistil compound, bicarpellary, each carpel 2-celled and 2-ovulate; style terminal, solitary, included, usually about equaling the lower pair of stamens; stigma oblong, rather thickened, sublaterally or unilaterally oblique; ovary superior, situated on a basal disk, compound, almost completely 4-celled, the cells 1-ovulate; ovules anatropous, for the major part laterally attached near the base of the cell to the carpellary margin; fruit drupeaceous, mostly dry and hard, globose to subtruncate or turbinate, mostly scarcely exserted from the accrescent, cyathiform, membranous, semi-velate fruiting-calyx, apically obtuse to truncate or shortly 4-lobed, 4-knobbed, 4-cornute, or 4-spinose, the exocarp very thin, somewhat fleshy, the endocarp hard, bony, 4-celled, rugose-areolate in drying, with a single central lumen; seeds solitary in each cell, erect, exalbuminous; cotyledons 2, flattish, thick, applicate; radicle very short.

Type species: *Tamonea spicata* Aubl. [*Ghinia spicata* (Aubl.) Mold.]

This small and very distinctive tropical American genus of about ten species and varieties was named in honor of Lucas China (1500--1556), professor of medicine and botany at Padua, Colonia, and Pisa, founder of the Padua and Pisa botanical gardens.

Tamonea Aubl. is obviously the oldest scientific name for the genus, but is rejected because it is a later homonym of *Tamonea* Aubl. in the *Melastomataceae*. The verbenaceous *Tamonea* was published by Aublet on pages 659--660, pl. 268, in volume 2 of his *Histoire des Plantes de la Guiane Française* (1775), while the melastomataceous *Tamonea* was published by him on page 440 of volume 1 of the same work. The work, according to Stafleu (1967) was published in 72 parts between June and September of 1775. Aublet himself realized his mistake in using the name twice in different senses and applied to plants in quite separate plant families, and, unfortunately, decided to retain it for the verbenaceous plant. He, therefore, "corrected" the name to *Fothergilla* [an invalid homonym of the *Fothergilla* of Linnaeus in the *Hamamelidaceae*] in such copies of volume 1 as were still within his reach. Apparently, however, he was not able to delete the name from all copies since copies exist now in some libraries without his deletion (correction) having been made, so it seems obvious that some uncorrected copies of volume 1 had already been distributed among subscribers and/or colleagues, thus effectively and validly publishing the generic name *Tamonea* for the melastome group. Regardless of Aublet's later attempt to "cancel out" the earlier publication by substituting "*Fothergilla*" for it and maintain the name for the verbenaceous group, under the present Code of Botanical Nomenclature he was not justified in so doing. Without formal conservation, the later homonym must be rejected, even though *Miconia* Ruiz & Pav. (1794) has since officially been conserved over the melastomataceous *Tamonea* of Aublet (1775) and in spite of the assertion by Green (1935) that "The name *Tamonea* Aubl. (*Verbenaceae*) stands without conservation."

The earlier *Tamonea* is now accepted by Wurdack, internationally recognized authority on the *Melastomataceae*, as the valid name for a rather primitive group of species which he classifies in the genus *Miconia* as Section *Tamonea* (Aubl.) Cogn. [or *Tamonea* Cogn. according to some experts on the interpretation of the present international Code]. It is certainly very possible, given the very large number and diversity of species that now comprise the genus *Miconia*, that sooner or later the Section *Tamonea* will be elevated to generic rank. In that case, according to Dr. Rupert Barneby, also a recognized expert on the Code, *Tamonea* would be available as the valid name for the new genus, since it is rejected only from use for the genus *Miconia* as such, a rejection which would not at all preclude its use for a genus segregated from *Miconia* and containing Aublet's original type species.

A rather similar case where a name published in only some copies of a work is yet regarded as validly published, is seen in the case of *Eriocaulon aquaticum* (J. Hill) Druce, the presently accepted by the European plant previously known as *E. septangulare* With. It has been shown that some (few) copies of Hill's Herbarium Britannicum, volume 1 (1769) exist with an additional plate illustrating a new genus, *Cespa* Hill, with a single species, *C. aquatica*. Some other copies exist with actually 4 additional pages of text. The fact that these pages, and this plate, do not exist in all copies of the work seems to indicate that they were not printed soon enough to include in all copies, yet the fact that they are in some copies validates Hill's genus and species [cfr. Dandy, *Watsonia* 7: 168--169. 1969].

Ghinia has in the past been accepted as the valid name for the genus by Swartz (1800), Britton & Wilson (1925), Standley (1924), Barkley (1965), Liogier (1957, 1965), Angely (1956, 1960), León & Alain (1974), López-Palacios (1977), and, of course, by myself in all my previous publications. Airy Shaw, in his 1966 work, accepts the name on pages 476, 680, and 1099, but not on pages 582, 595, and 597. In his 1973 work he definitely accepts it (pages 488, 698, & 1129) and rejects *Tamonea*.

Sherardia Vaill., sometimes included in the synonymy of *Ghinia*, actually belongs to that of *Stachytarpheta* Vahl. *Tamonea* Aubl. is given as a valid genus in the *Labiatae*, Section *Verbeneae*, by Reichenbach (1828), with *Kämpfera* Houst., *Leptocarpus* Willd., and *Ghinia* Willd. as synonyms. The *Ghinia* of Bubani, Fl. Pyren. 3: 158 (1901) is a synonym of *Cardamine* L. in the *Brassicaceae*.

It is perhaps worth noting here that the Meisner (1840) reference listed by me in the bibliography (above), is sometimes incorrectly cited as "1839" or as page "206" (instead of p. 200). The Swartz (1788) plate reference is sometimes cited as in volume 3 since it has been bound in that volume in some libraries [e.g., at the New York Botanical Garden], but it apparently was originally published with and bound in volume 2. The Walpers (1847) reference is sometimes erroneously cited to page "52" [instead of p. 520]. The Angely (1971) reference is often cited by the erroneous titlepage date of "1970". The genus *Kempfera* is credited to Adanson by Airy Shaw (1966), but in Adanson's work (1763) it is plainly credited to Houstoun. Similarly, he credits *Ischnia* to Meisner, but Meisner plainly credits it to DeCandolle. The Endlicher reference (1838) is often cited by the titlepage date of "1836-1856", but the page here involved was issued in 1838. Similarly, the Schnitzlein (1856) reference is often cited as "1843-1870", but the page involving the present genus was issued in 1856.

It is particularly interesting to note that the prestigious "Index Kewensis" [Supplement 6, 1926] mistakenly places no less than five binomials in the melastomataceous *Tamonea* in the verbenaceous *Tamonea*! This kind of mistake occurs quite frequently in the case of homonymous genera in works of lesser repute and is one of the reasons why I always try to include in my lists of excluded species the binomials published in homonymous genera.

Sweet (1830) lists "tamonea" as the recommended popular name for this genus as cultivated in English gardens, while Poiret (1823) uses "tamonée" as the vernacular French name. The German popular name is "Traubennuss".

Junell (1934) discusses the generic pistil morphology [on the basis of *G. curassavica* var. *yucatanensis* Mold.] as follows: "Die mittleren Partien der Fruchtblätter sind nur im oberen Teil des Fruchtknotens mit den Fruchtblatträndern verwachsen. Die Samenanlagen besitzen wie bei den vorhergehenden Gattungen eine nach unten gerichtete Mikropyle. Sie besitzen jedoch keine basale Befestigung, sondern sind am grössten Teil ihrer Länge entlang mit dem Fruchtblattrand verbunden. Man kann somit von keinem Funikulus sprechen. Das Leitbündel der Samenanlage reicht hoch im Fruchtblattrand hinauf, bevor es in den chalazen Teil der Samenanlage abbiegt. Wie aus den Schnitten a und b ersichtlich, setzt von den Plazentagefässbündeln eine kleine Abzweigung gerade nach oben beiderseits der medianen Fruchtknotenöhle fort. Aus der Schnittreihe ist ersichtlich, dass die Sietenwandungen dieser medianen Höhle mit leitendem Gewebe bekleidet sind. Die Pollenschläuche scheinen somit bis hinab zum Grunde dieser Höhle zu gehen, bevor sie zu eine der Samenanlagen abbiegen. Die Frucht ist nach Briquet eine viersamige Steinfrucht mit fleischigem Exokarp. Diese Angabe ist irreführend. Nach Herbarmaterial zu urteilen scheint die Frucht sehr wenig saftig zu sein. Das Endokarp zerfällt nicht."

Erdtman (1952) describes the pollen of the genus, again on the basis of *G. curassavica* var. *yucatanensis*, as "3-colpor(oid)ate, prolate (76 x 55 μ). Nexine thinner than the \pm compact extranexinous part of the exine which is traversed by fine \pm radial lines. Grains very different from those in *Verbena*, more similar to the grains in *Chascanum*".

The genus *Ghinia* is native to tropical America from Mexico and the West Indies to Brazil, northern Argentina, and Bolivia. It was regarded by Schauer (1847) as related to *Priva* Adans. and *Casselia* Nees & Mart., but is placed by Briquet (1895) in the Tribe *Euverbeneae* Briq. with *Verbena* [Dorst.] L., *Stylodon* Raf., *Hierobotana* Briq., *Junellia* Mold., and *Urbania* R. A. Phil.

A list of excluded taxa, including those of homonymous genera follows:

- Ghinia alpina* (Willd.) Bub., Fl. Pyren. 3: 158. 1901 = *Cardamine alpina* Willd., *Brassicaceae*
- Ghinia amara* (L.) Bub., Fl. Pyren. 3: 163. 1901 = *Cardamine amara* L., *Brassicaceae*
- Ghinia hirsuta* (L.) Bub., Fl. Pyren. 3: 162--163. 1901 = *Cardamine hirsuta* L., *Brassicaceae*
- Ghinia impatiens* (L.) Bub., Fl. Pyren. 3: 160--161. 1901 = *Cardamine impatiens* L., *Brassicaceae*
- Ghinia pratensis* (L.) Bub., Fl. Pyren. 3: 163--165. 1901. = *Cardamine pratensis* L., *Brassicaceae*
- Ghinia raphanifolia* (Pourr.) Bub., Fl. Pyren. 3: 165--166. 1901 = *Cardamine latifolia* Vahl, *Brassicaceae*
- Ghinia resedifolia* (L.) Bub., Fl. Pyren. 3: 160. 1901 = *Cardamine resedifolia* L., *Brassicaceae*

- Ghinia sylvatica* (Link) Bub., Fl. Pyren. 3: 161--162. 1901 = *Cardamine hirsuta* L., *Brassicaceae*
- Leptocarpus aristatus* R. Br., Prod. Fl. Nov. Holl., imp. 1, 250. 1810 -- in the *Restionaceae*
- Leptocarpus aristatus* F. Muell., Fragm. 8: 91. 1874 = *L. erianthus* Benth., *Restionaceae*
- Leptocarpus brownii* Hook. f., Fl. Tasm. 2: 73, pl. 136. 1858 -- in the *Restionaceae*
- Leptocarpus burchellii* Mast., Journ. Linn. Soc. Lond. Bot. 10: 222. 1869 -- in the *Restionaceae*
- Leptocarpus canus* Nees, Ann. Mag. Nat. Hist., ser. 1, 6: 50. 1841 -- in the *Restionaceae*
- Leptocarpus chilensis* Mast. in P. DC., Monog. Phan. 1: 341. 1878 -- in the *Restionaceae*
- Leptocarpus ciliaris* Nees in Lehm., Pl. Preiss. 2: 64. 1846 = *L. canus* Nees, *Restionaceae*
- Leptocarpus coangustatus* Nees in Lehm., Pl. Preiss. 2: 64. 1846 -- in the *Restionaceae*
- Leptocarpus desertus* F. Muell., Fragm. 8: 93. 1874 = *L. spathaceus* R. Br., *Restionaceae*
- Leptocarpus dichotomus* Heynh., Nom. 1: 455. 1840 = *Thamnochortus umbellatus* Kunth, *Restionaceae*
- Leptocarpus disjunctus* Mast., Journ. Linn. Soc. Lond. Bot. 17: 344. 1879 -- in the *Restionaceae*
- Leptocarpus distachyos* R. Br., Prodr. Fl. Nov. Holl., imp. 1, 250. 1810 = *Thamnochortus umbellatus* Kunth, *Restionaceae*
- Leptocarpus elatior* R. Br., Prodr. Fl. Nov. Holl., imp. 1, 250. 1810 -- in the *Restionaceae*
- Leptocarpus erianthus* Benth., Fl. Austral. 7: 235. 1878 -- in the *Restionaceae*
- Leptocarpus glaucus* Nees in Lehm., Pl. Preiss. 2: 64. 1846 = *Lepyrodia glauca* F. Muell., *Restionaceae*
- Leptocarpus imbricatus* R. Br., Prodr. Fl. Nov. Holl., imp. 1, 250. 1810 = *Thamnochortus imbricatus* Kunth, *Restionaceae*
- Leptocarpus imbricatus* Sieber ex Kunth, Enum. Pl. 3: 400. 1841 = *Restio bifidus* Thunb., *Restionaceae*
- Leptocarpus incurvatus* Mast., Journ. Linn. Soc. Lond. Bot. 10: 223. 1869 -- in the *Restionaceae*
- Leptocarpus modestus* Mast., Journ. Linn. Soc. Lond. Bot. 10: 225. 1869 -- in the *Restionaceae*
- Leptocarpus neglectus* Mast., Journ. Linn. Soc. Lond. Bot. 10: 225. 1869 -- in the *Restionaceae*
- Leptocarpus oxylepis* Mast., Journ. Linn. Soc. Lond. Bot. 10: 223. 1869 -- in the *Restionaceae*
- Leptocarpus paniculatus* Mast., Journ. Linn. Soc. Lond. Bot. 10: 221. 1869 -- in the *Restionaceae*
- Leptocarpus peronatus* Mast., Journ. Linn. Soc. Lond. Bot. 10: 224. 1869 -- in the *Restionaceae*
- Leptocarpus ramosus* R. Br., Prodr. Fl. Nov. Holl., imp. 1, 250. 1810 -- in the *Restionaceae*
- Leptocarpus scariosus* R. Br., Prodr. Fl. Nov. Holl., imp. 1, 250. 1810 -- in the *Restionaceae*

- Leptocarpus schultzii* Benth., Fl. Austral. 7: 237. 1878 -- in the *Restionaceae*
- Leptocarpus setuligerus* F. Muell., Fragm. 8: 97. 1874 = *L. tenax* R. Br., *Restionaceae*
- Leptocarpus simplex* R. Br., Prod. Fl. Nov. Holl., imp. 1, 250. 1810 = *L. brownii* Hook. f., *Restionaceae*
- Leptocarpus simplex* A. Rich., Fl. N. Zél. 142. 1832 -- in the *Restionaceae*
- Leptocarpus spathaceus* R. Br., Prod. Fl. Nov. Holl., imp. 1, 250. 1810 -- in the *Restionaceae*
- Leptocarpus squarrosus* [Nees in] Sieber ex Kunth, Enum. Pl. 3: 419. 1841 = *Hypolaena lateriflora* Benth., *Restionaceae*
- Leptocarpus tenax* R. Br., Prod. Fl. Nov. Holl., imp. 1, 250. 1810 -- in the *Restionaceae*
- Leptocarpus tenellus* F. Muell., Fragm. 8: 99. 1874 = *L. aristatus* R. Br., *Restionaceae*
- Leptocarpus thamnochortoides* F. Muell., Fragm. 8: 96. 1874 = *L. tenax* R. Br., *Restionaceae*
- Tamonea albicans* (Sw.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia albicans* (Sw.) Triana, *Melastomataceae*
- Tamonea andina* (Naud.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia latifolia* (Don) Naud., *Melastomataceae*
- Tamonea androsaemifolia* Jennings, Ann. Carnegie Mus. 11: 209. 1917 = *Miconia androsaemifolia* Griseb., *Melastomataceae*
- Tamonea arabica* Mirb., ed. 2, 15: 233. 1805 = *Priva adhaerens* (Forsk.) Chiov.
- Tamonea argyrophylla* (DC.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia argyrophylla* DC., *Melastomataceae*
- Tamonea atrata* (Spring) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia atrata* (Spring) Wawra, *Melastomataceae*
- Tamonea aureoides* (Cogn.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia aureoides* Cogn., *Melastomataceae*
- Tamonea ceramicarpa* (DC.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia ceramicarpa* (DC.) Cogn., *Melastomataceae*
- Tamonea ciliata* (L. C. Rich.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia ciliata* (L. C. Rich.) DC., *Melastomataceae*
- Tamonea cubensis* (Griseb.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia cubensis* (Griseb.) Sauv., *Melastomataceae*
- Tamonea delicatula* (A. Rich.) Jennings, Ann. Carnegie Mus. 11: 210. 1917 = *Miconia delicatula* A. Rich., *Melastomataceae*
- Tamonea epiphytica* (Cogn.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia latifolia* (Don) Naud., *Melastomataceae*
- Tamonea fothergilla* (DC.) Cook & Collins, Contrib. U. S. Nat. Herb. 8: 249. 1903 = *Miconia mirabilis* (Aubl.) L. Wms., *Melastomataceae*

- Tamonea fulva* (L. C. Rich.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia chrysophylla* (L. C. Rich.) Urb., *Melastomataceae*
- Tamonea guianensis* Aubl., Pl. Guian. Fr. 1: 440, pl. 175. 1775 = *Miconia mirabilis* (Aubl.) L. Wms., *Melastomataceae*
- Tamonea holosericea* (L.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia holosericea* (L.) DC., *Melastomataceae*
- Tamonea humilis* (Cogn.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia humilis* Cogn., *Melastomataceae*
- Tamonea ibaguensis* (Bonpl.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia ibaguensis* (Bonpl.) Triana, *Melastomataceae*
- Tamonea impetiolearis* (Don) Cook & Collins, Contrib. U. S. Nat. Herb. 8: 249. 1903 = *Miconia impetiolearis* (Sw.) Don ex DC., *Melastomataceae*
- Tamonea jucunda* (DC.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia jucunda* (DC.) Triana, *Melastomataceae*
- Tamonea laevigata* (L.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia laevigata* (L.) DC., *Melastomataceae*
- Tamonea lappulacea* Pers. ex Schau. in A.DC., Prodr. 11: 529 & 534, in syn. 1847 = *Priva lappulacea* (L.) Pers.
- Tamonea lasiopetala* DC. ex Triana, Trans. Linn. Soc. Lond. 28: 103. 1871 = *Miconia serrulata* (DC.) Naud., *Melastomataceae*
- Tamonea ligustroides* (DC.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia ligustroides* (DC.) Naud., *Melastomataceae*
- Tamonea longifolia* (Aubl.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia longifolia* (Aubl.) DC., *Melastomataceae*
- Tamonea macrophylla* (Don) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia serrulata* (DC.) Naud., *Melastomataceae*
- Tamonea magnifica* (Denis) Voss in Vilm., Blumeng., ed. 3, 1: 320. 1894 = *Miconia calvescens* DC., *Melastomataceae*
- Tamonea media* (D. Don) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia media* (D. Don) Naud., *Melastomataceae*
- Tamonea minutiflora* (Bonpl.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia minutiflora* (Bonpl.) DC., *Melastomataceae*
- Tamonea moënsis* Britton, Mem. Torrey Bot. Club 16: 91. 1920 = *Miconia moënsis* (Britton) Alain, *Melastomataceae*
- Tamonea nervosa* (Smith) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia nervosa* (Smith) Triana, *Melastomataceae*
- Tamonea praecox* Jennings, Ann. Carnegie Mus. 11: 211. 1917 = *Miconia obtusa* (Griseb.) Triana, *Melastomataceae*
- Tamonea prasina* (Sw.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia prasina* (Sw.) DC., *Melastomataceae*
- Tamonea racemosa* (DC.) Cook & Collins, Contrib. U. S. Nat. Herb. 8:

249. 1903 = *Miconia racemosa* (Aubl.) DC., *Melastomataceae*
Tamonea reclinata (Bonpl.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia reclinata* (Bonpl.) Naud., *Melastomataceae*
Tamonea rubiginosa (Bonpl.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia rubiginosa* (Bonpl.) DC., *Melastomataceae*
Tamonea speciosa (St. Hil. & Naud.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia speciosa* (St. Hil. & Naud.) Naud., *Melastomataceae*
Tamonea stenostachya (DC.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia stenostachya* DC., *Melastomataceae*
Tamonea theaezans (Bonpl.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia theaezans* (Bonpl.) Cogn., *Melastomataceae*
Tamonea thomasiana (DC.) Cook & Collins, Contrib. U. S. Nat. Herb. 8: 249. 1903 = *Miconia thomasiana* DC., *Melastomataceae*
Tamonea tomentosa (L. C. Rich.) Krasser in Engl. & Prantl, Nat. Pflanzenfam. 3 (7): 142. 1893 = *Miconia tomentosa* (L. C. Rich.) Don ex DC., *Melastomataceae*
Tamonea tomentosa var. *auriculata* Jennings, Ann. Carnegie Mus. 11: 211. 1917 = *Miconia tomentosa* (L. C. Rich.) Don ex DC., *Melastomataceae*
Tamonea wrightii Jennings, Ann. Carnegie Mus. 11: 211. 1917 = *Pachyantha wrightii* Griseb., *Melastomataceae*

I am very grateful to my friend and colleague, Dr. John J. Wurdack, for his assistance in the preparation of the above list of melastomataceous taxa.

An artificial key to the taxa of *Ghinia* follows:

1. Fruit distinctly sharp-spinose.
 2. Some leaf-blades subpinnatifid; native to Puerto Rico, Barbuda, and Antigua.....*G. boxiana*.
 - 2a. None of the leaves subpinnatifid; native to Cuba, Hispaniola, Mexico, Central & South America.
 3. Inflorescence mostly many-flowered and elongate.
 4. Leaf-blades rusty-puberulent with distinct short hairs beneath; native to South America.....*G. cardenasi*.
 - 4a. Leaf-blades usually only very minutely and obscurely puberulent.
 5. Mature leaf-blades usually large, to 4 cm. long and 3 cm. wide; mature fruiting-calyx not reaching base of the spines.
 6. Native to the Bahamas, Cuba, and Mexico; pubescence fine, short, appressed.
 7. Leaf-blades apically decidedly acute or acuminate, basally acute or cuneate-attenuate, the marginal teeth sharply acute or acuminate; native to northern & central Mexico and Cuba.....*G. curassavica*.
 - 7a. Leaf-blades apically obtuse, basally truncate or subtruncate; the marginal teeth rather obtuse; native to the Yucatán Peninsula only.....

-*G. curassavica* var. *yucatanensis*.
 6a. Native to Brazil; pubescence longer, coarser, and more spreading.....*G. curassavica* var. *australis*.
 5a. Mature leaf-blades usually small, only to 1.5 cm. long and 0.6 cm. wide; mature fruiting-calyx reaching base of spines.
 8. Corolla 6--7 mm. long; petioles to 7 mm. long; leaf-blades narrowly ovate-lanceolate, apically acute, the venation pinnate.....*G. curassavica* f. *parvifolia*.
 8a. Corolla 15 mm. long; petioles to 1 mm. long; leaf-blades deltoid-ovate, apically obtuse, the venation subflabelliform.....*G. euphrasiifolia*.
 3a. Inflorescence mostly only 1- or 2-flowered; native to Cuba & Hispaniola only.....*G. subbiflora*.
 1a. Fruit merely short-horned or knobbed, muticous.
 9. Leaves sessile or subsessile; fruit 4-horned, the horns short and blunt; South American.....*G. juncea*.
 9a. Leaves distinctly petiolate; fruit only obscurely knobbed; Central & South American.....*G. spicata*.

GHINIA BOXIANA Mold., Known Geogr. Distrib. Verbenac., ed. 1, 77. 1942.

Synonymy: *Ghinia spinosa* Britton & P. Wils. apud Worsdell, Ind. Lond. Suppl. 1: 433. 1941 [not *G. spinosa* Willd., 1797]. *Ghinia verbenacea* Leprieur ex Mold., Alph. List Inv. Names Suppl. 1: 9, in syn. 1947 [not *G. verbenacea* Sw., 1800].

Bibliography: Sw., Fl. Ind. Occ. Prod. 1: 94. 1797; Willd. in L., Sp. Pl., ed. 2, 1: 114. 1797; Sw., Fl. Ind. Occ. Prod. 2: 1089--1090. 1800; Sweet, Hort. Brit., ed. 2, 418 (1830) and ed. 3, 552. 1839; Schau. in A.D.C., Prodr. 11: 528 & 529. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 198 & 469. 1858; Griseb., Cat. Pl. Cub. 214. 1866; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1027 (1893) and imp. 1, 2: 1034. 1895; M. Kunz, Anatom. Untersuch. Verb. 35. 1911; Britton & P. Wils., Scient. Surv. Porto Rico 6: 139. 1925; N. L. Britton, Addisonia 17: 5, pl. 547. 1932; Fedde & Schust., Justs Bot. Jahresber. 58 (2): 329. 1938; Mold., Suppl. List Com. Vern. Names 9. 1940; Wangerin & Krause, Justs Bot. Jahresber. 60 (1): 753. 1941; Worsdell, Ind. Lond. Suppl. 1: 433. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 27, 28, 77, & 93. 1942; Mold., Phytologia 2: 103. 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1027 (1946) and imp. 2, 2: 1034. 1946; Mold., Alph. List Inv. Names Suppl. 1: 9 & 21. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 49, 52, & 185. 1949; E. J. Salisb., Ind. Kew. Suppl. 11: 100. 1953; Véléz, Herb. Angiosp. Lesser Ant. 117. 1957; Mold., Résumé 54, 60, 295, 353, & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1027 (1960) and imp. 3, 2: 1034. 1960; Liogier, Rhodora 67: 349. 1965; Mold., Fifth Summ. 1: 105 & 108 (1971) and 2: 520, 639, & 879. 1971; Mold., Phytologia 36: 42 & 47. 1977; Mold., Phytol. Mem. 2: 97, 100, 354, 405, 445, & 548. 1980.

Illustrations: N. L. Britton, Addisonia 17: pl. 547 (in color). 1932.

A shrubby much-branched perennial herb, to about 60 cm. tall; branches slender, finely pubescent and scabrous; leaves decussate-opposite, rather firm; petioles usually very short or absent; leaf-blades herbaceous, some (usually the lower) oblong, 1 cm. long or less, marginally subpinnatifid with mostly obtuse or rounded lobes, sometimes entire or subentire, some (usually the upper ones) linear to lanceolate or narrowly oblong, 1.4--2.5 cm. long, few-toothed or entire; inflorescence racemiform, slender, 2.5--10 cm. long, rather few-flowered, the flowers distant, short-pedicellate, about 5 mm. long; calyx tubular, about 4 mm. long in anthesis; corolla hypocrateriform, purple or lavender to whitish, the limb about 1.2 cm. wide; fruiting-calyx obconic, its teeth about 0.5 mm. long; fruit hard, shiny, glabrous, 2- or 4-horned or 4-spinose, the 2 or 4 horns or spines 2--4 mm. long.

Collectors describe this plant as an herb, to 2 feet tall, and have found it growing on barren hillsides, dry hilltops, limestone hills, and seashores, as well as in thickets, flowering and fruiting in February, March, September, November, and December, also in anthesis in May and June and in fruit in July, so it apparently flowers and fruits throughout the year. Box reports that on Antigua island it grows "among grasses and in open dry country, generally near the sea, infrequent and local", also in "Coarse pastures and rocky hillslopes near the sea". On Barbuda island he reports it "is locally an important constituent of clearings in xerophytic bushlands, broad cattle-tracks, etc., often subdominant with the annual grass *Aristida swartziana*" [or *A. adscensionis* L.]. He cites from Antigua Box 1091, Nicholson 43, and Wulfschlägel s.n.

The only vernacular names for the plant are "cardero" and "coast broom". The corollas are described as "lavender" on Wagner 1667.

The nomenclature of the present taxon is rather complex and has been summarized by me in a letter to Harold E. Box, dated September 21, 1939, in response to a query from him while working at the British Museum (Natural History) in London on his proposed flora on Antigua: "About the *Ghinia*, however.....the situation is very complicated. There are TWO species in the West Indies -- one is found in the Bahamas and Cuba and also in Mexico. The other I have seen only from Porto Rico. Let us call the Cuban and Mexican one 'A' and the Porto Rican one 'B'. Dr. Britton called species A *G. curassavica* (L.) Millsp. and species B *G. spinosa* (Sw.) Britton & P. Wilson. Species A has large, ovate, petiolate, incised-serrate leaves. Species B has small, linear or oblong-lanceolate leaves, entire or few-toothed, or the uppermost ones incised-subpinnatifid (!). Britton based his use of the name '*spinosa*' for species B on the fact that Swartz in 1800 described his *G. verbenacea* as having the uppermost leaves subpinnatifid, but also said the ordinary leaves were ovate, petiolate, and incised-serrate and furthermore his *G. verbenacea* was merely a new name for what he called *Tamonea spinosa* in 1788. True, in 1800, he cites a '*Tamonea verbenacea*' to his Prod. 94, but you will find no such name there on that page or anywhere else in the book. The Index Kewensis cites the name *Tamonea verbenacea* to Swartz's Ind. Occ.

2: 1089, in syn. (1800), which is correct. Your citation, therefore, of this name to Nov. Gen. et Sp. Pl. 94 (1788) is erroneous -- it started in 1800 and was then published only in synonymy and is therefore not validly published under the present international rules. The name that occurs in the 1788 work is *T. spinosa* and that is plainly based on Linnaeus' *Verbena curassavica* and the Hermann and Houston synonyms. The illustration in Hermann proves that plant to be our species A and shows how the idea that it came from Curaçao originated, for Hermann says that he bases his name on a cultivated plant, the seeds of which were merely said to have come from Curaçao. I am personally convinced that they came from Vera Cruz, Mexico, where the species is common.

"So it seems evident that species A must be called *Ghinia curassavica* (L.) Oken and that the names *Verbena curassavica* L., *Tamonea verbenacea* Sw., *Ghinia verbenacea*, *G. spinosa*, and *Tamonea spinosa* all must be reduced to synonymy under that name. Of course, some of my colleagues would say that if Swartz in 1800 had before him a specimen of species B which he thought to be merely a runt of dwarfed specimen of species A, then that specimen is the type of his *G. verbenacea* and that this name can be used for species B. Personally I do not believe so. If Swartz did have a specimen of species B before him I would say that his application of the name *G. verbenacea* to it was merely a mis-identification, for *G. verbenacea* goes to the plant described in 1788 as *T. spinosa*, which, in turn, is obviously the plant which Linnaeus called *Verbena curassavica*.

"So it is my opinion that species B needs a new name and I propose, with your kind permission, to call it *Ghinia boxiana*."

In his reply Dr. Box says: "I enclose a portion of my duplicate of *Box 1091* (*Ghinia*), which I am sure you will like to see. It is certainly not the 'sp. A', which is represented at the BM by a number of sheets, from various localities in Mexico, but agrees well with *Sintenis* 632, 3554 & 3754, all from Porto Rico. Mr. Alston and I went over all the points you raise and agree with your conclusion. The sp. B is evidently without a published name and I thank you for the compliment you have paid me in proposing my name for it. I think you can safely assume that Grisebach's records refer to this plant so far as Antigua is concerned, and I have personally seen the Nicholson plant (no. 43) from Antigua, the *Nicholls s.n.* from Barbuda, which are the same species.

"I am inclined to believe that both of Swartz's locality records are erroneous, and on the face of it, if Curaçao is an error for Mexico (as it almost certainly is) the distribution 'Mexico and Antigua' is just as improbable as 'Curaçao and Antigua'. I think the whole of Swartz's records for *Tamonea verbenacea* (nom. illegit.) and *Ghinia verbenacea* (nom. illegit.) concern the large sp. A, i.e. *G. curassavica* (L.) Millsp. and that his reference to Antigua is an error (not the only error in Swartz, by any means). The BM has a specimen, which I take to be *G. curassavica*, labelled 'Mexico, Vera Cruz, Antigua, Sept. 1912, C. A. Purpus, No. 6138' with the collector's determination

'*Tamonea scabra* Ch. & Schl. forma'. I have met with other cases where the W. I. island of Antigua has been confused in literature with the Mexican town of the same name, and I rather think Swartz must have had a plant before him from the Mexican town of Antigua, for he surely could not have considered these two plants to be the same species if his Antigua plant were sp. B. So much for Swartz's records.

"I have said above that my Antigua and Barbuda plants agree with Sintenis' plants from Puerto Rico, but I would like your confirmation of this after seeing my specimen (which agrees exactly with my own plant from Barbuda and the Nicholson and Nicholls specimens at Kew. It also agrees well with Britton's description in *Addisonia*, xvii: 5, though NOT with the plate 547 in the same work. This picture, however, may not have been drawn from the living plant at all. The flowers illustrated are three times as large as those I am accustomed to see in Antigua and Barbuda, and are of the wrong colour, not pink or purple, but are white or pale lilac with (if I remember rightly) a patch of yellow on the lip, though I cannot be sure of this. Britton's heading 'Native of Porto Rico and Antigua' may be based on Swartz or on Grisebach; if the latter they are OK for sp. B, if the former they are right by coincidence only."

Britton & Wilson (1925) say that the species inhabits "Rocky thickets and hillsides at lower elevations in dry parts of the southwestern districts of Porto Rico. Antigua." Sweet (1830) calls the plant the "thorny-fruited tamonea" and Loudon (1834) does the same, but these names probably more properly apply to *G. curassavica*. In his 1932 work Britton calls our species "A rare plant, at present definitely known only from the very dry, southwestern parts of Porto Rico, where it grows in rocky thickets at low elevations."

Herbarium material of *G. boxiana* has been widely misidentified and distributed in herbaria as *G. spinosa* (Sw.) Britton & P. Wils., *Tamonea spinosa* Sw., and *T. verbenacea* Sw.

Citations: PUERTO RICO: Britton & Britton 9592 (N, S); Britton, Britton, & Boynton 8301 (N, W--1302107 Britton, Cowell, & Brown 4602 (N, W--791564); A. H. Liogier 10612 (N); F. H. Sargent 157 (W--1558184); Sintenis 632 (Ln--70088, Mu--1514, Pa, S, W--404099, W--1323149), 1815 (Ac), 1875 (Br), 3554 (Ac, Mu--3765, N, S, W--404100), 3754 (Io--75758), 4815 (B, Cm, Po--63883); Spiegelberg s.n. [October 1, 1927] (It); F. L. Stevens 4869 (N); Stevens & Hess 3037 (N); Velez 915 (N); R. J. Wagner 1667 (Me--152780, Ws). LEEWARD ISLANDS: Antigua: Box 1091 (Ca--939077--isotype, Mi--isotype, N--isotype, N--isotype, W--1714026--isotype. Barbuda: Box 694 (W--1713655).

[to be continued]

BIG TREES OF THE SOUTHERN ILLINOIS CACHE RIVER BOTTOMS

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Some of the largest swamp trees in the United States occur in and along the shallow floodplains of the lower Cache River near the Village of Karnak in southern Illinois. Though the existence of these big trees has long been known and appreciated by the local residents of the area, few of these ancient plants have served as the object of scientific measurement, description, and study. And yet, there would appear to be much to be learned from a detailed analysis of the ecology, growth patterns, and distribution of these venerable giants of the forest, and especially so as the information gleaned from such studies may be useful in the resolution of problems relating to their current preservation. To this latter end, in particular, the following remarks are directed.

Dominating the landscape of southern Illinois are its extensive river systems. One such system, the Cache, which winds through five southern counties before finally finding entrance into the Mississippi River some ten miles north of the city of Cairo, drains a portion of the state long known affectionately to its local residents as the "land between the rivers." This folk name for the area derives from the fact that the two very largest rivers of the area, the Ohio and the Mississippi, prior to becoming confluent south of Cairo, converge abruptly to form the eastern and western boundaries of the state. The land thus enclosed on three sides by these large rivers forms a distinct geographic province within the state, this characterized by a culture and a set of traditions which are more in keeping with those of the deep south than they are of the north (Horrell, Piper & Voigt, 1973).

Floristically, the area encompassed by the extreme southern tip of Illinois may be categorized as a northward extension of the Coastal Plain (Vestal, 1931; Braun, 1950). Cypress-tupelo swamp was at one time the dominant vegetation of this area. Today, however, only remnants of this once widespread formation exist in southern Illinois, this due to the extensive logging of the area, and the subsequent drainage of the land for agriculture.

Though there are many places in southern Illinois where good examples of second growth cypress-tupelo swamp can be seen today, the finest and least disturbed stands of this wetland association, if not to be described as primeval, occur in the vicinity of the small rural community of Karnak in northeastern Pulaski County. In this area, the Cache River, prior to its damming, straightening, and dredging by the Corps of Engineers back around the turn of the century, formed a shallow series of side channels, ponds, and lakes (Bell, 1905). As the main channel of the Cache River was then very ill-defined, this locality soon became known to the early settlers of the region as the "scatters," a name by which it is still known today.

Although much of the basin of the Cache River system has seen some ecological disturbance, a small portion of the original "scatters" area remains as relatively untouched. This area is best seen at the bridge crossing of State Highway 37 over the Cache River, this located but one mile north of the junction of this road with State Highway 169. Here, providing the season is mid-summer and the ground by that time dried out, one may view without special hardship the largest individuals of Drummond's red maple and water tupelo in the United States, as well as the largest specimens of baldcypress, pumpkin ash, planertree, and swamp oak in the State of Illinois!

DESCRIPTION OF THE CHAMPION BIG TREES

The following descriptions of the big trees of the Karnak area, with the exception of one, the swamp oak (the dimensions of which have been published elsewhere; see Koelling, 1976), are based upon original measurements and data collected by the authors over the course of several field trips to the area. Circumferences were measured at breast height (4 1/2 ft.), and tree heights were determined with the aid of a "Haga" brand altimeter.

Drummond's Red Maple (*Acer rubrum* var. *drummondii* (H. & A.) Sarg.).--The largest currently known United States specimen of this species grows in the floodplains of the lower Cache River near Karnak, Illinois. It is found in the vicinity of the highway bridge, a short distance off the west side of the road. This very massive tree (see Fig. 1) forks about ten feet from the ground, and has several side branches which originate about the base. Its circumference is 16 ft. 2 inches; while the average spread of its canopy and its height are respectively 85 and 135 feet.

One of the lower branches of this huge maple tree originates near ground level, and runs parallel and fused to the trunk for a distance of four feet before diverging. This side branch, which measures over a foot and a half in diameter, is not included in the above circumference measurement. Had there not been a narrow space between this branch and the trunk of the tree so as to permit a measurement at the standard breast height level, the tape would have indicated a combined circumference of 18 ft. 3 inches.

Ornamenting the lower trunk of this big maple tree, beginning some ten feet above ground and running some five feet downwards, is a huge gall-like growth. This tumorous structure, which is clearly visible in Fig. 1, is a foot and a half thick in places.

By way of comparison, the largest Drummond's red maple previously reported for the State of Illinois has a circumference, height and spread of 11 ft. 7 in., 90 ft., and 73 ft., respectively; while the AFA's National Register lists a Missouri tree with corresponding measurements of 10 ft. 1 in., 99 ft., and 62 feet (Pardo, 1978).

Also of some interest here is the fact that the largest Illinois specimen of the typical variety of the red maple (Acer rubrum L., var. rubrum) grows only 30 miles north of the present locality. According to Koelling (1976), this tree, which is located on the Crab Orchard Wildlife Refuge in Williamson County, measures 13 ft. 10 in. in circumference, 72 ft. in height, and 73 ft. in spread. The national champion of this variety, however, occurs near Armada, Michigan. The AFA's National Register reports that it has a circumference of 16 ft. 3 in., and a height and spread of 125 and 108 ft., respectively. Our champion Drummond's red maple, however, compares very favorably with this national record for the typical variety.

In addition to the above champion Drummond's red maple, a number of other smaller, but still rather sizable individuals of this species are to be found in the alluvial plains of the Cache River near Karnak. The authors, for example, located one tree with a circumference of 11 ft. 7 in. at breast height, and yet another with a circumference of 14 ft. 4 inches. One rather large but abnormally developed individual of this species had a cluster of trunk-like prop roots extending upwards some eight feet above the ground, from which point the main trunk finally emerged. Prop roots and buttressed trunks, however, while apparently rare in maple, are not uncommon in certain other species groups where the plants are subjected to periodic floodings.

Pumpkin Ash (Fraxinus profunda (Bush) Bush).--The largest known Illinois specimen of this tree grows within 150 feet of the big maple described above. This is a 97 ft. tall, straight-growing tree with a circumference of 11 ft. 1 1/2 inches, and an average spread of 56 feet (Fig. 2). The largest previously described Illinois specimen of this species was reported from a locality but five miles northeast of the present one (near the town of Cypress, fide Koelling, 1976). This latter tree is said to be 90 ft. tall, with a circumference of 6 ft. 6 in., and a spread of 35 feet.

In contrast to our Illinois trees, the largest member of this species in the United States, as reported by AFA's National Register, is an 86 ft. tall Virginia tree. This eastern champion measures 18 ft. 3 in. in circumference and has a spread of 84 feet. However, our two Illinois trees, standing at 90 and 97 feet, are taller!

Specimens of pumpkin ash are not nearly as frequently met with in the Karnak swamp area as are specimens of water tupelo, cypress, and Drummond's red maple, which assume dominance in that order. Moreover, no seed reproduction of pumpkin ash was noted in the areas where they do occur.

Water Tupelo (Nyssa aquatica L.).--The largest known Illinois specimen of this species stands but a short distance off the east lane of Highway 37, near the Cache River bridge. This peculiarly formed tree (see Fig. 3) has a circumference of 26 ft. 7 in., and a height and spread of respectively 81 and 35 feet. According to Southern Illinois University ecologist, Dr. Philip A. Robertson, the several slender upper trunks of this plant may have developed originally as sprouts from along the rim of an older broken trunk.

If true, the original bole probably reached skyward to a much greater height than it does today. In any event, the huge base of this plant is hollow and forms a chamber 15 ft. long and 9 ft. 5 in. wide at ground level, and over 6 ft. high at the center. The "walls" of this room, being only 6 to 8 inches thick in most places, are remarkably thin for the size of the upper plant which they support.

A second water tupelo tree at this location also deserves mention (see Fig. 4). This is a single bole, normally developed tree measuring 22 ft. 5 in. in circumference, with a height and canopy spread of 118 ft. and 65 ft., respectively. Though the trunk of this tree is smaller in circumference than the first big water tupelo mentioned, this plant nevertheless exceeds all previously published reports for this species in so far as plant height and canopy spread are concerned, and is therefore another national record. Like the first tree mentioned above, this one is also hollow at the base. Its interior cavity, which measures some 8 ft. 6 in. in diameter at the soil line, is entered via an inverted V-shaped opening in the base of the trunk, this measuring some 5 ft. wide at ground level. This inner cavity extends upward some 40 ft. to the height of the first branch, and daylight can be seen breaking through a small hole which pierces the trunk at the elevation.

The largest previously reported Illinois specimen of the water tupelo comes from a locality just east of the town of Cypress in Johnson County, an area only 4.5 miles north of the present one. According to Koelling (1976), this is an 80 ft. tall tree having a circumference of 7 ft. 4 in. and an average spread of 35 feet. In contrast, the largest tree of this species in the United States (located near Kinder, Louisiana) has a height of 105 ft., a circumference of 27 ft. 1 in., and a spread of 58 ft. (Pardo, 1978; Behlen, 1980). Our first mentioned big Illinois water tupelo tree, you will note, lacks only 6 inches to rival the current national champion of this species in circumference!

Planertree (*Planera aquatica* Gmel.).--Although remaining as a small tree throughout its range, this species, which is sometimes called "water elm," attains rather impressive proportions in the swamps near Karnak (Fig. 5). Here, one large individual in the near vicinity of the second big water tupelos mentioned above has a circumference of 4 ft. 6 in., a height of 51 ft., and a spread of 48 ft. 6 inches. The largest previously reported Illinois specimen of this species comes from Ft. Massac State Park in Massac County, the latter locality situated about 20 miles SE of the present area. This tree is recorded to have a circumference of 3 ft. 10 in., a height of 40 ft., and a spread of 18 feet.

Planertree is rather rare in Illinois, being known principally from the banks of the Cache River in Pulaski, Johnson, Massac, and Alexander Counties. However, it is also reported by Mohlenbrock (1972) as occurring in Pope County.

The largest known specimen of planertree in the United States occurs in Gadsden Co., Florida. This tree, according to the National Register, is 8 ft. 4 in. in circumference, 77 ft. tall, and has a spread of 47 feet.

Baldcypress (Taxodium distichum (L.) Rich.).-- In the near vicinity of the planertree and big water tupelos mentioned above occurs the state's largest known example of this species (Fig. 6). This swamp giant is found about 200 yards, from the road, and about half that distance to the river banks. It is 26 ft. 7 in. in circumference, 103 ft. tall but broken at the summit, and has an average spread of 40 feet. It is surrounded by numerous huge "knees," the largest of which is 7 ft. 9 in. tall, with a circumference of 9 ft. 1 in. at the base. Only one other Illinois tree is known to have a circumference greater than this one, and that is an eastern cottonwood from the northeastern part of the state (Grundy Co.) with a girth of 27 ft. 4 inches (Koelling, 1976).

A number of other very large specimens of baldcypress are also found at this locality. The authors, for example, measured seven trees in this area which had a circumference, of 16 ft. or over. Four of these were over 19 ft. in circumference, while the larger of these lesser giants measured 21 ft. 10 inches.

Damage to the big cypress trees of this area has occurred primarily through the agency of fire, disease, logging, and vandalism associated with the cutting of "knees," the latter probably sold to curiosity shops or used in the manufacture of lamp bases. Some of the big cypress trees have been "topped" by lightning; others, still living, show charred streaks running down to the base of the trunk; and still others stand as skeletons of dead wood, mute testimony to the thunderous storms which, in the past, have been known to shake this area. Several of the big trees studied by the authors had large cancerous growths covering portions of the lower trunks. While similar-appearing tumors were also observed to infect occasional individuals of water tupelo and Drummond's red maple, the nature of this disease, as well as its affect upon the longevity of the plant, needs to be investigated.

According to the National Register of Big Trees, there are two individuals of this species which qualify for the title of co-champion. One is a North Carolina plant with a circumference of 38 ft. 3 in., and a height and spread of 138 ft. and 36 ft. while the second, the "Tennessee Titan," has a circumference of 39 ft. 8 in., and a height and spread of 122 ft. and 47 ft. respectively.

It may be of some interest here that the largest cypress tree in the world is a Montezuma Cypress (Taxodium mucronatum) (Ten.). It is found near Mitla in Southern Mexico and has a diameter of 50 feet. However, some claim that the trunk of this very massive tree, the age of which is reputed to be 5000 years (Chamberlain, 1932), is actually made up of three smaller trees which have become fused into one.

Swamp Chestnut Oak (*Quercus michauxii* Nutt.).-- The largest known Illinois specimen of this species is found along the north bank of the Cache River, opposite the town of Karnak. This slightly disjunct locale, which lies four miles due east (map distance) of the Highway 37 river bridge, is in Johnson County, but forms a continuation of the "scatters" area which was previously described. The tree known from here is 94 ft. tall with a girth of 18 ft. 4 in. and a spread of 124 feet (Koelling, 1976, updated sheet). The 122 ft. tall national champion of this species, which is found in Talbot County, Maryland, has a girth of 22 ft. 7 in., and a spread of 123 ft.

Other Species.-- Although not of record proportions, many other big trees of various species are found in the swamplands of the Cache River basin near Karnak, Illinois. The authors, for example, in the course of their investigations, determined the maximum circumferences of other important bottomland species of the area as follows: American elm, 9 ft. 11 in.; black willow, 7 ft. 4 in.; eastern cottonwood, 11 ft. 2 in.; river birch, 7 ft. 0 in.; sugarberry, 5 ft. 2 in.; sweetgum, 8 ft. 3 in.; and water hickory, 5 ft. 2 inches. One green ash measured by the authors, with a circumference of 10 ft. 5 in., height 137 ft., and a spread of 60 ft., came close to being a state record.

CLIMATIC AND EDAPHIC CONSIDERATIONS

The larger territory where the above trees grow, the southernmost counties of Illinois, is a region of gently rolling hills that are covered by a rather thick mantle of loess (the latter, a wind-blown dust deposited during glacial times). Elevations in this part of the state range from 340 to 450 feet. Underlying these hills are deposits of unconsolidated sand, gravel, and clay, all materials brought in or laid down when this particular part of the state lie at the very foot of the enormous Gulf of Mexico embayment during Cretaceous and Tertiary times. The remaining landforms in this area consist of some rather broad alluvial plains and terraces bordering the Mississippi, Ohio, and Cache Rivers (Parks & Fehrenbacher, 1968).

According to the USDA Soil Survey Book of Pulaski and Alexander Counties, the alluvial land in the big tree area is classified as "Karnak Silty Clay, Wet." This is a light-colored, poorly drained soil formed of sediments measuring more than 50 inches thick. Moreover, the survey reports that the Karnak soils are "... slightly to strongly acid; very slowly permeable; and the water table is close to the surface of the ground during much of the year, with flooding occurring in the spring." Our own tests of soil taken from the vicinity of the big trees of this area indicate pH range of 4.0 to 4.2.

With respect to its climate, the area is noteworthy for its short and rather mild winters. The average January temperature at Cairo, the closest recording station (2.2 miles to the south), is 37.5°F, while the average July temperature is 81°F. Rainfall averages 45.2 inches per year, and the average length of the growing season is about 208 days (Parks & Fehrenbacher, 1968).

Whether or not the above environmental conditions are truly optimal ones for the growth and development of the big tree species taken into consideration here, or whether other matters need be taken into account, is a question which may be of some interest, if not practical concern, to foresters, ecologists, and plant geographers alike. In this connection, it is interesting to note that with respect to the overall continental distributions of the big tree species of the Karnak area, all are situated at or very near the northernmost boundary of their respective species' ranges. A similar phenomenon was noted by the two phytogeographers, Meentemeyer and Elton (1978), who plotted the distribution of big tree champions reported for Eastern North American in the National Register. In this latter case, the majority of the big trees occurred in the far northern sectors of their respective species' ranges, where climatic conditions, as deduced from the far greater frequency of occurrence of the species in other portions of their range, would not appear to be especially favorable. In an effort to shed more light on this particular problem, the above authors undertook a graphical analysis of those environmental factors which were deemed by them to be most instrumental in the growth and development of large plants. Thus, they chose to plot an index of potential evaporation-transpiration (PE) by one of moisture to obtain a comparative picture of solar energy and precipitation at each big tree site. These authors discovered, much to their surprise, that the big trees occurred mostly in the cooler and drier portions of their overall respective species ranges, in areas or latitudes where solar radiation was mostly at a minimal value.

Although Meentemeyer and Elton were seemingly at a loss to explain the occurrence of these national-champion big trees in areas of the country where climatic conditions would appear today to be less than ideal for the growth and propagation of the species as a whole, it must be remembered that the trees in question are, in many cases, ones which are very old (500 to 1200 years, or more in certain cases; see Fowells, 1965), and that the climate of the various small locales which are involved, far from being the kind of constant or unchanging factor that it was implicated to be by the above authors, has in reality changed markedly in the intervening years. Thus, the evidence from fossil pollen grains, from tree rings, and from other sources all suggest that the world was much

warmer six hundred to two-thousand years ago than it is today. Dolf (1960), for example, reports that Norsemen settled Greenland a thousand years ago, raising many head of cattle on what is now permanently frozen land. He also states that glaciers in Iceland were far less extensive from 900 to 1300 A.D. than they are today. Similarly, Sauer (1965) reports that many European tree species grew much farther north a thousand years ago than they do today. The past 600 years or so, however, has seen much change. According to Spurr (1964), a period of increasing cold set in about 1300 which culminated about 1800. The latter change was responsible for the shifting of many tree species ranges in a southerly direction in both Europe and the United States.

Assuming that the above sequence of climatic events is correct, and we have no reason to believe otherwise, then it would seem quite possible that many tree species ranged much farther north in Eastern North American during pre-Columbian and pre-Renaissance times than is the case today. If so, Southern Illinois, far from representing the northernmost outlier of the great cypress-tupelo coastal swamp as it does today, may have been closer to the geographic center of this formation, and thus closer to the area where optimal climatic conditions may be inferred to exist. This would mean, in essence, that our big Illinois trees sprouted and developed in an era when the climate of the state was much more favorable to swampland formation than it would appear to be today. When climate eventually changes (that is became cooler and drier), cypress swamps ranging north of the present ones became extinct. Thus, our large swamp trees of Southern Illinois would appear to stand as relics of a bygone era, an era when higher temperatures and greater precipitation prevailed throughout an area extending perhaps several hundreds miles north of the present cypress swamps.

Palmer (1921), who also argues that the big swamp trees of Southern Illinois may be relics of a once more-northerly distributed plant formation, suggests there may have been continuous survival of southern swamp species in the Cairo district from the time of the great Mississippi embayment in the Cretaceous Geologic Period all the way to the present time. With the uplift of the Ozark plateau and the obliteration of the Mississippi embayment in late Tertiary times, the swamp flora north of the present study area may have become extinct, while the emerging land of the embayment area received the influx of species migrating southwards from the Cairo area, which at that time stood at the edge of the retreating gulf waters. While Southern Illinois may thus be looked upon as a center of dispersal for southern swamp species back in the Tertiary, it is obvious to us that Palmer overlooked the influence of the great ice sheets which swept across the state on several different occasions at a

still later period, during Pleistocene times. Each advance of the ice had the effect of displacing plant formations in a southerly direction (Cain, 1971). Hence, it would appear to us as rather doubtful whether the cypress-tupelo swamps of Southern Illinois could have existed so close to the leading edge of the ice, which in some places was no more than 42 miles north of Cairo, or less than 20 miles north of the Karnak big tree area (Horberg, 1957). More likely, the present trees of the area are survivors of later migrations, especially during the period of the "climatic optimum" (Sauer, 1965) which followed the demise of the last glaciation.

DISTRIBUTION, HABITAT AND PROPAGATION OF THE SWAMP TREES

Although apparently shrinking in distribution during modern times, the present range extent of cypress-tupelo swamp in the United States is nonetheless impressive. This uniquely American swamp formation, endemic to the southern and central regions of the United States, extends over 2700 miles along the margins of the Coastal Plain from southern Delaware to south Florida, and west through southeastern Texas almost to the Mexican border. Inland, in the Coastal Plain, cypress swamp occurs along the many streams of the Southeastern States, and then ranges northward along the Mississippi River and its many large and small tributaries until it reaches southern Illinois and southern Indiana, where the northern range of this widely distributed formation finally terminates.

In Southern Illinois, cypress swamp occurs primarily in the river bottoms of the Mississippi near McClure; the backwaters of the Ohio; and the Cache River bottoms near Karnak, where the finest remaining stands of this formation occur today.

Teford (1926) reports that the original extent of coverage of cypress forests in Illinois before drainage activities were begun was in the neighborhood of 250,000 acres. Today, as a result of the logging and the subsequent drainage of these swamps for agriculture, only very few, small, and scattered remnants of this formation remain, these to be found largely in Alexander, Pulaski, Massac, Union, and Johnson Counties (Anderson and White, 1970).

Although the flora of the swampland formation is best preserved in the "scatters" region of the Cache River basin near Karnak, Illinois, this area in the past has received very little publicity, and has therefore been very little visited by either the public or the scientific community at large. Thus, few naturalists or others interested in the botanical sciences have had opportunities to collect the interesting and rather varied plant life of this area, and still fewer have actually written of its flora.

One of the earliest reports of the region appears in the record of the Public Land Survey, the report of which covers the years 1806 to 1809. Included within this report as well as in the notes of a somewhat later one (Bell, 1905) are descriptions of the potentially valuable timber trees of the area; the important undergrowth species; the location, dimensions and bearings of "witness trees" used in the establishment of section corners; and the distribution of different soils.

In 1919, the botanist Ernest J. Palmer visited Pulaski County and made a number of rather extensive plant collections from swamps located in the vicinity of Mounds City and Cairo, but as his published report (1922) of the expedition makes no mention of the "scatters" near Karnak, it would appear likely that he was not even aware of this area's existence.

To date, the only scientific collections of plants from the "scatters" region that are available for study, other than those which have been assembled with our own effects, consists of some dozen specimens of various species collected by William M. Bailey and Julius R. Swayne during brief forays to the area in 1947, 1950 and 1952; and a similar number that was collected by botanist R. A. Evers in 1948 and 1952.

As far as the floristic composition of the "scatters" is concerned, our habitat list of the species of this area includes the following trees: Drummond's red maple (Acer rubrum var. drummondii), river birch (Betula nigra), American hornbeam (Carpinus caroliniana), water hickory (Carya aquatica), big shellbark hickory (C. laciniosa), sugarberry (Celtis laevigata), swamp privet (Forrestiera acuminata), green ash (Fraxinus pennsylvanica var. subintegerrima), pumpkin ash (F. profunda), water locust (Gleditsia aquatica), swamp holly (Ilex decidua), sweet gum (Liquidambar styraciflua), water tupelo (Nyssa aquatica), planertree (Planera aquatica), eastern cottonwood (Populus deltoides), swamp cottonwood (P. heterophylla), overcup oak (Quercus lyrata), swamp chestnut oak (Q. michauxii), chestnut oak (Q. prinus), black willow (Salix nigra), baldcypress (Taxodium distichum), and American elm (Ulmus americana).

Also associated with the swamp trees cited above are a number of shrubs and woody vines. Characteristic shrubs of the "scatters" area include button bush (Cephalanthus occidentalis), swamp rose (Rosa palustris), and silky willow (Salix sericea), while the only vines of the deep swamp are buckwheat vine (Brunnichia cirrhosa), trumpet creeper (Campsis radicans), poison ivy (Rhus radicans), climbing dogbane (Trachelospermum difforme), and catbird grape (Vitis palmata).

Few herbaceous plants are found in the swamp, largely because the area is flooded with several feet of water each spring. However, scattered individuals and occasional colonies of the following plants are to be found here: copper leaf (Acalypha rhomboidea), swamp milkweed (Asclepias perennis), bur-marigold (Bidens discoidea), bog hemp (Boehmeria cylindrica), dodder (Cuscuta cuspidata), turnsole (Heliotropium indicum), catchfly grass (Leersia lenticularis), whitegrass (Leersia virginica), water-horehound (Lycopus rubellus), Lizard's tail (Saururus cernuus), and marsh St. John's wort (Triadenum tubulosum).

Plants of the dense roadside thickets, which, in places, all but obscure one's sight of the big trees of this area, include: box elder (Acer negundo), giant ragweed (Ambrosia trifida), nodding spurge (Euphorbia maculata), spotted touch-me-not (Impatiens biflora), evening primrose (Oenothera biennis), smooth paspalum (Paspalum laeve), dock-leaved knotweed (Polygonum lapathifolium), false dandelion (Pyrrophappus carolinianus), wild blackberry (Rubus sp.), foxtail grass (Setaria glauca), bur cucumber (Sicyos angulatus), Johnson grass (Sorghum halepense), smooth buttonweed (Spermacoce glabra), hedge parsley (Torilis japonica), and redtop grass (Triodia flava). In addition to the above, water hemlock (Cicuta maculata) and halberd-leaved rose mallow (Hibiscus militaris) grow in the wet roadside ditches of the area.

In so far as ecological plant succession in the swamp is concerned, the overriding consideration here would appear to apply to the rate of reproduction of the water tupelo, Nyssa aquatic. A rather uniform, though spacially discontinuous understory of plants of this species, averaging about five feet in height, has become established in the Karnak big tree area, suggesting that the future forest of the Cache River bottoms will be predominantly of this species. Although annual seed reproduction of cypress and other trees also occurs in this area, the small seedlings of these species (usually only 8-10 inches high by the end of the first growing season) are totally inundated and eradicated by the floodwaters which rise early each spring.

In this connection, it is interesting to note that the main requirement for germination of cypress seeds, according to Fowells (1965), is an abundant supply of moisture for a period of one to three months. Following the germination of the seed, the plants must necessarily grow tall enough the first year to stay above the floodwaters of the following spring. While the rate of growth of water tupelo seedlings appear to fulfill this requirement, those of the cypress and other tree species of the area presently do not. However, it should be noted that current water levels in the area are much higher than they were in days past, this due largely to the construction of dams downstream. If these were removed, reproduction of the species in this area would probably continue as in days past.

VALUE AS A POTENTIAL SCIENTIFIC AREA

As a geographic region, Southern Illinois stands out as one of the few areas of the state where very many champion trees have been reported. The current Illinois listing of big trees, for example, cites 44 record-holders for the area bounded by the sixteen southernmost counties of the state. These champions can all be seen within a radius of 50 miles from the Karnak swamp station. Moreover, in contrast to the many official records of "big trees" that have been cited for the extreme northeastern counties of the state, the great majority of our "big trees" are ones which are genuinely very large. These represent, for the most part, neither introduced varieties nor horticultural forms, but wild species which are indigenous to particular natural areas. Thus, far from arising as an artifact of the species distribution within the state, our records would appear instead to be much more indicative of the actual level of development of the forests of our region during presettlement times.

Though at one time undoubtedly growing in close association with other large trees, our official champion big trees of Southern Illinois stand today largely as lone individuals in areas where the original forest has been cut down, freeing the land for agriculture, urban expansion, or the regrowth of the same or different forest trees. Nowhere within this formerly well developed center of species diversity and optimal tree growth do we find any suggestion of what the presettlement vegetation of the land appeared like, except, perhaps, in the case of the presently described "scatters" district of Pulaski County and the more widely publicized and botanically better known swamps of the Horseshoe Lake area, the latter located some 20 miles to the SW in Alexander County (cf. Koelling, 1968). Significantly, within each of the above areas are to be found local associations of very old trees, quite a few of which approach record-size proportions.

Unlike the swamplands of the Horseshoe Lake area, which presently fall under protection of the Illinois Department of Conservation, the "scatters" region of the Cache River still needs to be set aside for the purpose of scientific study, as well as for the enjoyment of future generations. Signs of the gradual erosion of this swampland are everywhere. Water-levels in recent years are much higher than they were in years past, this due to the construction of dams downstream and the logging and drainage of much of the watershed for agricultural purposes. Moreover, unless some effort is made to preserve this land soon, the remaining small acreage of swampland along the lower Cache River, all of which is in private hands, will soon follow in the wake of the passenger pigeon.

As to the future of this area, we cannot but help agree with Mr. Max D. Hutchinson of the Illinois Nature Preserves Commission, who, in a privately printed and distributed circular (1979) concerning this swampland writes:

"The threats of logging and land clearing are real. Farming in the adjoining crop fields is continuing to dump more silt and chemical pollutants into the drainage ditches which flow into the area. The landowners must be informed and convinced that this is truly a significant natural area deserving of protection; that it is worth more than the profit from thousands of acres of marginal farmland in the area."

Today, a group of concerned individuals who reside in the near vicinity of the swamps has formed a "Citizens Committee to Save the Cache." This group, under the able leadership of Mr. Neal Needham of Dongola, has been actively seeking outside support for their one major goal--the preservation of the "scatters" area. As scientists, we can concur with their recommendation that this land be bought up by the state, or by one of the several private conservation agencies, and be permanently set aside for the use and pleasure of our children and our "children's children."

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Fig. 1. The tape held by Dr. Donald Ugent confirms an earlier measurement of 16 feet 2 inches in circumference for this record-breaking specimen of Drummond's red maple. Note the huge gall which has formed on the trunk of this tree. These growths appear to be common on nearly all of the very oldest plants of this swampland.



Fig. 2. A source of pride for Illinois residents, this pumpkin ash, as remeasured by Michael Mibb checks out at 11 feet 1 1/2 inches.



Fig. 3. Awaiting visitors, as Dr. Donald Tindall (left) and Michael Mibb would testify, the base of this peculiarly-formed water tupelo is hollow and forms an interior chamber 15 feet long and 9 feet 5 inches wide at ground level.



Fig. 4. Standing at 118 feet, this massive water tupelo is the tallest known individual of its kind in the country. The inner diameter at ground level of the cavity behind Dr. Ugent is 8 feet 6 inches.



Fig. 5. The circumference of this champion Illinois planer-tree, as verified by Dr. Ugent, is 4 feet 6 inches.



Fig. 6. Surrounded by numerous large and small "knees", this very huge baldcypress tree presents rather a spectacular sight to the casual swamp visitor.

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TAXONOMIC IMPLICATIONS OF BRANCHING PATTERNS
IN THE DWARF MISTLETOES (*ARCEUTHOBIMUM*)

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Rocky Mountain Forest and Range Experiment Station¹
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Abstract

The genus *Arceuthobium* has been separated into two subgenera based primarily on branching patterns: verticillate in subgenus *Arceuthobium* and flabellate in subgenus *Vaginatum*. This study of two California members of subgenus *Vaginatum* (*A. occidentale* and *A. campylopodium*) showed that they exhibited limited (average less than 5%) verticillate branching in addition to the predominate flabellate type. Presence of flabellate branching, rather than absence of verticillate branching is thus a better criterion for distinguishing subgenus *Vaginatum*. Subgenus *Arceuthobium* seems to be exclusively verticillate.

Secondary branching pattern has been considered to be of major taxonomic importance in separating subgeneric groupings of dwarf mistletoe, *Arceuthobium* (Hawksworth and Wiens 1970, 1972; Kuijt 1970). There are two basic types of secondary branching: verticillate and flabellate (fig. 1). Species with flabellate branching occur only in the New World, but verticillate branching is exhibited by all Old World species and a few in the New World. Hawksworth and Wiens (1970) used branching patterns as the primary basis for designation of subgenera. Species with flabellate branching were placed in subgenus *Vaginata*, and those with verticillate branching in subgenus *Arceuthobium*.

¹Headquarters is in Fort Collins, in cooperation with Colorado State University.

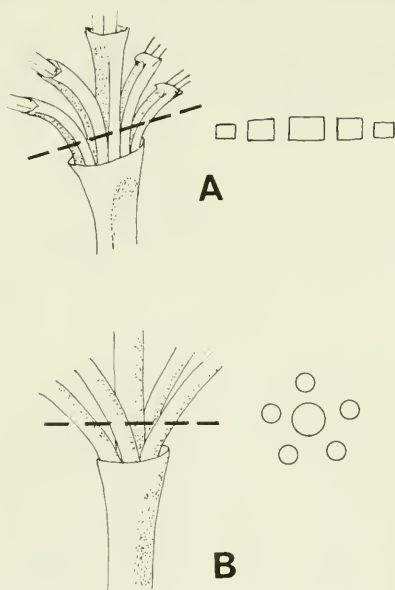


Figure 1.--Shoots of dwarf mistletoe: A, typical flabellate branching pattern with cross section through dashed area; B, typical verticillate or whorled type of branching with cross section through dashed area. All taxa show decussate primary branching, but in most cases the secondary type of branching also develops which may be either flabellate or verticillate (Hawksworth and Wiens 1972).

Recently we noticed that *Arceuthobium occidentale* Engelm. (subgenus *Vaginata*), parasitic on *Pinus radiata* at Cambria, California, exhibited some verticillate branching in addition to the predominately flabellate branching. These observations prompted a detailed examination of *A. occidentale* and the closely related species *A. campylopodium* Engelm., in California.

Thirty populations of *A. occidentale*, from 6 pine hosts, and 33 populations of *A. campylopodium*, from 6 pines, were sampled throughout California (Table 1). For each population, 50 shoots with secondary branching (25 of each sex) were examined and the proportion showing verticillate branching determined.

The results (Table 1) show some verticillate branching in all but 1 of the 63 populations sampled. Verticillate branching was quite variable among the populations studied: from none to 18% for *A. campylopodium* and from none to 10% for *A. occidentale*. In some populations, verticillate branching was common in plants of one sex but absent in the other. For all populations, 4% of the *A. campylopodium* shoots and 5% of the *A. occidentale* shoots showed some verticillate branching. Verticillate branching was about twice as common in staminate as in pistillate shoots for both species.

The results show that these two members of the subgenus *Vaginatum* exhibit verticillate branching in addition to the predominate flabellate type. In addition, rare verticillate branching has been observed in other members, in the subgenus *Vaginatum* (*A. vaginatum* subsp. *cryptopodium* (Engelm.) Hawksw. & Wiens, and in *A. cyanocarpum* Coult. & Nels.), in Colorado.

From a taxonomic standpoint, branching pattern is still a valid character for separating the two subgenera of *Arceuthobium*. However, the presence of flabellate branching, rather than the absence of verticillate branching, is a better criterion for distinguishing subgenus *Vaginatum*. Subgenus *Arceuthobium* seems to be exclusively verticillate. From a phylogenetic standpoint, subgenus *Vaginatum* seems to be derived from a basically verticillate (Old World) stock and, while predominately flabellate, exhibits a limited amount of residual verticillate branching.

Table 1. Proportion of shoot exhibiting verticillate branching.
Based on 50 shoots in each population.

Dwarf mistletoe and host	Number of populations examined	<u>Pistillate Plants</u>	<u>Staminate Plants</u>
		% shoots with verticillate branching	
<i>Arceuthobium campylopodum</i>			
<i>Pinus ponderosa</i>	16	2.6	3.7
<i>Pinus jeffreyi</i>	11	2.8	7.3
<i>Pinus coulteri</i>	2	0	2.0
<i>Pinus attenuata</i>	2	0	18.0
<i>Pinus sabiniana</i>	1	0	0
<i>Pinus contorta</i>	<u>1</u>	<u>0</u>	<u>4.0</u>
Totals	33	2.2	5.4
<i>Arceuthobium occidentale</i>			
<i>Pinus sabiniana</i>	17	2.9	7.2
<i>Pinus muricata</i>	5	3.8	7.1
<i>Pinus contorta</i>	2	3.3	6.5
<i>Pinus radiata</i>	2	10.0	0
<i>Pinus coulteri</i>	2	2.0	2.0
<i>Pinus ponderosa</i>	<u>2</u>	<u>0</u>	<u>4.0</u>
Totals	30	3.3	6.0

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TWO NEW SPECIES OF STIPA FROM PERU

Oscar Tovar

Museo de Historia Natural, Lima-Peru

Stipa wurdackii Tovar, sp.nov.

Perennis caespitosa; culmi erecti 60-65 cm. alti; vaginae internodiis breviores; ligula 0.2-0.3 mm. longa; laminae involutae vel planae, 5-15 cm. longae; paniculae 15 cm. longae, ramis adscendentibus in parte inferiore nudis; spiculae 5.5-6.5 mm. longae; glumae aequales vel subaequales, acutae vel subacuminatae, pupureae, glabrae; lemma 3.5-3.8 mm. longum, fusiforme, sparse pubescente, arista 17-20 mm. longa, flexuosa, minute scabrida.

Cespitose perennial; culms 60-65 cm. tall, erect, glabrous, 2- or 3-noded, the nodes glabrous; sheaths shorter than the internodes; ligule about 0.2-0.3 mm. long; blades involute or flat, the uppermost 5-15 cm. long, those of the innovations shorter than those of the culm; panicle long-exserted, 15 cm. long, the branches slender, ascending or somewhat spreading, naked on the lower half, minutely pubescent, the pedicels usually shorter than the spikelets; spikelets 5.5-6.5 mm. long; glumes equal or nearly so, acute or subacuminate, purple, the tip hyaline, glabrous; lemma 3.5-3.8 mm. long, fusiform, sparsely pubescent, summit of the lemma narrowed, cylindrical forming a short neck and crown scarcely ciliate-pubescent, awn 17-20 mm. long, flexuous, slightly twisted and minutely scabrous on the lower half.

Type in the U.S.National Herbarium, No 2382275, collected at summit of Puma-urcu southeast of Chchapoyas, Provincia Chchapoyas, Departamento Amazonas, Peru, altitude 3100-3200 meters, July 3, 1962, by John J. Wurdack (No 1152).

This species is related to Stipa mexicana Hitchc., which differs in having the terete lemma and conspicuously pubescent awn.

Stipa Vargasii Tovar, sp.nov.

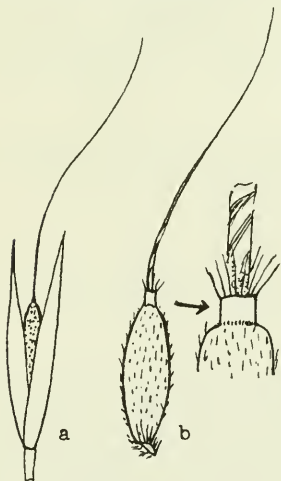
Perennis caespitosa; culmi erecti 35-45 cm. alti; vaginae sparse pubescens, suprema basin paniculae aequans; ligula 1 mm. longa; laminae involutae, 10-15 cm. longa, supra pubescens, infra glabrae, marginibus scabrae; paniculae 12-16 cm. longae, supra pubescens, infra glabrae, marginibus scabrae; paniculae 12-16 cm. longae, paulo laxae, ramis gracilibus appressis basi nudis; pedicelli quam spiculis breviores, minute pubescentes; spiculae 7.5-8 mm. longae, pupureae; glumae aequales vel subaequales, membranaceae, setaceae; lemma 6-7 mm. longum, terete, basi sparse pubescente, apice ciliato-pubescente, pilis 0.7-1 mm. longis, arista 30 mm. longa, bigeniculata, pubescens;

antherae 2.8 mm. longae.

Cespitose perennial; culms 35-45 cm. tall, erect, glabrous, 2-noded; sheaths sparsely pubescent, the uppermost reaching the base of the panicle; ligule 1 mm. long, surrounded by numerous hirsute hairs; blades involute, 10-15 cm. long, somewhat setaceous, pubescent above, glabrous or nearly so beneath, the margins rather scabrous; panicle 12-16 cm. long, more or less lax, the slender branches appressed or somewhat ascending, naked below; pedicels usually shorter than the spikelets, minutely pubescent; spikelets 7.5-8 mm. long, purple; glumes equal or nearly so, somewhat setaceous membranaceous, hyaline toward the summit; lemma 6-7 mm. long, terete, pubescent along the central nerve at the base, the summit of the lemma narrowed, with numerous ciliate-hairs on the tip, these 0.7-1 mm. long, the awn usually bigeniculate, 30 mm. long, twisted below the bend, pubescent toward the base; the callus hairs dense, hirsute; anthers 2.8 mm. long.

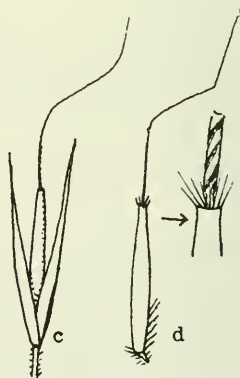
Type in the U.S. National Herbarium, No 2474222, collected at laderas de Tarpata, Provincia Urubamba, Departamento Cuzco, Peru, altitude 2860-3000 meters, March 8, 1963, by César Vargas (No 14127).

This species is closely related to Stipa gilliesii Hitchc., which differs in having lanceolate glumes, glabrous pedicels and the lemma pubescent on the lower half.



Stipa wurdackii.

a. spikelet; b. lemma



Stipa vargasii.

c. spikelet; d. lemma

ADDITIONAL NOTES ON THE GENUS *GHINIA*. I

Harold N. Moldenke

GHINIA Schreb.

Additional bibliography: A. L. Juss. in Orbigny, Dict. Univ. Hist. Nat. 13 :184. 1849; Mold., Phytologia 47: 404--419. 1981.

GHINIA BOXIANA Mold.

Additional bibliography: Mold., Alph. List Comm. Vern. Names 7. 1939; Mold., Phytologia 47: 415--419. 1981.

GHINIA CARDENASI Mold., Geogr. Distrib. Avic. 28, nom. nud. 1939; Bull. Torrey Bot. Club 58: 504--505. 1941.

Synonymy: *Ghinia cardenasii* Mold. apud R. C. Foster, Contrib. Gray Herb 184: 169. 1958. *Tamonea cardenasii* (Mold.) Troncoso, Darwiniana 18: 322 & 323, fig. 5. 1974. *Tamonea cardenasi* Troncoso, Darwiniana 18: 411. 1974.

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Illustrations: Troncoso, Darwiniana 18: 322, fig. 5. 1974.

An herb, to about 50 cm. tall, woody at the base; branches slender, acutely tetragonal, very densely puberulent throughout, longitudinally costate; nodes annulate, not ampliate; principal internodes 1--3.5 cm. long; leaves decussate-opposite; petioles slender, 3--6 mm. long, very densely puberulent like the branchlets; leaf-blades chartaceous, rather uniformly green on both surfaces or somewhat lighter beneath, ovate or rarely elliptic, 1.5--3.5 cm. long, 0.8--2 cm. wide, apically obtuse in outline, marginally sharply serrate from almost the base to the apex with acute antrorse teeth, basally abruptly acute or subtruncate, densely puberulent above and densely canescent beneath when young, very obscurely puberulent or subglabrate above in age, more plainly puberulent beneath; midrib slender, subimpressed above, prominulous beneath; secondaries slender, 6--8 or more per side, close together, subparallel, straight and ascending, mostly extending directly to the sinuses between the teeth and secondarily into the teeth themselves, mostly subimpressed above, prominulous beneath; veinlet reticulation sparse, obscure on both surfaces; inflorescence axillary, spicate, 4.5--18 cm. long, many-flowered, the flowers during anthesis barely overlapping, the lowermost separate; peduncles (3--5 cm. long) and rachis slender, rather densely incanous-puberulent throughout, tetrago-

nal and costate; pedicels obsolete; bractlets linear or filiform, 3--4 mm. long, puberulent; calyx tubular, 4--5 mm. long, 1--1.5 mm. wide, 5-costate, hyaline between the ribs, densely incanous-puberulent, its rim 5-apiculate, the apiculations filiform and 1--1.5 mm. long; corolla hypocrateriform, blue or lilac, its tube cylindric, curvate, 5--7 mm. long, the limb 5--7 mm. wide; fruiting-calyx spreading-campanulate, about 6 mm. long and to 6 mm. wide, appressed-puberulent, its rim scalloped and long-apiculate, the apiculations filiform and about 2 mm. long; fruit obovate, the body about 6 mm. long and 5 mm. wide, glabrous, apically prominently reticulate, with 3 divergent horns to 4 mm. long, sharply pointed and spine-like.

This species is based on *M. Cárdenas* 2946 from grassy pampas at 230 m. altitude between Ilias and Chiquitos, Santa Cruz, Bolivia, collected in October, 1934, and deposited in the herbarium of the Field Museum of Natural History in Chicago.

Hatschbach encountered what seems to be this taxon in caatinga in Bahia, Brazil, flowering in March, and describes the corollas as having been "blue".

Material of this species has been misidentified and distributed in some herbaria as *G. curassavica* var. *australis* Mold., "*Stachitarphe*" sp., "*Timotoua*" sp., and "*Tamonea curassavica* (L.) Pers.?", the last by P. C. Standley.

Citations: BRAZIL: Bahia: *Hatschbach* 42120 (N, Z). Minas Gerais: A. P. Duarte 7541 [Herb. Brad. 27652] (N). BOLIVIA: Santa Cruz: *M. Cárdenas* 2946 (F--755045--type, N--isotype, N--photo of type, Z--photo of type); *Peredo* s.n. [El Pori, 9-IV-1946] (N).

GHINIA CURASSAVICA (L.) Oken, Allg. Naturgesch. 3 (2): 1104. 1841.

Synonymy: *Veronicae similis fruticosa curassavica teucriifoliis, flore galericulato* Herm., Parad. Bot. Prod. 240, pl. 240. 1689. *Violae surrectae latiore folio species peregrina* Pluk., Phytogr. pl. 234, fig. 4. 1692. *Verbena nodiflora curassavica foliis menthae*. R. Morison, Pl. Histor. Univ. Oxon. 3: "408" [=418] & 419, sec. 11, pl. 25, fig. 11. 1699. *Verbena nodiflora curassavica, foliis menthae* Herm. ex Ray, Hist. Plant. 3: suppl. 287. 1704. *Verbena curassavica* L., Sp. Pl., ed. 1, imp. 1, 1: 19. 1753. *Veronicae similis fruticosa curassavica* Herm. apud L., Sp. Pl., ed. 1, imp. 1, 1: 19, in syn. 1753. *Kaempferia* Houst. ex L., Sp. Pl., ed. 1, imp. 1, 1: 19, in syn. 1753. *Verbena curassavica* L., Syst. Nat., ed. 10, 852. 1759. *Verbena diandra, spic. longis, calyc. aristatis, fol. ovatis serratis* L. apud J. A. Murray in L., Syst. Veg., ed. 13, 62. 1774. *Kaempferia* Banks ex Houst., Reliq. 3: pl. 2. 1781. *Tamonea spinosa* Sw., Nov. Gen. Sp. Pl., imp. 1, 94. 1788. *Zapania curassavica* (L.) Lam., Tabl. Encycl. Méth. Bot. [Illust. Gen.] 1: 59. 1791. *Ghinia curassavica* Raeusch., Nom. Bot., ed. 3, 8, nom. nud. 1797. *Ghinia tamonea* Raeusch., Nom. Bot., ed. 3, 8, nom. nud. 1797 [not *G. tamonea* J. F. Gmel., 1789]. *Ghinia spinosa* Willd. in L., Sp. Pl., ed. 6, 1: 114. 1797. *Ghinia verbenacea* Sw., Fl. Ind. Occ. Prod. 2: 1089--1090. 1800. *Tamonea verbenacea* Sw., Fl. Ind. Occ. Prod. 2: 1089, in syn. 1800. *Ghinia fructibus quad-*

rispinosis, foliis glabris Willd. apud Gaertn. f., Fruct. Sem. Pl. 3: 174, in syn. 1805. *Verbena (curassavica) diandra, spicis longis, calycibus aristatis, foliis ovatis argute serratis* L. apud Gaertn. f., Fruct. Sem. Pl. 3: 174, in syn. 1805. *Tamonea curassavica* (L.) Pers., Syn. Pl. 2: 139. 1806. *Tamonea fructibus quadrispinosis, foliis glabris* Willd. apud Lam., Encycl. Méth. Bot. 7: 567, in syn. 1806. *Verbena (curassavica) diandra, spicis longis, calicibus aristatis, foliis ovatis, argutè serratis* L. apud Lam., Encycl. Méth. Bot. 7: 567, in syn. 1806. *Zapania (curassavica), spicis longis, calicibus aristatis, foliis ovatis, argutè serratis* Lam., Encycl. Méth. Bot. 7: 567, in syn. 1806. *Veronicae similis fruticosa, curassiva, teucriffoliis, flore galericulato* Herm. apud Lam., Encycl. Méth. Bot. 7: 567, in syn. 1806. *Violae surrectae, latiore folio, species peregrina* Pluk. apud Lam., Encycl. Méth. Bot. 7: 567, in syn. 1806. *Tamonia scabra* Schlecht. & Cham., Linnaea 5: 99. 1830. *Tamonea scabra* Schlecht. & Cham., Linnaea 6: 372--373. 1831. *Verbena diandra, spicis longis., calycib. aristatis, fol. ovatis, argute serratis* L. apud Richter, Cod. Bot. Linn. 35, in syn. 1835. *Tamonea scabra* Cham. & Schlecht. apud D. Dietr., Syn. Pl. 3: 610. 1843. *Tamonia curassavica* Aubl. ex Voigt, Hort. Suburb. Calc. 473. 1845. *Pedaliu filiforme* Pers. apud P. DC., Prodr. 9: 256, in syn. 1845. *Ischnia verbenacea* P. DC., Prodr. 9: 257. 1845. *Tomonea verbenacea* Schau. in A. DC., Prodr. 11: 556. 1847. *Pedaliu filiforme* Pav. apud Wittstein, Etymolog.-bot. Handwörterb. 477. 1852. *Ghinia curassavica* (L.) Millsp., Publ. Field Columb. Mus. Bot. 2: 174. 1906. *Ghinia curassavica* Millsp. apud Prain, Ind. Kew. Suppl. 4, imp. 1, 97. 1913. *Ghinia spinosa* (Sw.) Britton & P. Wils., Scient. Surv. Porto Rico 6: 139. 1925. *Pedaliu spicatum* Sessé & Moc. ex Mold., Prelim. Alph. List Inv. Names 33, in syn. 1940. *Maceria* Sessé & Moc. ex Mold., Prelim. Alph. List Inv. Names 32, in syn. 1940. *Guinia curassavica* (L.) Millsp. ex Mold., Phytol. Mem. 2: 409, in syn. 1980. *Tamonea curassavica* (L.) Millsp., in herb.

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Pers., Syn. Pl. 2: 139. 1806; Dum. Cours., Bot. Cult., ed. 2, 2: 626--627. 1811; Balbis, Cat. Stirp. Hort. Acad. Taur. 80. 1813; Pers., Sp. Pl. 3: 349. 1819; Steud., Nom. Bot., ed. 1, 873. 1821; Sweet, Hort. Brit., ed. 1, 1: 324 (1826) and ed. 2, 418. 1830; G. Don in Loud., Hort. Brit., ed. 1, 248. 1830; Schlecht. & Cham., Linnaea 5: 99 (1830) and 6: 372--373. 1831; G. Don in Loud., Hort. Brit., ed. 2, 248 & 552. 1832; Richter, Cod. Bot. Linn. 35. 1835; Sweet, Hort. Brit., ed. 3, 552. 1839; Peterm., Cod. Bot. Linn. Ind. Alph. 196. 1840; Oken, Allg. Naturgesch. 3 (2): 1104. 1841; Steud., Nom. Bot., ed. 2, 2: 750. 1841; D. Dietr., Syn. Pl. 3: 610. 1843; P.DC., Prodr. 9: 257. 1845; Voigt, Hort. Suburb. Calc. 473. 1845; Schau. in A.DC., Prodr. 11: 529 & 556. 1847; Wittstein, Etymolog.-bot. Handwörterb. 477. 1852; Griseb., Abhandl. König. Gesell. Wissen. Götting. 7: 255. 1857; Buek, Gen. Spec. Syn. Candoll. 3: 198, 469, & 494. 1858; Griseb., Cat. Pl. Cuba 214. 1866; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1027 & 1234. 1893; Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4 (3a): 148. 1895; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1034 & 1285. 1895; Millsp., Field Columb. Mus. Publ. Bot. 2: 174. 1906; M. Kunz, Anatom. Untersuch. Verb. [thesis] 35. 1911; Prain, Ind. Kew. Suppl. 4, imp. 1, 97. 1913; Britton & Millsp., Bahama Fl. 367. 1920; P. C. Standl., Contrib. U. S. Nat. Herb. 23: 1236. 1924; Britton & P. Wils., Scient. Surv. Porto Rico 6: 139. 1925; Urb. & Ekm., Arkiv Bot. 22A (10): 106. 1929; P. C. Standl., Field Mus Publ. Bot. 3: 404 (1930) and 8: 323. 1931; Stapf, Ind. Lond. 3: 279 (1930) and 6: 429. 1931; N. L. Britton, Addisonia 17: pl. 547. 1932; Junell, Symb. Bot. Upsal. 1 (4): 18 & 19, fig. 24. 1934; Fedde & Schust., Justs Bot. Jahresber. 58 (2): 329. 1938; Mold., Geogr. Distrib. Avic. 14 & 28. 1939; Mold., Alph. List Comm. Vern. Names 7, 8, & 12. 1939; Mold., Prelim. Alph. List Inv. Names 32, 33, & 54. 1940; Mold., Suppl. List Comm. Vern. Names 21. 1940; Wangerin & Krause, Justs Bot. Jahresber. 60 (1): 753. 1941; Worsdell, Ind. Lond. Suppl. 1: 433. 1941; Mold., Alph. List Inv. Names 33, 34, & 57. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 16, 24, 25, & 93. 1942; Mold., Phytologia 2: 103. 1944; Mold., Alph. List Inv. Names Suppl. 1: 17 & 21. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 30, 42, 44, & 185. 1949; E. D. Merr., Journ. Arnold Arb. 31: 268 & 277. 1950; Bravo Hollis & Ramírez Cantú, Anal. Inst. Biol. Mex. 22: 421. 1951; Erdtman, Pollen Morph. Pl. Tax., ed. 1, 449. 1952; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 282--283, fig. 122. 1957; Prain, Ind. Kew. Suppl. 4, imp. 2, 97. 1958; Mold., Résumé 36, 50, 52, 301, 319, 329, 353, 363, 393, & 456. 1959; Sw., Nov. Gen. Sp. Pl., imp. 2, 94. 1962; Erdtman, Pollen Morph. Pl. Tax., ed. 2, 449. 1966; Gibson, Fieldiana Bot. 24 (9): 230. 1970; Mold., Fifth Summ. 1: 69, 70, 93, & 96 (1971) and 2: 533, 570, 593, 639, 665, 685, 709, 736, & 879. 1971; Mold., Phytologia 24: 498 (1972) and 25: 229 & 240. 1973; Anon., Biol. Abstr. 55 (9): B.A.S.I.C. S.105. 1973; Alain in León & Alain, Fl. Cuba, imp. 2, 2: 283, fig. 122. 1974; Heslop-Harrison, Ind. Kew. Suppl. 15: 60 & 151. 1974; Hock- ing, Excerpt. Bot. A.23: 292. 1974; Mold., Phytologia 29: 43, 46,

& 56 (1974), 31: 378--380, 398, 400, 403, 405, 408, & 410--412 (1975), 34: 280 (1976), and 40: 415. 1978; Mold., Phytol. Mem. 2: 62, 86, 89, 405, 409, 412, 422, 429, 444, 448, 452, 456, 462, & 548. 1980; Mold., Phytologia 47: 88 (1980) and 47: 411 & 415--419. 1981.

Illustrations: Herm., Parad. Bot. Prod. pl. 240. 1689; Pluk., Phytogr. pl. 234, fig. 4. 1692; Houst., Reliq. pl. 2. 1781; Sw., Fl. Ind. Occ. Prod. 2: pl. 21 [sup.]. 1800; Gaertn. f., Fruct. Sem. Pl. 3: pl. 213 a--g. 1805; Junell, Symb. Bot. Upsal. 1 (4): 19, fig. 24 a--d. 1934; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 282, fig. 122 (1957) and imp. 2, 2: 282, fig. 122. 1974.

A stiffly erect annual or perennial herb, bush, or scraggly subshrub, 35 cm. to 1 m. tall, basally woody, pubescent or scabrid-pubescent throughout or nearly glabrous, branched from the base; roots large; stems at least basally woody; branches suberect, tetragonal, shallowly 2- or 3-sulcate on the leaf-bearing sides; leaves decussate-opposite, relatively rather large, petiolate; petioles rather elongate, to 1.5 cm. long; leaf-blades membranous or thin-chartaceous, ovate, 2--4 cm. long, to 2.5 cm. wide, apically acute, marginally coarsely sharp-serrate or incised-serrate, basally acuminate into the petiole or usually obtuse, venose, penninerved, basally trinerved, scabulous above, paler beneath and there inconspicuously, finely, and appressedly puberulent, especially on the venation; inflorescence axillary, erect, racemose and racemiform, elongate to about 15 cm., rather few-flowered, the elongate peduncle and rachis filiform; bractlets beneath the individual flowers minute; flowers distant, small, subsessile or short-pedicellate; calyx membranous, subcampanulate or oblong, about 4 mm. long, 5-striate, 5-dentate, persistent, the teeth subulate-aristate, about 1 mm. long; corolla zygomorphic, hypocrateriform or infundibular to tubular, whitish to lilac, violet, purple, or blue, 5--7 mm. long, the tube narrow, longer than the calyx, basally dilated, apically contracted, the limb 2-lipped, sub-5-fid, the upper lip subrotund, suberect, shallowly emarginate, the lower lip 3-fid, the lobes ovate-subrotund, marginally entire, the central one larger; stamens didynamous; filaments slender, inserted high in the corollatube, 2 very short, the other 2 longer and equaling the tube and often with a median ovate somewhat fleshy scale; style terminal, short, subulate, erect; stigma capitate, 4-lobed; ovary ovate-tetragonal; drupes at first somewhat fleshy, eventually dry and nut-like, obovate or turbinate-tetragonal, 4--5 mm. long, 4-spinose on the apical angles, 4-celled, 4-seeded, the nutlets not separating on maturity, the spines sharp, slender, terete-subulate, the 2 anterior ones longer (about 2 mm. long), farther apart, and more spreading, the 2 posterior ones smaller (about 1 mm. long), approximate, and erect.

The nomenclature of this species is rather confused -- see the discussion under *G. boxiana*. Linnaeus' original (1753) description is: "*Verbena diandra*, spicis longis, calycibus aristatis, foliis ovatis argute serratis. *Veronica* similis fruticosa curasavica. Herm. parad. 240. *Kempferia*. Houst. m. ss. Habitat in

Curassao Americes." His citation of the Hermann and Houstoun polynomials as synonyms is critical because Hermann's illustration shows that his name certainly applies to our Bahama-Cuba-Mexican species and not to the Puerto Rico-Antiguan *G. boxiana* and shows how the inappropriate specific epithet was chosen by Linnaeus for it -- Hermann stating that his plant was a cultivated one, the seeds from which it was grown merely said to have come from Curaçao. Almost certainly, they came, instead, from Veracruz, Mexico, where the typical form of the species is common. Willdenow awarded the species a new epithet, *spinosa*, when he transferred it to the genus *Ghinia*, a practice advocated by DeCandolle and long in vogue after that among European botanists, not finally abandoned until the advent of the so-called "American" code of rules.

Swartz (1800) separated the Cuba-Bahaman population as *Tamonea verbenacea*, while Schlechtendal & Chamisso (1830) separated the Mexican population as *T. scabra*. Actually, the West Indian population seems to be identical with the type Mexican plants, although there is more variation in the latter. Dietrich (1843) asserts that *T. curassavica* is from "ins. Caribaeis", not further specifying the particular islands. DeCandolle (1845), in describing his *Ischnia verbenacea*, comments that it possesses "Flos Verbenae. Fructus Pedalii" and classifies the genus in the "Sesameae" or the modern *Pedaliaceae*.

Urban & Ekman (1929) comment that "Si *T[amonea] curassavica* (L.) Pers. in insula Curacae iterum reperta erit, non dubito, quin haec species cum *T. scabra* Cham. et Schlecht. (Cuba, Mexico) identica sit."

The original description of *Tamonia scabra* is "ex toto scabrido-pubescent, fructu quadrispinoso. -- Habitus Verbenae, spicis gracilibus sparsifloris elongatis; foliis ovatis, acutis, grosse serratis, in petiolum brevem angustatis ad summum sesquipollicaribus. Flores coerulei. Fructus spinae duae longiores distantes, duae breviores approximatae. -- Tierra caliente, Puerto del Rey. Jul. Hacienda de la Laguna. Oct." To this the author later (1831) added "fruticosa, caulibus inferne lignescens. Loco natali adde: Inter Mesachica et Mapilque. Dec."

The colored illustration in Addisonia (1932), labeled "*Ghinia spinosa*", actually represents, not the present species, but *G. boxiana* Mold.

Collectors have found *G. curassavica* growing on rocky plains and slopes, steep wooded slopes and hillsides, along roadsides and riversides, on semi-deserts, in low deciduous and dry thorn forests, among rocks, along rocky trails, in coppices and ruinate woods, in potreros, pastures, and thickets, on sandstone in mesophytic canyons, among limestone rocks, on dry brushy slopes, in cultivated fields and roadside ditches, in deep black or yellow clay or sandy soil, in riparian associations and oak woods, in acahual and secondary vegetation, and on coastal *Acacia* savannas, at altitudes of 15--1750 m., flowering and fruiting from March

to December.

The species is said by King to be a "common woody shrub 0.5 m. tall in sandy loam in open sun", while Ventura refers to it as "scarce in matorral" and "rare in wet places", Shapiro calls it "very abundant" and Martínez-Calderón reports it abundant in acahual and "an abundant annual" in Oaxaca, while Lot reports it "abundant in pastival derived from coastal dunes". Barkley found it to be "rare on shaly loam in desert scrub, 6 in. tall". Rzedowski encountered it on "ladera caliza con vegetación de zacatal". In the Bahamas Webster reports it as "locally a common weed".

Standley (1930) records the species from Belize on the basis of Schipp 612, but this collection proves to be *G. spicata* (Aubl.) Mold. In 1931 he refers to the fruit as "black" and the corollas as "blue". Schlechtendal & Chamisso (1830) also refer to the corollas as blue. The species is occasionally cultivated and is, in fact, based on a cultivated specimen.

The corollas are said to have been "blue" on Breedlove 10268, Correll & Popenoe 50785, Dorantes Lopez 273, Dorantes Lopez & al. 1035, Martínez-Calderón 1462 & 1520, Moore 1827, and Vazquez Yanes 683, "bluish" on Galeotti 747, "light-blue" on Dressler & Jones 224, "pale-blue" on King 1022 and Webster & al. 7142, "lilac" on Dorantes & al. 1382 and Ventura A. 12920, "bluish-lavender" on Edwards 514, "lavender" on Edwards 745b, "violet" on Crutchfield & Johnston 6109a and Webster & al. 10415, "purple-violet" on Ekman 13468, "purple" on García Saucedo 44, Martínez-Calderón 1020, 1030, & 1956, Rzedowski 6047, Soto J. s.n., Vazquez Yanes 659, and Ventura A. 924, and "2 shades of purple" on Leavenworth 315; on Dorantes & al. 931 they are described as "violeta-blanca", on Lot & al. 1862 as "blanca con guías purpuras", on Fearing & Thompson 184 as "lower lip dark-blue, upper lip violet", and on Dressler 2337 as "lower 3 petals purple, upper 3 petals blue" [but, of course, the corolla only has 5 petals]. King 1022 exhibits especially large leaves.

The accepted specific epithet is sometimes uppercased in certain publications and by some herbarium botanists. *Purpus* 6138 is labeled as "*Tamonea scabra* Ch. & Schl. forma". Cooper 24 is labeled as from New Providence, "Bermuda" (doubtless an error for "Bahamas"). Brace 19 was originally distributed as "No. 121", but the latter number has been struck out by an unknown hand for a reason not known to me. The Persoon (1807) is sometimes erroneously cited to page "256".

Alain (1957) records *Ghinia curassavica* from "Terr. yermos" in Cuba and correctly lists it also from Mexico and the Bahama Islands. Grisebach (1857) lists it from Antigua, but this is due to a misidentification on his part of the *G. boxiana* Mold. limited to that island and Puerto Rico. Schauer (1847) maintains that his *Ischnia verbenacea* applies to an annual, rather than perennial, Mexican plant. Briquet (1895) used the name, *Tamonea scabra*, for the entire Mexican population and *T. verbenacea* for that of the "Westindischen Inseln". The species is said by Sweet (1830) to have been introduced into English gardens in 1733 from the "W. In-

dies". Willdenow (1797) arbitrarily renamed Linnaeus' taxon *Ghinia spinosa*, using a new specific epithet as was customary among European botanists when a taxon was shifted from one genus to another. Rauschel (1797) lists both his *G. curassavica* and *G. tamonea* as native to Jamaica, but the genus is not known to me from that island.

The *Purpus* 15227, cited below, exhibits very small leaves on some sheets, but the fruiting-calyx and fruit are definitely those of the typical form of this species.

Common and vernacular names reported for the species are "flor morada", "spiny-fruited vervain", "stachliche Traubennuss", "tamonee épineuse", "thorny-fruited tamonea", and "zapane de Curaçao". Don (1830), disagreeing with Sweet (see above), claims the species was not introduced into cultivation in England until 1823.

Citations: MEXICO: Chiapas: *Breedlove* 10268 (W--2470277, Z), 36612 (Me--255177; *LeDoux, Dunn, & Wallace* 2187 (Ld, N); *Webster, Miller, & Miller* 7142 (Me--133602). Guerrero: *Bravo Hollis* 578 (Me--50123). Hidalgo: *V. H. Chase* 7454 1/2 (Ur, Ur); *M. T. Edwards* 745b (F--915242), 897 (F--915240); *G. L. Fisher* 37078 (Gg--339423); *H. E. Moore* 1827 (Ba); *Seler & Seler* 624 (W--1323148). Oaxaca: *Liebmann* 11307 (Ba, W--1315088); *Martínez-Calderón* 1520 (Me--167731). San Luis Potosí: *O. M. Clark* 7379 (E--1287828); *Crutchfield & Johnston* 6109a (Au); *M. T. Edwards* 514 (Au, Du--278655, F--915243); *Hitchcock & Stanford* 6905 (Ca--710863, Du--361412, Pl--130114, Po--266461, Se--58991, W--1806783); *Kenoyer s.n.* [Valles, 9-3-38] (Fs); *W. C. Leavenworth* 315 (Ld); *J. Rzedowski* 6047 (Au, Ip); *J. N. Weaver* 682 (La, W--2134166). Tamaulipas: *F. A. Barkley* 17M059 (Au--100556); *Dressler* 2337 (Mi); *Fearing & Thompson* 184 (Au--183338); *W. C. Leavenworth* 109 (Ur); *Rozynski* 40 (Ca--469709, F--650156), 40a (Mi), 483 (B, F--677845); *Viereck* 686 (W--1687365). Veracruz: *Barkley, Rowell, & Webster* 2607 (Au, N); *Dressler & Jones* 224 (Ca--48899, Me, Mi, N, W--2328468); *Dorantes Lopez* 273 (Me--154657); *Dorantes Lopez & al.* 931 (Me--179232), 1035 (Me--179237), 1382 (Me--170052); *Erverdborg* 110 (T); *Galeotti* 747 (Br); *García Saucedo* 44 (Mi); *Gonzalez G.* 108 (Me--1614069); *F. W. Johnson s.n.* [Cordova, 9-26-06] (N); *Kerber* 28 (Br, Cb, Cp, Mu--1779); *R. M. King* 1022 (Au--211645, Ld, Mi, W--2397529); *Lot & al.* 1862 (Me--161626); *MacDaniels* 441 (Ba, F--837807); *Martínez-Calderón* 1020 (Ac, N), 1030 (Me--140804), 1462 [Rec. Inf. D001529] (Ld, Me--140637, Mi, N), 1956 [Rec. Inf. D004790] (Ac, Me--145218, Mi); *Matuda s.l.* (Mi, N); *Nevling & Gómez-Pompa* 486 (Me--213909), 864 (Me--212273); *Purpus* 2220 (Ca--83377, F--201780, N, N--photo, W--840339), 6138 (Ca--168104, F--386649), 12040 (W--1409794), 13040 (F--603315), 15227 (Cp, Du--245708, F--650334, N); *Seaton* 399 (C, W--60824); *Shapiro* 155 (Me--234660); *Soto J. s.n.* [20.VIII.1967] (Ip); *Sousa & Ramos* 4791 (Me--90467); *Vazquez Yanes* 659 (Me--157202), 683 (Go, Me--157194, W--2790890); *Ventura A.* 924 (Mi, Sd--78084), 12920 (Me--232819). State undetermined: *Black* 38-5133 [Cofre de Perote] (Be--45822); *F. Müller s.n.* [1853] (M); *Sessé, Moçino, Castillo, & Maldonado s.n.* [1220, *Pedaliump spicatum*] (F--847125, Q, Q). BAHAMA ISLANDS:

New Providence: *Brace* 19 (N); *Britton & Brace* 183 (N, W--429723); *W. Cooper* 24 (T); *Correll & Popenoe* 50745 (N); *Curtiss* s.n. [Nassau, Apr. 24, '03] (N); *P. Wilson* 8407 (N); *Webster, Samuel, & Williams* 10415 (S). CUBA: Havana: *C. F. Baker* 1917 (Es, F--214562, N, W--523656); *Ekman* 13468 (Mi, N, S, W--2113444), 14127 (N, S); *León* 7320 (W--2289084), s.n. [Abril 18, 1923] (Ha); *León, Colon, & Albear* 7320 (Ha, N); *Roig & León* 8124 (Es); *Shafer* 94 (Cm, N). Oriente: *Acuña* 17187 (Es, N); *Hioram* 1777 (Se--14933).

GHINIA CURASSAVICA var. *AUSTRALIS* Mold., *Phytologia* 24: 498. 1972.

Bibliography: Mold., *Phytologia* 24: 498 (1972) and 25: 229. 1973; Anon., *Biol. Abstr.* 55 (9): B.A.S.I.C. S.105. 1973; Hocking, *Excerpt. Bot. A.23*: 292. 1974; Mold., *Phytol. Mem.* 2: 142 & 548. 1980; Mold., *Phytologia* 47: 416. 1981.

This variety differs from the typical form of the species in having the pubescence on its branches, branchlets, and lower leaf-surfaces longer, more coarse, more spreading, and decidedly whitish.

The variety is based on *Irwin, Harley, & Smith* 31404 from wet places in the cerrado on the slopes of the Espigão Mestre about 25 km. west of Barreiras, at about 600 m. altitude, in the valley of the Rio das Ondas, Bahia, Brazil, collected on March 3, 1971, and deposited in my personal herbarium. The collectors describe the plant as an ascending herb, about 75 cm. tall, with dark red-violet "heads" -- the flowers, however, are clearly borne on thin, open spikes! Thus far the taxon is known only from the original collection.

Citations: BRAZIL: Bahia: *Irwin, Harley, & Smith* 31404 (W--2709889--isotype, Z--type).

GHINIA CURASSAVICA f. *PARVIFOLIA* Mold., f. nov.

Bibliography: Mold., *Phytologia* 47: 416. 1981.

Haec forma a forma typica speciei foliis parvioribus plerumque ovato-lanceolatis usque ad 10 mm. longis acutis petiolis usque ad 7 mm. longis fructibus parce maioribus spinis brevioribus plerumque 0.5--1 mm. longis calyce maturo usque ad basin vaginatis recedit.

This form differs from the typical form of the species in its leaves being on the average smaller, the petioles to 7 mm. long, the leaf-blades usually narrowly ovate-lanceolate, 1 cm. or less in length, rarely to 1.5 cm. long, apically acute, the fruit slightly larger and the spines shorter, usually only 0.5--1 mm. long, enveloped by the mature calyx to the base of the spines.

The form is based on an unnumbered George L. Fisher collection from Valles, San Luis Potosí, Mexico, at 260 m. altitude, collected on August 3, 1937, and deposited in the Britton Herbarium at the New York Botanical Garden.

Collectors describe the plant in the field as a shrub or suffrutescent perennial herb, 50--60 cm. tall, with green fruit. The late Joseph V. Monachino critically examined *Clark 6826* and reports the "calyx and corolla 5-parted, the corolla contorted in bud; stamens 4, 2 attached higher up in the corolla-tube and with glan-

dular appendages at the filament tips, the other two attached lower down and with no appendages; the anthers dehisce longitudinally; stigma capitate, 1 lobe aborted; style 1; ovary apex with 4 knobs; ovules 4, 2 each basally attached to incompletely intrusive placentae".

Collectors have encountered this plant in forests and "jungle forests", as well as in low secondary deciduous forests with "suelo cafe arcilloso", along semi-desert and other roadsides, in matorral, on rich bottomlands, in moist rocky places, on hills, and in open areas in brush on shaly ridges, at 10--2050 m. altitude, flowering and fruiting from April to October.

Erdtman (1966) has examined the pollen of *Gaumer 834b* from Mexico and describes the grains as 3-colpor(oid)ate, prolate, 76 x 55 μ , the nexine thinner than the more or less compact extranexinous part of the exine which is traversed by fine more or less radial lines; the "grains very different from those in *Verbena*, more similar to those of *Chascanum*, etc."

The corollas are said to have been "purple" on *Lot 610 & 654* and *Rzedowski 10405*, "2 shades of purple" on *Leavenworth 215*, "lilac" on *Ventura A. 5407* and *Zola B. 587*, and "blue" on *Stanford & al. 886*. A pollen sample has been taken by M. Strick in 1942 from *Rozynski 378*.

The leaves are slightly larger than usual on *Breedlove 19784*, *Matuda 1457*, and *Zola B. 587*. *Purpus 15227* exhibits rather small leaves on some specimens, but the fruiting-calyx and fruit are those of typical *G. curassavica*, so I am regarding it as a depauperate example of that taxon.

Ventura reports the present form "abundant" in Veracruz; Graham & Johnston found it to be a "frequent perennial in brush along an arroyo through shale of the Mendez formation" in Tamaulipas. Breedlove encountered it "on grassy slopes with scattered trees and shrubs of *Acacia*, *Bursera*, *Gliricidia*, *Annona*, and *Daphnopsis*"; while Stanford and his associates found it in a "broad damp riverbed among varied vegetation of large shrubs, small trees, and herbs!" Rzedowski found it growing in oak woods on "ladera caliza" in San Luis Potosi.

Material of this taxon has been misidentified and distributed in some herbaria as *Bouchea* sp., *Duranta repens* L., and *Labiatae*.

Citations: MEXICO: Chiapas: *Breedlove 19784* (Me--228925). San Luis Potosi: O. M. Clark 6847 (E--1287828, N); G. L. Fisher 3743 (W--1725449), s.n. [Valles, Aug. 3, 1937] (N--type); Graham & Johnston 4501 (Au--174678, Me--59213, Mi); W. C. Leavenworth 215 (Ld, N, Ur, Ur); Edw. Palmer 125 (E--1906519, N, W--470987), 133 (N, W--470994); Pringle 3547 (Vt); *Purpus 5290* (Ca--157334, F--299034, N, W--463851), 5291 (Ca--157408, F--299035, Me, N, S, W--463852); J. Rzedowski 10405 (Au, Ip, Me--94831, Mi), 10681 (Ip). Tamaulipas: O. M. Clark 6826 (E--1287825, N); Graham & Johnston 4415 (Au--174476, Me--59212, Mi); Richardson 1517 (Au--302919); Rozynski 378 (B, F--677844, N, W--1482736), 521 (F--713536, N); Stanford, Retherford, & Northcraft 886 (Ca--714029, Du--288742, N). Veracruz: *Lot 610* (Me--146541), 654 (Me--14412); *Matuda 1457* (Me--85462, Mh,

Mi, N); *Ventura A.* 5407 (Au, Mi); *Zola B.* 587 (N).

GHINIA CURASSAVICA var. *YUCATANENSIS* Mold., Alph. List Comm. Vern. Names 8, nom. nud. 1939; Carnegie Inst. Wash. Publ. 522: 152. 1940.

Bibliography: Millsp., Field Columb. Mus. Publ. Bot. 1: 317. 1896; Mold., Geogr. Distrib. Avic. 14. 1939; Mold., Alph. List Comm. Vern. Names 8. 1939; Mold., Carnegie Inst. Wash. Publ. 522: 152--153. 1940; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 16 & 93. 1942; Mold., Phytologia 2: 103. 1944; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 30 & 185. 1949; Mold., Résumé 36 & 456. 1959; Mold., Fifth Summ. 1: 70 (1971) and 2: 879. 1971; Mold., Phytol. Mem. 2: 62 & 548. 1980; Mold., Phytologia 47: 411 & 416. 1981.

This variety differs from the typical form of the species in having its leaf-blades apically obtuse or rounded, basally truncate or subtruncate, and the marginal teeth rather obtusish.

It is a perennial herb, slightly woody at the base, 40--65 cm. tall; stems erect, rather much branched; branches erect or ascending, acutely tetragonal, minutely puberulent; leaves petiolate; petioles very slender, 3--10 mm. long, sparsely or densely short-pilose with whitish hairs; leaf-blades thin-chartaceous, ovate, 5--25 mm. long, 4--17 mm. wide, apically rounded or obtuse in outline, basally truncate or subtruncate, marginally rather coarsely dentate from the widest part to the apex with numerous antrorse rather bluntish teeth, very sparsely short-strigillose above with rather scattered whitish hairs, obscurely and very minutely puberulent beneath with brownish hairs especially along the larger venation, the larger venation mostly impressed above and prominent beneath; flowers subsessile or short-pedicellate, remote, small; corolla blue or lilac; fruiting calyx broadly campanulate, to 4.5 mm. long and 6 mm. wide, membranous, 5-ribbed, the ribs projecting at the rim as 5 aristate-subulate apiculations 0.5--1 mm. long; drupes at first fleshy, later dry, turbinate-tetragonal, bearing 3 or 4 stiff wide-spreading horn-like spines 1--3 mm. long.

This variety, limited to the Yucatán Peninsula, is based on *Gumer 834b* from waste ground about Izamal, Yucatán, Mexico, collected in 1895 and deposited in the Britton Herbarium at the New York Botanical Garden. It was recorded by Millspaugh (1896) as *Tamonea scabra* Cham. & Schlecht and the type collection was distributed under that name. It is described by Gumer as an "herb 2 feet high, abundant on waste lands". Gumer and his sons assert that "this plant grows around pools of water where the water is very shallow; it is not abundant in any locality." On the other hand, Moreno refers to it as "abundant".

Collectors have also encountered this plant in low forests and clearings, in thickets on hillsides, and along rocky paths, flowering and fruiting from June to August and in November. The corollas are said to have been "blue" on *Bequaert 46* and *Lundell & Lundell 8176* and "lilac" on *Moreno 284*. Vernacular names reported are "chancolenexnuc", "chan-ko-xnuk", and "chanxnuk".

The typical form of the species, as well as its other subspecific taxa, do not seem to occur on the Yucatan peninsula and differ in their much more acute or acuminate leaf-apex, acute or even cuneate-attenuate leaf-base, and sharply acute or acuminate teeth on the leaf-margins.

Material of the present variety has been misidentified and distributed in some herbaria as typical *G. curassavica* and as *Tamonea curassavica* (L.) Pers., *T. prismatica* (L.) Pers., and *T. scabra* Cham. & Schlecht.

Citations: MEXICO: Quintana Roo: *G. F. Gaumer 1988* (B, Br, Du--199855, F--58786, Gg--160366, Po--174879, S, W--1265819), *1989* (Ca--446041, F--58787, I, Mi, W--1265820); *Moreno 284* (Me--90243). Yucatán: *Bequaert 46* (F--710812, W--1490767), *81* (F--710795, G); *Enriquez 766* (Me--120799); *G. F. Gaumer 834* [Herb. Umbach 15468] (Br, Br, Ca--446226, Du--207670, F--437600, Gg--160703, I, Mi, Ws), *834b* (G--isotype, Gg--164030--isotype, N--type, S--isotype, W--268611--isotype), *24097* (Br, Ca--446074, Du--199772, F--552100, Gg--160620, N--photo, W--1268186, Z--photo), *24228* (Ca--882558, F--552233, S, W--1268304); *Gaumer & Sons 23384* (F--460117, W--1265855); *Lundell & Lundell 8176* (Mi, N); *Steere 1221* (Mi), *1376* (Mi), *2010* (F--668595, Me, Mi).

GHINIA EUPHRASIIFOLIA (B. L. Robinson) Standl., Contrib. U. S. Nat. Herb. 23: 1236. 1924.

Synonymy: *Tamonea scabra* var. *minor* Schlecht. & Cham., Linnaea 6: 373. 1831. *Tamonea scabra* var. *minor* Cham. & Schlecht. apud Schau. in A.DC., Prodr. 11: 529. 1847. *Tamonea euphrasiifolia* B. L. Robinson, Proc. Amer. Acad. 44: 613. 1909. *Ghinia euphrasiifolia* Standl. apud A. W. Hill, Ind. Kew. Suppl. 7: 102. 1929. *Ghinia curassavica* var. *minor* (Schlecht. & Cham.) Mold., Phytologia 47: 88. 1980.

Bibliography: Schlecht. & Cham., Linnaea 6: 373. 1831; Schau. in A.DC., Prodr. 11: 529. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 469. 1858; B. L. Robinson, Proc. Amer. Acad. 44: 613. 1909; Prain, Ind. Kew. Suppl. 4, imp. 1, 232. 1913; Fedde & Schust., Justs Jahresber. 41: 387. 1918; P. C. Standl., Contrib. U. S. Nat. Herb. 23: 1236. 1924; A. W. Hill, Ind. Kew. Suppl. 7: 102. 1929; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1074. 1932; Mold., Prelim. Alph. List Inv. Names 43. 1940; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 575. 1941; Mold., Alph. List Inv. Names 43. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 16 & 93. 1942; Mold., Alph. List Inv. Names Suppl. 1: 21. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 30 & 185. 1949; Prain, Ind. Kew. Suppl. 4, imp. 2, 232. 1958; Mold., Résumé 36, 353, & 456. 1959; Erdtman, Pollen Morph. Pl. Tax., ed. 2, 449. 1966; Mold., Fifth Summ. 1: 70 (1971) and 2: 639 & 879. 1971; Mold., Phytologia 47: 88. 1980; Mold., Phytol. Mem. 2: 62, 548, & 627. 1980; Mold., Phytologia 47: 416. 1981.

A low much-branched shrub; branches flexuous, covered by a yellowish-gray bark; leafy branchlets elongate, tetragonal, strict, grayish-puberulent; leaves very short-petiolate, the peti-

oles to about 1 mm. long; leaflet-blades subdeltoid-ovate, equilateral, only 4--6 mm. long, apically rounded or obtuse, flabeliform-venose, usually shorter than the internodes, marginally dentate, green, glabrous and rugose above, puberulent (especially on the venation) beneath; racemes often spiciform, pedunculate, 5--10 cm. long; bracts small, subulate, about 2 mm. long; lower pedicels about 4 mm. long; calyx at first cylindric, later turbinate, 6 mm. long at maturity, 5-costate, externally puberulent, the costae excurrent; corolla about 1.7 cm. long, glabrous; fruit obovoid, only the spines exerted from the fruiting-calyx.

The species is based on *E. W. Nelson 4415* from Alta Mira, Tamaulipas, Mexico, collected between May 14 and 22, 1898, and deposited in the Gray Herbarium of Harvard University at Cambridge Schlechtendal and Chamisso's original (1831) description of *Tamonea scabra* var. *minor*, based on *Deppe & Schiede 138*, collected on a sandy seashore at Laguna Salada, Veracruz, deposited in the Vienna herbarium and photographed there by Macbride as his type photograph no. 34357, is: "minoribus donata foliis quatuor circiter lineas longis, fructu paulo majori, brevius spinoso, altius ad spinarum basin usque calyce majori vestito; caeteris ad amussim [*T. scabra*] convenientibus, novum proponere speciem nequimus. -- Fruticulosa, floribus magnis, pallide rubellis, fundo atropurpureis."

Recent collectors describe the plant as an erect perennial herb, 30--60 cm. tall, with a "tallo correoso", and have found it in anthesis in March, June, September, and October and in fruit in June, inhabiting rock sandy soil among secondary vegetation, at altitudes of sealevel to 100 m. Nevling & Gomez Pompa refer to it as an abundant herb in secondary oak woods in Veracruz, but Ventura reports it "very scarce" in that Mexican state. Actually the Veracruz collections seem suspiciously like a natural hybrid or intermediate with *G. curassavica* f. *parvifolia* Mold. In *G. curassavica* and its varieties, however, the corolla is usually only 6--7 mm. long and the leaf-blades are scabridous above, while in *G. euphrasiifolia* the corolla is about 15 mm. long and the leaf-blades are glabrous above.

Graham & Johnston's topotype collection is described by them as "a frequent perennial in sandy clay-loam soil on shell-hash ridge (shellmound on old beach ridge) among brush of *Prosopis*, *Pithecellobium pallens*, etc."

The corollas are said to have been "violet" on *Dorantes & al. 777*, "lilac" on *Ventura A. 3375*, "light-purple" on *Nevling & Gomez Pompa 444*, and "white with purple decorations" on *Graham & Johnston 4572*. Schlechtendal & Chamisso described it as pale-pink.

Material of *G. euphrasiifolia* has been misidentified and distributed in some herbaria as *Bouchea* sp.

Citations: MEXICO: San Luis Potosí: *Kenoyer 4241*(Mi). Tamaulipas: *Graham, Crutchfield, & Johnston 4512* (Au--174694, Ld, Me-59214, Mi); *E. W. Nelson 4415* (N--photo of isotype, W--330966--isotype, Z--photo of isotype); *Rutten & Rutten-Pekelharing* [Quarles van Ufford] 529 (N--photo, S--photo, Ut, Z--photo). Veracruz:

Deppe & Schiede 138 [Laguna Salada; Macbride photos 34357] (Kr--photo, N--photo, W--photo, Z--photo); *Dorantes & al. 777* (Me--172377); *Nevling & Gomez Pompa 444* (Me--212278); *Edw. Palmer 533* (E--778659), 538 (N, W--463427); *Ventura A. 3375* (Me--99172).

GHINIA JUNCEA (Schau.) Mold., *Phytologia* 1: 169. 1935.

Synonymy: *Tamonea juncea* Schau. in A.DC., *Prodr.* 11: 529. 1847. *Tamonea iuncea* Schau. apud M. Kunz, *Anatom. Untersuch. Verb.* 34. 1911.

Bibliography: Schau. in A.DC., *Prodr.* 11: 529. 1847; Schau. in Mart., *Fl. Bras.* 9: 177. 1851; Buek, *Gen. Spec. Syn. Candoll.* 3: 469. 1858; Briq. in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 1, 4 (3a): 148. 1895; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 1, 2: 1034. 1895; M. Kunz, *Anatom. Untersuch. Verb.* [thesis] 34. 1911; Mold., *Phytologia* 1: 169. 1935; A. W. Hill, *Ind. Kew. Suppl.* 9: 123. 1938; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 36 & 93 (1942) and ed. 2, 37 & 185. 1949; Mold., *Résumé* 89 & 456. 1959; Mold., *Fifth Summ.* 1: 150 (1971) and 2: 639 & 879. 1971; Troncoso, *Darwiniana* 18: 411. 1974; Mold. & Bromley in Harley & Mayo, *Towards Checklist Fl. Bahia* 188. 1980; Mold., *Phytol. Mem.* 2: 142 & 548. 1980; Mold., *Phytologia* 47: 416. 1981.

A green shrub, to 50 cm. tall, scabridous-pubescent throughout; stems and branches tetragonal, almost rush-like, strict, deeply 3-sulcate beneath the leaves; leaves decussate-opposite, small, usually subsessile or sessile, rather rigid; petioles very short or obsolete; leaf-blades small, rather firm, arrect or spreading, mid-green, subtriangular, marginally coarsely incised-serrate and conspicuously revolute, basally truncate, penninerved-lineate above; inflorescence unilaterally racemiform, abbreviated, subsessile, 2--5-flowered; calyx-teeth about 1.5 mm. long; corolla pale blue or mauve with darker veins, the lobes broadly rotund, about 3 mm. long; drupes dark-green, subquadrate, scarcely exceeding the calyx-teeth, depressed on the upper angles, 4-horned, the horns very short and blunt, the anterior ones well developed, the posterior ones subobsolete and merely hump-like.

This species is based on *Blanchet 2566* & 3397 from the mountains around Jacobina and near Igreja Velha, Bahia, Brazil, deposited in the DeCandolle Herbarium at Geneva. Macbride photographed a duplicate of *Blanchet 2566* in the Berlin herbarium as his type photograph number 7858 and of *Blanchet 3397* in the Geneva herbarium as number 17397. Schauer (1847) comments that the species is very similar to *G. spicata*: "habitu simillima, sed notis allatis bene distincta". In his 1851 work he again points out the similarity between these two species, but affirms that *G. juncea* differs in "praeter pubem brevissimam rigidulam aequalem omnes partes virides obducentem, etiam foliis subsessilibus sessilibusve grossius serratis racemisque subsessilibus, corolla majore laciniiis latis rotundatis sesquilineis longis, drupaque 4-corniculata insignis."

Harley and his associates encountered this plant on white sand along a small stream with marsh and surrounding cerrado on sandstone rock exposures, at 950--1000 m. altitude, in both flower and

fruit in March. The *Blanchet* 3397 cotype in the Brussels herbarium is a mixture with no. "76", which is *G. spicata* (Aubl.) Mold. The Macbride photograph number 7857 [depicting *Blanchet* 1027], distributed in at least some herbaria as "*Tamonea juncea* Schau.", actually is a photograph of a cotype of *Priva bahiensis* P.DC.

Citations: BRAZIL: Bahia: *Blanchet* 2566 [Macbride photos 7858] (Kr--photo of cotype, N--photo of cotype, W--photo of cotype), 3397 [Macbride photos 17397] (Br--cotype, Br--cotype, E--876600--cotype, Kr--photo of cotype, N--cotype, N--photo of cotype, W--1706051--cotype, W--photo of cotype); *Harley*, *Renvoize*, *Erskine*, *Brighton*, & *Pinheiro* in *Harley* 16667 (Z).

GHINIA SPICATA (Aubl.) Mold., *Phytologia* 1: 169. 1935.

Synonymy: *Tamonea spicata* Aubl., Pl. Guian. Fr. 2: 660--661, pl. 268. 1775. *Tamonea mutica* Sw., Nov. Gen. Sp. Pl., imp. 1, 94. 1788. *Ghinia tamonea* J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 37. 1789 [not *G. tamonea* Raeusch., 1797]. *Ghinia mutica* (Sw.) Willd. in L., Sp. Pl., ed. 6, 1: 114. 1797. *Ghinia mutica* (Sw.) Sw., Fl. Ind. Occ. Prodr. 2: 1090. 1800. *Tamonea mutica* Gaertn. f., Fruct. Sem. 3: 175, pl. 213. 1805. *Tamonea fructibus muticis, foliis tomentosus* Sw. apud Gaertn. f., Fruct. Sem. 3: 175, in syn. 1805. *Tamonea mutica* Pers., Syn. Pl. 2: 139. 1806. *Ghinia mutica* Willd. apud Lam., Encycl. Méth. Bot. 7: 567, in syn. 1806. *Leptocarpus chamaedrifolius* Willd. ex Link, Jahrb. Gew. 1 (3): 51. 1820. *Tamonia spicata* Aubl. apud Kunth, Syn. Pl. 2: 65. 1823. *Ghinia mutica* Sw. apud G. Don in Loud., Hort. Brit., ed. 1, 248, in syn. 1830. *Priva spicata* Aubl. ex J. A. Steyerl., Act. Bot. Venez. 3: 156, in syn. 1968. *Ghinia spicata* Mold. apud Gibson, Fieldiana Bot. 24 (9): 228, in syn. 1970. *Chinia mutica* [Sw.] apud Lopez-Palacios, Fl. Venez. Verb. 649, in syn. 1977. *Chinia spicata* [(Aubl.) Mold.] apud Lopez-Palacios, Fl. Venez. Verb. 649, sphalm. 1977. *Chinia mutica* Schreb., in herb.

Bibliography: Aubl., Pl. Guian. Fr. 2: 660--661, pl. 268. 1775; Sw., Nov. Gen. Sp. Pl., imp. 1, 94. 1788; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 965. 1789; L. C. Rich., Act. Soc. Hist. Nat. Paris 1: 111. 1792; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 2, 2: 965. 1796; Raeusch., Nom. Bot., ed. 3, 8. 1797; Willd. in L., Sp. Pl., ed. 6, 1: 114. 1797; Sw., Fl. Ind. Occ. Prodr. 2: 1090. 1800; Gaertn. f., Fruct. Sem. 3: 175, pl. 213 (inf.). 1805; Lam., Encycl. Méth. Bot. 7: 567. 1806; Sw., Fl. Ind. Occ. Prodr. 3: pl. 21. 1806; Pers., Syn. Pl. 3: 349. 1819; Poir. in Lam., Tabl. Encycl. Méth. Bot. 3: pl. 542. 1819; Link in Spreng., Jahrb. Gew. 1 (3): 51. 1820; Kunth, Syn. Pl. 2: 65. 1823; G. Don in Loud., Hort. Brit., ed. 1, 248. 1830; Sweet, Hort. Brit., ed. 2, 418. 1830; G. Don in Loud, Hort. Brit., ed. 2, 248 (1832) and ed. 3, 248. 1839; Sweet, Hort. Brit., ed. 3, 552. 1839; A. Dietr., Syn. Pl. 3: 610. 1843; Schau., Linnaea 20: [476]. 1847; Schau. in A.DC., Prodr. 11: 529. 1847; Schau. in Mart., Fl. Bras. 9: 177. 1851; Buek, Gen. Spec. Syn. Candoll. 3: 469. 1858; Bocq., Adansonia, ser. 1, 2: 126. 1862; Griseb., Symb. Bot. Argent. 280. 1879; Jacks. in Hook. f. & Griseb., Ind. Kew., imp. 1, 1: 1027 (1893) and imp. 1, 2: 1034. 1895.

[to be continued]

BOOK REVIEWS

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"LOKALANAESTHESIE" Vol. 18 of "KLINISCHE ANAESTHESIOLOGIE UND INTENSIVTHERAPIE," by F.W. Ahnefeld, et al. (Editors), XI + 265 pp., 86 figs., 58 tabs. Springer-Verlag, Berlin--Heidelberg--New York. 1978. Flexible cloth binding. DM 48,--.

This book deals with the theoretical bases of local anesthetics - their chemistry, pharmacodynamics and pharmacokinetics, their pharmacology and toxicity. This is followed by chapters on the clinical use and technical methods of application. Discussions will be found of the regular local anesthesia, surface and infiltration technics, peripheral conduction anesthesia, intravenous regional anesthesia, lumbar, caudal, and continuous peridural anesthesia, spinal anesthesia (in obstetrics), and regional anesthesia (children), as well as plexus blockaders, and therapeutic nerve blockade. The use of CO₂-containing local anesthetics to induce anesthesia more rapidly and to reduce dosage of the anesthetic is discussed in several chapters. The indications for regional anesthesia in the emergency room are explained, the complications arising from the use of local anesthetics, and their treatment, and the use of these agents in postoperative and post-traumatic pain is detailed. The treatment of chronic pain ("Pain Clinic") is given an important place. The papers in the volume were presented by German, Austrian, and French specialists at a workshop in Linz (Austria); the seven German and Swiss editors of the series were also the editors of this volume. The text is entirely in German and there are no English summaries as so often found in Springer books. The book has three main divisions each with a summary of the discussions ("brainstorming" sessions) varying in length from one page to 33 pages. Each summary is a kind of catechism with questions and answers. References are given at the end of each paper, with a total for the volume of 392 references. There is no index so that one must depend on the table of contents in front. The volume represents kind of a climax to 15 years of an increasing awareness of the importance of preventing local pain. Now in the larger medical centers, 10-15% of all operations are carried out under local anesthesia, and this practice is now spreading to the smaller hospitals, and of course their use in spreading out for the treatment of painful conditions outside of the hospital.

"ROHYPNOL (FLUNITRAZEPAM): PHARMAKOLOGISCHE GRUNDLAGEN - KLINISCHE ANWENDUNG," by F.W. Ahnefeld, (et al) (Editors). "KLINISCHE ANAESTHESIOLOGIE UND INTENSIVTHERAPIE BAND 17: XI + 217 pp., 93 figs., 35 tabs. 1978. Price DM 36,--; US \$18.00. Springer-Verlag; Berlin, Heidelberg, New York.

This monograph on the synthetic anesthetic Flunitrazepam (commercially provided as Rohypnol) ($C_{16}H_{12}N_3O_3F$) is the product of a Workshop participated in by 25 specialists including five of the seven editors. These professional anesthesiologists, physicians, clinicians, pharmacologists, neurologists, and surgeons met together and presented 18 papers, with one to six authors each. There are also two final chapters summarizing the discussion. Flunitrazepam is another of the series of benzodiazepines which includes such well known agents as Valium (diazepam), said to be the most widely used drug in the world at present, and Librium. Like these other benzodiazepines, flunitrazepam has anxiolytic, anticonvulsant, muscle-relaxing, and central NS-suppressing activities. The quantitatively greater of these two last activities makes this substance of special interest for introduction into the area of anesthesia. Based on pharmacological studies, Rohypnol was tested as a premedication agent (i.e., administered on the evening before the operation so that the patient will spend a quiet night and await the surgical adventure without apprehension) and for the induction of narcosis. It was shown that its hypnotic action prolongs and fortifies the action of other narcotics and sedatives for more than 8 hours. The medication is therefore recommended as a highly potent substance for use in clinical anesthesia. The first chapter on the pharmacology of this agent also briefly discusses its properties. Later chapters bear on the pharmacokinetics and metabolism of the compound, qualities of sleep under the drug, effect on behavior and psychology, histamine liberation (very limited, hence no danger of anaphylaxis), respiration, circulation (especially coronary) blood gases, etc. There are chapters on usage and dosage in analgesic combinations, regional anesthesia, local anesthesia, and intensive medication. Clinical experiences are detailed, including usage in 3,000 otorhinolaryngological operations without intubation. One very interesting case is presented in detail of continuous administration of Rohypnol to a patient 70 years of age with severe tetanus; after about a month the patient recovered and was returned to his home. This medicinal agent seems indeed to be of much value in the induction of general anesthesia and in other indications as well.

G M H

"THE RAIN FORESTS OF GOLFO DULCE," by Paul H. Allen. xvii + 417 pp., 35 figs., 1 map, 34 pls., 1 port. Stanford University

Press, Stanford, Cal. 94305. 1977 (1956). \$25.00.

This reissue of a work originally published in 1956 makes again available a most attractive treatment of the higher plants of a small area of Costa Rica, the Golfo Dulce region. In this tropical rain forest, the annual rainfall comes to about 200 inches, making it possible to produce an enormous plant growth - rich in both numbers of species and in numbers of plants. Latin America has one of the richest floras on earth, and this part of the Neotropics is among the richest. The flora of the American tropics is even yet not very well known. The present edition shows the original text plus an interesting foreword by Dr. Peter Raven of the Missouri Botanical Garden; he has given us a sketch of the life of the author, the late Paul Allen, who died in 1963. Although not decorated with higher degrees, Allen through devotion, hard work, and keen interest managed to become an outstanding authority on the flora of Central America and the author of this excellent text, which "stands out as (an island) of knowledge in a sea of almost total ignorance" (Raven). The work has an original format. Following an introductory informative text, the area is divided into fourteen ecological types, such as "Evergreen lowland forest" and for each a key is provided to cover the trees of that particular terrain: this key runs the tree down to species. Appended to this section are lists of plants arranged by use: lumber sources, edible fruits, medicinal plants, etc. The last three quarters of the book is occupied by a single alphabetic sequence, in which both botanical names (families, genera, and species) and common names are included. Thus, "Azulillo" is referred to Hamelia patens. Under Hamelia, a key serves to separate the two species described; a brief but adequate text gives the essential points about each species. The book ends with a bibliography and index of general terms which apply to the earlier text preceding the "Alphabetical Index," the long descriptive section of the book.

G M H

"TRANSFER RNA", Sidney Altman (Editor). xv + 356 pp., 72 figs, many tabs. The MIT Press, Cambridge, Mass. 1978. Bound. \$29.95.

The chemistry and biology of t-RNA is very thoroughly covered beginning from B.F.C. Clark's review of the implications of primary, secondary and tertiary structure, biosynthesis of t-RNA (S. Altman), its role in translation (O. Pongs) and suppression (A.M. Korner, S.I. Feinstein and S. Altman), effects on amino acid biosynthesis, transport, stringent response and activity of enzymes (R. LaRossa and D. Söll), types of modified nucleosides and their effects (S. Nishimura), conformational changes and functional role (D.M. Crothers and P.E. Cole), crystal structure (S.H. Kim) and finally interactions of aminoacyl t-RNA

synthetases and their substrates (G.L. Igloi and F. Cramer). The general primary structure of t-RNA was thoroughly reviewed as well as exceptions, the significance of G-U base pairs, position of ψ and the functional significance of tertiary structure of yeast t-RNA^{phe} was extensively described. It is now known that the average number of t-RNA genes per *E. coli* is 60, that t-RNA sequences have been identified in r-RNA cistrons and the t-RNAs may be transcribed as one long transcript but that has not been demonstrated yet. Post-transcriptional processing occurs to give finished t-RNA molecules. The details of the t-RNA function in translation is well covered with all the protein cofactors which have been now identified with that process. It is now known that transfer RNAs can mediate suppression of mutations of the following types: nonsense, missense and frameshift mutations: This phenomenon is discussed for procaryotes and in the eucaryote, yeast, t-RNA and aminoacyl-t-RNA can act as regulators of particular metabolic processes. Apparently there are a tremendous number of modified nucleosides and isoaccepting t-RNAs. Seventeen of the 87 nucleosides of t-RNA^{ser} are modified. The modified residues have very specific functional roles in the t-RNA metabolism. The complex subject of conformational charge of t-RNA and its functional role is discussed, but the story is so far incomplete and vague, whereas the crystalline structure studies of t-RNA have presented us with very precise models of the various t-RNAs. The synthetase-substrate interactions are yielding to enzymatic studies. Thus a very complete survey has been presented of t-RNA to date, but we can be assured that it will be vastly changed within a year or two as this is a very dynamic area.

Paul Melius, Professor of Chemistry, Auburn University

"LEHRBUCH DER PHARMAZEUTISCHEN CHEMIE", by Harry Auterhoff.

XII + 620 pp., 13 figs., 98 tabs. 9. erweiterte Aufl.

Wissenschaftliche Verlagsgesellschaft mbH, 7000 Stuttgart 1, BRD. (West Germany). Bound. 1978. \$32.00. DM 62,--

Previous reviews by the same reviewer have appeared as follows: (ed. 1: Pharm. Abstracts; 5: 773; 1964; ed. 5: Quart. J. Crude Drug Res. 9: 1480; 1969; ed. 6: ibid. 14: 143-4; 1976.) With each succeeding edition, this textbook improves. The ninth edition has an attractive appearance with a spectrophotometric pattern serving as background to graphic formulas of such compounds as cyclobenzaprine (a synthetic muscle relaxant). The book is provided with exceptionally clean-cut typography and with eminent readability. Some 17% of the text is made up of inorganic chemistry, the balance of organic, indicating some slight increase in the latter over previous editions. In the present edition, data from the European Pharmacopeia are included. Some of the older compounds in previous

editions have been deleted and newer ones introduced. The latter include Gliquidone, a synthetic oral antidiabetic; Carbidopa, used in Parkinsonism; Azlocillin (Securopen), so new that it is not listed in Merck Index IX (1976), a semi-synthetic penicillin with certain advantages. The encephalins, natural products of the animal body which have morphine-like action, are discussed. The chapters on the tetracyclines and penicillins and on appetite retarders are rearranged. The section on barbiturate analysis is enlarged. Many structural formulas have been improved, particularly those of stereochemical type. The author is a professor (pharmaceutical chemistry) at the University of Tuebingen. A co-author is Professor Joachim Knabe of Saarbruecken. The text is simple and uncomplicated and it should be a pleasure to study from a book with its direct and unadorned style. A few references appear as footnotes.

G M H

"MARINE PHARMACOLOGY: A STUDY OF THE TOXINS AND OTHER BIOLOGICALLY ACTIVE SUBSTANCES OF MARINE ORIGIN", by Morris H. Baslow (University of Hawaii, School of Medicine), XIV + 327 pp., 70 figs., 1 portr., 120 tabs., 41 formulas. Robert E. Krieger Publishing Company, Huntington, New York. Paperback. \$11.50. 1977 (Ed. 2).

This modern text (First Edition, 1969) presents much information on substances of medicinal use or having potential medicinal use which have been obtained from the ocean. Both plant and animal substances are represented and the basis of distribution of the text is along the lines of classification. Following the introductory first chapter and a second chapter on sea water, there are chapters which deal with the Schizophyta (Bacteria) and Eumycophyta (Fungi); Cyanophyta; Pyrrophyta (Dinoflagellata) and Cryptophyta (Cryptomonads); Chrysophyta; Chlorophyta, Phaeophyta, and Rhodophyta. The Kingdom of Animalia is covered in eight chapters as follows: Porifera; Cnidaria (hydrozoans, jellyfish, corals, sea anemones, etc.) and Ctenophora (comb jellies); Platyhelminthes (flatworms) and Nemertina (ribbon worms); Annelida, Echiuroidea (proboscis worms), and Sipunculoidea (peanut worms; so called apparently because of the similarity in appearance to the peanut fruit (shell); Mollusca, Arthropoda; Echinodermata; Hemichordata and Chordata (including the urochordates and vertebrates). Chapter 16 is a summary of the pharmacological potentials of marine organism compounds. The text goes into much detail on the chemistry, pharmacological activity, toxicity, etc., of the hundreds of substances and compounds which are taken up. Each chapter has abundant textual references and the interested person will find ample opportunities for satisfying his (her) curiosity and desire for further information by searching these primary sources of information. This text promises to be a gold mine for researchers

in what is generally conceded to be a frontier in the search for new and more effective medicinal agents. Most of our valuable medicinal articles originate from natural sources and this work should demonstrate the value of research in this direction.

G M H

"CACTUS IDENTIFIER: INCLUDING SUCCULENT PLANTS", by Helmut Bechtel. 256 pp., 118 figs. Sterling Publishing Co., 419 Park Avenue South, New York 10016, 1977. \$4.95.

To the layman, "cacti" generally means plants with the external appearance of members of the cactus family, Cactaceae. In this group belong the true cactus plants but also plants of succulent nature with an external or superficial resemblance to true cactus plants, such as the spurges (Euphorbiaceae), along with some members of the milkweed family (Asclepiadaceae), geranium family (Geraniaceae), Orpine family (Crassulaceae), daisy family (Compositae), carpetweed family (Aizoaceae), dogbane family (Apocynaceae), and lily family (Liliaceae). All of these families are covered in this book, with the greatest emphasis and amount of space devoted to the Cactaceae (159 pages as against 78 pages for all of the other families). The work, originally published in German in Stuttgart, West Germany, is a compact compendium of succulent plants, of primary interest to plant and especially "cacti" fanciers. While information on the care of this type of plants is supplied, in reality it seems probable that there are so many who grow cacti because it is so easy to care for these plants. They thrive for long periods of time without watering, hence forgetfulness, holidays, and simple carelessness may have their reward in keeping these household "pets." The pictures are reproductions of colored photographs by the author and are not only beautiful in themselves but also useful in identifying the various plants. Generally, the illustration occurs on the right side page with the descriptive text on the page opposite. One would believe this small pocket-sized book an unlikely place for taxonomic information. However, the authorities are regularly shown throughout and there is one new combination shown, Gymnocalycium calochlorum var. proliferum (Backbg.) (the basionym is not however indicated). The family name Asclepiadaceae is regularly mis-spelled "Asclepidaceae."

G M H

REGIONALANAESTHESIE IN DER GEBURTSHILFE, UNTER BESONDERER BERUECKSICHTIGUNG VON CARTICAIN. Beck, L., Strasser, K., and Zindler, M. (Editors). Anaesthesiologie und Intensivmedizin No. 113: IX + 94 pp., 19 figs., 24 tabs.; 1978. Flexible cloth binding. Dm 32,--; US \$16.00. Springer-Verlag Berlin.

"Regional anesthesia in obstetrics with special attention to Carticaine" deals with an important segment of medicine, a matter of life and death of two persons, the parturient woman and the child in process of entering the world. Thirteen authors (including the three editors from Duesseldorf), German, Austrian, and Swedish specialists, consider the subject as presented at a Symposium held in Duesseldorf (in 1978?). The text is all in German except for a 1½ page summary following a Zusammenfassung in German. The synthetic compound, Carticaine, is shown to be an analgesic safe with proper usage for both mother and fetus. The local anesthetic compound also called Ultracain is of the acid amide type, the first to contain a thiophene ring system. It was first studied by Muschaweck and others, who published in 1974. This brochure has three major sections: (1) Basic information (pharmacology) (2) Use in conduction anesthesia (representing use of local anesthetic to produce a blockade of the sensory nerves in the genital regions) and effect on the fetus; and (3) "podium discussion" of regional anesthesia in obstetrics, with much information on indications and contraindications, advantages and disadvantages for mother and child, various procedures of use, etc. On the whole, Ultracaine has shown itself to be an agent having excellent analgesic effectiveness, with comparatively low neonatal serum levels and specially appropriate for use in obstetric analgesia.

G M H

BLAKISTON'S GOULD MEDICAL DICTIONARY. Fourth Edition. XXVII + 1637 pp., 26 pls. (mostly color), 20 tabs., McGraw-Hill Book Company, New York, Bogota, 1979. \$24.95.

This large well-made volume, with the title in large old gold letters on front cover and spine, will make an appeal to physicians, pharmacists, and other professionals as well as to scientists primarily because of its wide inclusion of terms and clear cut definitions. There is one primary difference in this medical dictionary and others currently on the market which will soon become obvious to anyone using the book. That is instead of using generic main entries and following each generic term with specifics in alphabetic order, the entire two to four word term is supplied under the alphabetic order of the first letter of the first word. Thus for instance, in a contemporary medical dictionary published in 1974 (Dorland's), mescal button is listed under button as, "button, mescal", whereas in the dictionary under consideration the term appears under "m" as "mescal button" and there is only one entry under "button", a dental term used to refer to casting procedures. This order does not of course apply to Latin terms, such as *Musculus sartorius*, *musculi multifidi*, *nervi*...., *nervus*...., and so on, which are by nature of their word order placed together in generic groups. This is

really a quite enormous difference and has important advantages in use. However, the other more conventional arrangement (for medical dictionaries not regular dictionaries) also has its advantages, and the solution might lie in a physician (or other) having at his command a dictionary of each type. Between the two, there would be no difficulty in finding the term sought. (Webster's, American Heritage, and other English dictionaries use the same kind of arrangement as in Blakiston's). The volume has been edited by an Editorial Board of five members (A.R. Gennaro; A.H. Nora; J.J. Nora; R.W. Stander; L. Weiss). 34 "contributors" are listed (including the five editors). Some 90,000 terms are said to be defined in this tome. A very useful appendix of 134 pages include anatomical tables, abbreviations, and many other important data. The Pictionary should prove like its predecessors of inestimable value to the busy practitioner and others. - - Some terms not found include: Allozyme; sundown syndrome; prodrug; megavitamins; cytotoxicity; anxiolytic; antamines; dysleptic; psychotronics; cornu uteri; pesticin; RDA (recommended daily allowance); L/W (lipid/water, emulsion); liver spots (additional definition as applied to chloasma); muricin; lipase index; protectins (antibiotics secreted by invertebrates, snail eggs, etc.); dolabra phenomenon (seen in erysipelas); CMT (cancer multistage therapy); alkanol; tyrosolvin (antibiotic); refractory phase; Celsus signs (of inflammation) (heat, pain, redness, swelling); cystocrit (separation of cells); aoral; thromboxane; emotivational syndrome; myelolytic leucocyte; Kambucha; chronic progressive polyarthritis; progredient chronic polyarthritis; para-rheumatic diseases.

G M H

THE GLORY OF THE TREE, Boom, B.K. and Kleijn, H. 128 pp., 194 col. pls; figs. Doubleday and Co. Inc., Garden City, New York. 1966. \$12.95

In this volume will be found textual information on several hundred of the most important trees of the world, with attractive colored photographs of nearly 200 of them. The coverage includes Pteridophyta (tree ferns), Gymnospermae, and Angiospermae. At the end of the volume are a list of major botanical gardens of North America and Europe, a list of trees appearing on postage stamps, a glossary of Latin or Latinized plant names, a short bibliography, and the index. Although semi-popular, the volume should be of interest to botanists because of the rich detail and the fine illustrations.

G M H

"ENDANGERED AND THREATENED PLANTS AND ANIMALS OF ALABAMA: The Results of a Symposium," edited by Herbert Boschung. vii + 93 pp., many figs. Bulletin. Alabama Museum of Natural History, No. 2. University, Alabama. 1976. \$5.00.

Ten authors collaborated to prepare this volume, representing papers presented before a symposium sponsored by the Alabama Department of Conservation and Natural Resources and the Alabama Museum of Natural History. Next following a historical review, there is a chapter on the plants of Alabama by Joab L. Thomas, (pp.5-12), consisting mainly of an annotated listing of ca 250 taxa of endangered and threatened species and "species of special concern" (*Uniola* spp. (sea oats) are not included). The balance of the brochure is taken up with animals.

G M H

"KREISLAUFSCOCK", edited by J. B. Brueckner. Anesthesiology and Intensive Care Medicine, Vol. 125. XXIV + 646 pp., 407 Figs., 96 tabs. Springer-Verlag Berlin, Heidelberg, New York. 1980. DM 168,--; ca US \$99,20. (soft binding)

This volume represents a record of the speeches and discussions at an international symposium (Berlin, 1977) on all aspects of circulatory shock (respiratory disturbances, shock lung, coagulation disorders, and inflammatory, tourniquet, anaphylactic, hemorrhagic, traumatic, low volume, septic, endotoxic, and cardiogenic shock). Also included is information on the cardiac factors found in shock, ischemia, and hypoxia. Of paramount importance of course are the discussions and findings on therapy of the shock syndrome. The text includes original contributions, reviews and round-table discussions. The complexity of the shock syndrome becomes apparent, since a multitude of factors can produce it--trauma, blood loss, infections, failure of the pumping action of the heart, poisoning, antigen reactions, and so forth and so on. Thus, the clinical picture of circulatory shock may be a resultant of all of these factors and others, singly or in multiple. Also this markedly dynamic event can show considerable variations. Depending on the degree of injury and the period of oxygen deprivation, the chances of survival are always small, since shock passes over into a therapy-resistant irreversible state. The effective treatment of shock is not simple since it requires the collaboration of various medical specialists. Much is lacking in our knowledge of the pathophysiological consequences of shock. Despite many improvements in specific therapy, as well as in general treatment, all too often patients still die in shock despite the best efforts of the physicians. Earlier symposia on this great topic (1961, Stockholm; 1969, Freiburg/Br.) considered

problems directly related to shock. The present symposium was more concerned with various scientific fields basic to the study of shock, such as physiology, biochemistry, and pharmacology, but also surgery, internal medicine, anesthesiology, etc. The book is in German, all participants being from West Germany (185) or German-speaking countries (Switzerland 2, Austria 4) or countries where German is well known (Netherlands 2, Sweden 3). No less than 196 individuals are listed as authors, discussion speakers, and chairmen. The book has ten sections, each section with several papers, each paper with its own terminal bibliography and discussion section. The contents of the volume are so diverse in nature and the data so voluminous that it was scarcely possible to have a summary in English, as is often done in volumes of this series. A translation into English of the text would undoubtedly be of great interest and value. Besides the table of contents in the front of the volume, there is a comprehensive index at the back which makes the work more available and therefore useful. In Section 10 on septic shock, precipitating causes in the gastrointestinal tract (intestine, gall bladder) are described but there is no mention of vaginal injury as a factor, something which is recently much spoken of in the United States literature and which has been attributed to the use of vaginal tampons. Because of the great hazards and life-threatening nature of circulatory shock, this book should be available to physicians in all specialties but particularly to those in the area of intensive care.

G M H

"THE HISTORY OF BACTERIOLOGY," by William Bulloch, M.D., F.R.S.
x + 422 pp., 36 figs., 16 pls. Dover Publications, Inc., 180
Varick St., New York 10014. 1979 (1938). \$6.50.

This unabridged republication of Bulloch's "History" was prepared from a copy of an edition published in 1960, apparently unchanged from the original edition of 1938. It recounts in dramatic fashion the beginnings and development of one of the most important and valuable of all the sciences - bacteriology - in view of the enormous saving of human and animal life which has resulted from its development. Much of the content is biographical, which fact may explain the special attractiveness of the text. To fortify the biographical feature, a glossary of workers' names is appended to the text. There is also a large bibliographic section at the back, with entries for each of the eleven chapters of the text. Considerable space is given to the labors of Louis Pasteur, Robert Koch, and Ferdinand Cohn. The last chapter chronicles theories of immunization. While obviously not dealing with researches of the last 50 years, the book is an excellent source to learn of the pioneering days of Bacteriology.

"FLORA COSTARICENSIS, Families #42-53," edited by William Burger. Fieldiana: Botany. Vol. 40. vii + 291 pp., 30 figs. Field Museum of Natural History, Roosevelt Road, Chicago, IL 60605. 1977. Price unstated.

The editor has written the text for ten families in this part of the "Flora of Costa Rica": Chloranthaceae; Lacistemaceae; Garryaceae; Myricaceae; Bataceae; Fagaceae; Ulmaceae; Moraceae; Cannabaceae; and Urticaceae. Other families included are Salicaceae (by Luis D. Gomez P.) Juglandaceae (by Donald E. Stone); and Betulaceae (by John G. Furlow). Novelties include Alfaroa guanacastensis D. Stone sp. nov. (Cordillera de Guanacaste; tree closely related to A. manningii Leon) and A. williamsii Molina subsp. tapantiensis D. Stone subsp. nov. (tree close to A. costaricensis Standl.). Descriptions with illustrations of all taxa in the various families is combined with much extra-morphological information, bibliography, etc.

G M H

PUBLICATIONS FROM CAIRO UNIVERSITY HERBARIUM No. 7 & 8, 1977. Edited by M. Nabil El Hadidi. viii + 331 pp., many figs. The Herbarium, Botany Dept., Fac. of Science, Cairo Univ., Giza, Egypt. Published by Otto Koeltz Science Publishers, D-6240 Koenigstein, West Germany. 1977.

This volume represents actually a Festschrift Vivi Tackholm, since it commemorates the 80th birthday of this pioneering botanist of Egypt as well as the 50th anniversary of the Herbarium. During those 50 years, Mrs. Tackholm has devoted her time both to collecting and identifying plants for the herbarium, first with her husband (who died in 1933 at the age of 42); and then alone to fulfil her dream of writing a "Flora of Egypt". The Flora appeared in four volumes (1941-1969). Two articles telling about this remarkable woman appear after the editor's note, one in Swedish, one in English. These are followed by 32 scientific papers dealing with taxonomic subjects chiefly, but also including some articles on phytogeography, ecology, cytotaxonomy, morphology, anatomy, palynology, and chemosystematics. Most of the papers deal with Egypt but there are also items from Libya, Chad, Jordan, Iraq, Yemen, and Saudi Arabia. Professor Tackholm co-authors two articles, one on a new species of Egypt, Amaranthus spinosus L., the other additions and corrections to the second edition of the "Students' Flora of Egypt." (ed. 1, 1956; ed.2, 1974). The series of "Publications from Cairo Univ. Herbarium" began in 1968, the first five issues being monographic.

G M H

"THE ORCHIDS OF MAINE," by Jean Wallace Cameron. 1-80; 0 pls, 1 tab. University of Maine at Orono Press. 1976.

This paper-backed brochure was originally published as Univ. of Maine Bulletin vol. 53, No. 12 (1951); it now appears as a Maine Studies Book 2nd ser. No. 65. (1976). Keys and descriptions are given for 21 genera in the family with 46 species. Synonyms, descriptions, and range distribution data are given; at the end are a glossary, a good bibliography with ca 125 references, and index.

G M H

"WINTER KEYS TO WOODY PLANTS OF MAINE," by Christopher S. Campbell, Fay Hyland, and Mary L. F. Campbell. Ed. 2. IV + 117 pp. 63 pls., 1 map. University of Maine at Orono Press, Orono, Maine. 1978. \$4.95.

This key to trees in winter condition would be useful in almost any area of the northern USA and Canada since many of the tree species are general in this great region. The text is mostly occupied by a diagnostic key to genera which is quite readily available to an ordinarily intelligent person. Where a technical word may occur occasionally, the glossary following the key will be serviceable. However, the most useful single feature in the text is the truly effective drawings which give all necessary detail for hundreds of structures. There is also a very useful index of scientific and common names. This book will be a very useful one for the winter-loving outdoors person.

G M H

"HOUSEHOLD AND INDUSTRIAL CHEMICAL SPECIAL TIES. Chalmers, Louis, and Bathe, Peter. Volume I. Second Ed. The Chemical Publishing Co. Inc., 155 West 19th St., New York 10011. ix + 219 pp., 1978. \$22.50.

This title is a scientific-technical treatment of soaps, detergents, and laundry products (such as bleaches, laundry conditioners (generally called softeners in the USA), enzymes, brightening agents, etc.) in the first part and of household pests in the second. The discussion is lucid and accurate and this book should be very useful to chemists and technicians in the field of categories covered. There are two chapters on the pests: one covering the roach, ant, springtail, etc., the second the clothes moth and other fabric eating insects. The book was originally printed in Great Britain and published by George Godwin Ltd. Hence some of the data does not apply to American conditions. Some of the recommended pesticides are now disallowed in the USA, for instance,

DDT. There should perhaps have been some kind of an addendum or correction for the American edition of the book, so that persons in the manufacturing field would not attempt the preparation of illegal compounds. There are many references and a good index.

G M H

"THE HAWAIIAN GARDEN-TROPICAL EXOTICS," by Horace F. Clay and James C. Hubbard. xvii + 267 pp., 109 full page col. pls. The University Press of Hawaii, Honolulu. 1977. \$35.00.

Because of its location at a focus of travel and commerce, Hawaii has become a propagation center for many of the world's tropical and subtropical plants now growing alongside the native flora. This has come about also because Hawaii offers such a great variety of habitats - dry, wet, low, high, rich substrate and poor. This volume offers the interested person color photographs of great beauty with an opposite page describing many features of the plant, including horticultural information. The illustration may be of a close up of a part of the leaf, the entire leaf, a flower, flower group, a spray showing leaf and flowers, fruits, etc. All 109 plants included are monocotyledons. This important fact does not appear on the title page or explanatory preface nor is it indicated in the brief notes concerning other volumes to appear in this series "The Hawai'a Garden", indicating that a total of 16 volumes is planned including this one and "Tropical Shrubs." Tentative titles are given of nine of the additional volumes. Possibly one of the five others will be titled "Tropical Dicot Exotics." The attractive plates are of large size (letter page size, 8½ x 11 in.) and would framed make most attractive pictures to ornament the wall. Perhaps they should be offered separately for this purpose because it would be unconscionable to "butcher" such a book for this purpose. The book will fit nicely into either the parlor or the study room.

G M H

"COMPENDIUM OF PHARMACEUTICALS AND SPECIALTIES" Ed. IX (CPS IX) (CPS '74) Rotenberg, Gerald N. (Editor). The Canadian Pharmaceutical Association, 175 College St. Toronto, Ont. M5T 1P8, Canada. XIV + 1026 pp., 27 pls.; 1974. \$15.00.

This might well be proposed as the ideal physician/pharmacist reference compendium on medicinals; it is quite a good deal similar to the American PDR (Physicians Drug Reference) but in my estimation it is superior. (It is important for a Canadian practitioner to have this reference book because products marketed

in Canada by U.S. manufacturers have different colors or other properties from the American as described in the PDR.). The various sections of the directory have been printed on papers of different colors; thus, the section of monographs (White Pages) includes the many proprietary products in alphabetic sequence by their specialty names, running from A and D ointment to Zynocyl; this is followed by several preparations with numbered designations: 0065 to 692 tablets. The prescriber's guide and therapeutic index (Pink Pages) is a listing of indications (disease or disorder, thus gout; and therapeutic action term, thus acidifiers) followed by the products specifically recommended in treatment of same. Included at the end is anew subsection: diagnostic agents. The Product Recognition Section (27 pages) following presents colored figures of many medications to assist in their identification; the products are arranged by manufacturing Company, from Arlington to Winthrop. The Yellow Pages section contains the full names of concerns which in the White Section were designated by a short name or abbreviation. There is also in this section a list of companies and addresses with under each a list of its products. The Green Pages is a kind of master index listing all proprietary and non-proprietary (generic) names in the book; however, it is even more useful than that since it also lists drugs not yet available either because undergoing clinical trial or because simply not available in Canada. A final White Pages reference section at the back furnishes abbreviations, conversion tables, children drug dosages, drug schedules, list of poison control centers (Canada), and so on. This is of course an indispensable book in Canada for the medical professions but it is also of much help elsewhere.

G M H

"THE GENESIS OF BIOLOGY." L. P. Coonen (Compact Studies). The Thomist Press, Washington, D.C. 20017. 56pp.; 1964. 35¢.

This pamphlet is concerned entirely with the work of Aristotle as revealed in his writings, particularly as they concerned biology. The author designates him more than simply the "father of natural history" but as the "greatest biologist of all time." His accurate observations and reasoning as well as those that were fallacious are discussed.

G M H

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH New Delhi, India.
 "The Wealth of India. Raw Materials." Vol. X: Sp-W. LI + 1-591,
 175 figs., 6 pls.; 1976 (recd. 1977)

As in the previous volumes of this encyclopedia (sub-title:

A dictionary of Indian raw materials and industrial products), a large number of plants is reviewed; in this volume, there are 625 entries out of a total of 648. Hence the work is basically concerned with economic plants. Chronologically this work descends from Sir George Watt's "Dictionary of the economic products of India"; however, it has been greatly enlarged and otherwise improved.

G M H

"CACTI AND OTHER SUCCULENTS," by Jack Cramer (Photos by Don Worth). 160 pp., 39 figs., 188 pls. (67 in color; 121 bl. and white). Harry N. Abrams, Inc., 110 E. 59th St., New York, 10022. 1977. \$7.95 (paperback).

Often the term "Cacti" has been used by writers to indicate both members of Cactaceae (properly so used) and non-cactus succulents which superficially resemble the cactus plants. In this book, the term is used correctly. The succulents considered in the volume before us include members of families Commelinaceae, Bromeliaceae, Liliaceae, Begoniaceae, Euphorbiaceae, and others. Aside from information on culture of the various plants, the most interesting thing in this volume are the remarkable colored and uncolored photographs. They are among the most beautiful reproductions this reviewer has ever been privileged to see. You might well say that the beauty of the flowers exhibited here exceeds that of the plant as seen in nature. If you don't believe that, get a copy and see for yourself! The volume is a tribute to the overpowering beauty of plants. A pleasant surprise is the price: \$7.95 sounds like the good old days!

G M H

"WILDFLOWERS OF THE EAST," by Mabel Crittenden and Dorothy Telfer. vi + 220 pp., many figs. Celestial Arts, 231 Adrian Rd., Millbrae, Cal. 94030. 1977. \$5.95.

The "East" here refers to the eastern half of North America. The commonest species in 45 families have been briefly described and figured (drawings by the authors). A key is furnished. The plants are arranged by number of petals (3, 4 (separate and united), 5 all alike, 5 not, 5 united all alike, 5 united not, more than 5, many apparently (Compositae)). (Also there are sections on plants with sepals but no petals, and aquatic plants). The book is designed to be used by the beginner.

G M H

"THE GENETICS AND BREEDING OF SOUTHERN PINES." Dorman, K.W. USDA, Forest Serv. Agr. Handbook No. 471: x + 1-407, 202 figs., 9 tabs.; 1976 (recd. 1977). Price \$6.40 (paper).

This comprehensive compilation deals with the ten southern pine spp. The chief subject matter is descriptions of spp., factors of flowering and seed production, methods of vegetative propagation, traits of intersp. hybrids, and geographic, racial, stand, and individual variations. Much practical information on technics of breeding and seed production is included.

G M H

"DIAGNOSIS AND THERAPY OF PORPHYRIAS AND LEAD INTOXICATION." Editor, Doss, M. International Symposium Clinical Biochemistry. 107 figs., 70 tabs., XIX + 310 pages. 1978. Berlin-Heidelberg-New York, Springer-Verlag. Soft cover DM 69,--; US \$34.00.

This volume contains the proceedings of the International Symposium in Clinical Biochemistry held on the occasion of the 450 year celebration of the founding of Philipp University of Marburg, West Germany. International authorities presented papers at the symposium on the state of research, diagnosis and treatment in clinical chemistry, pathobiochemistry and the therapy of porphyrias and lead poisoning. The symposium was presented in twelve sections which covered the following topics: I. Pathobiochemistry of heme metabolism; II. Pathogenesis and differential diagnosis of acute hepatic porphyrias; III. Clinical course and therapy of acute hepatic porphyrias; IV. Pathogenesis, clinical biochemistry and treatment of chronic hepatic porphyrias; V. Porphyria and environment; VI. Diagnosis of lead poisoning; VII. Therapy of lead poisoning; VIII. Porphyria and tumors; IX. Erythropoietic protoporphyria; X. Porphyrin, heme and iron transport; XI. Quality control in porphyrin laboratories; XII. General discussion and conclusion. The first ten topics listed above constituted the ten sessions along with contributed papers listed in the table of contents of the proceedings. In general the papers appear to represent original research presented in the format of scientific papers and supported generously with references. In summary this volume includes clinical considerations relative to heme metabolism, acute and chronic hepatic porphyria, the diagnosis and therapy of lead intoxication, the environment and porphyria, porphyria and tumors, protoporphyria and the interaction of porphyrin, heme and iron transport. In this reviewer's opinion the volume would be a valuable addition to all health-related libraries and to the personal libraries of physicians, medical technologists, hematologists, pathologists, clinical toxicologists and other clinicians who wish to know more about

porphyrias and lead intoxication.

Samuel T. Coker
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"BIOLOGICAL IMPLICATIONS OF METALS IN THE ENVIRONMENT."
Drucker, H. and Wildung, R.E. (Chairmen). Tech. Information
Center, U.S. Dept. Energy. Energy Res. Devt. Admin., USDC,
Springfield, VA. ix + 1-682, figs. and tabs.; 1977. \$10.50.

This volume represents the Proceedings of the 15th Annual
Hanford Life Sciences Symposium, Richland, Wash., 29 Sept.-1 Oct.,
1975. Metal behavior, microbiology and speciation in soils,
sediments and water, and the effects of metals on plants,
animals and man are subjects of discussion. 49 papers are included
in 5 categories: biochemistry of metal transformation, form and
distribution of metals in soil, etc.; the form and distribution
of metals in plants and in animals; and implications for man and
the environment. Chapters of special botanical interest are:
HANDY, M.K.: Effect of mercury on bacteria; protection and
transmethylation. - pp. 2035; TIFFIN, L.O.: The form and
distribution of metals in plants: an overview. - pp.315-334.
-ELDER, J.F.: Iron uptake by freshwater algae and its diel
variation. - pp.346-357. - and others.

G M H

"ENTWICKLUNG DER HYPERTONIE-MORTALITÄT UND DES ANTIHYPERTENSIV-
VERBRAUCHS IN DER SCHWEIZ," by Martin Escher (Pfyn). XI + 106 pp.,
27 figs., 31 tabs. Springer-Verlag Berlin Heidelberg New York.
1977. DM 24,-- (appr. US \$12.00).

This work on epidemiology of hypertension mortality rate^s presents
data on the incidence of such deaths in Switzerland and the use
of antihypertensive medication there. It was thought that due to
the wide occurrence of high blood pressure and its significance
for cardiovascular diseases and cerebral vascular disease complications,
the study might well show how effective anti-hypertensive
treatment is. In Switzerland, deaths from hypertension have fallen
appreciably during the last two decades, thus ca 33% from 1951-
68 and ca 33% from 1969-74; also deaths from cerebrovascular
accidents (strokes). These changes coincided with increasing use
of antihypertensive drugs, indicating a causal relationship. With
only 28 pages of text, much more than half the text consists of
tables and figures. All is in German except for one page each of
English and French summaries.

G M H

"HANDBOOK OF THE BIOLOGY OF AGING," edited by Caleb E. Finch and Leonard Hayflick. xvi + 771 pp., 198 figs., 160 tabs. Van Nostrand Reinhold Company, New York, Atlanta, etc. 1977. \$33.50.

This is one of three volumes of "The Handbooks of Aging", the other two being sub-entitled "Handbook of the Psychology of Aging" and "Handbook of Aging and the Social Sciences." They are subtitled "Critical comprehensive reviews of research knowledge, theories, concepts, and issues." In the volume under review, the writings of 36 authorities (including the two editors) have been assembled to represent the best possible opinion on the process of aging in humans at molecular, cellular, physiological, and organismic levels. Included are data on molecular genetics, metabolism, cell division, and cell longevity in the living organism. Changes in the various tissues, organs, and systems of the body are explored in some depth. Examined are pathobiology, abnormal cell growth, nutrition, life table modification and life prolongation, systems integration, and aging as it affects the functioning of the gastrointestinal system. With the populations in America and other advanced countries of the world showing greater and greater percentages of older people, say beyond 65 years, there is a proportional increase in the subjects of gerontology and geriatrics. Unless we die young, all of us will have to come to this stage of our life and we are therefore interested to a greater or lesser degree in what this book is all about. The text is divided into five parts: 1) Introductory 2) Molecular level 3) Cellular level 4) Tissue and organ level 5) Whole animal (organismic) level. There are author and subject indexes. In using the index, it is necessary to determine the main subject matter of one's interest and look under this; there are generally several sub-topics. For instance, one would find nothing under "hyperthyroidism" but under "Thyroid", there are eleven subjects including hyperthyroidism. The penultimate chapter is made up entirely of tables on many various values as affected in the process of aging, f.i., the glycogen contents of the CNS of the rat at different ages. This book should be in every medical library, of course, but will also fit into libraries devoted to biology, pharmacy, and other subjects.

G M H

"ENZYMES IN ANESTHESIOLOGY," Foldes, F.F. (editor) with contributions by Aszolos, A.A.; Foldes, F.F.; Mark, L.C.; Ngai, S.H.; Patterson, R.W.; Perel, J.M.; Sullivan, S.F.; Triner, L.; Zsigmond, E.K. XIX, 368 pages, 34 figs, 18 tables, 1978. Springer-Verlag, Berlin-Heidelberg-New York. Cloth DM 78,--. US \$39.00.

With its coverage of basic principles of enzymology followed by detailed descriptions of specific enzymes, this book becomes a practically effective, complete in itself, reference in clinical

anesthesiology and a useful reference, also, for those with academic and research interest in this area of applied biochemistry. The self-sufficiency of the volume is apparent also at chapter level. Under the heading of "Basic Considerations", the first seven chapters review the essential principles of enzyme function, characterization, and classification. The second and remaining major division treats with specific enzymes and enzyme groups involved in anesthesiology, this coverage comprising chapters eight through thirteen. Reference listing is good for each chapter and for those chapters dealing with specific enzymes approaches the exhaustive. The complexities of the anesthetic management of surgical patients emphasize the importance of an understanding of the interactions of anesthetic agent and adjunctive pharmacologic materials with the biologic systems which alter their manifestations. The book should serve as a practically useful handbook and as an effective reference for the practicing anesthesiologist and those in supporting areas.

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"A HANDBOOK FOR THE TECHNICAL AND SCIENTIFIC SECRETARY" by Freedman, George. xiv + 300 pp., 58 figs., 38 tabs. Dover Publications, Inc., 180 Varick St., New York 10014. 1974 (1967). \$3.50.

This is a very useful guide for a secretary working for a man or woman in the sciences or engineering, and (what is important) was written by a man who has constant need of the services of a secretary (he lists the given names of 22 he has employed over the last 20 years!). The chief division^s of subject matter are chemistry, mathematics, physics, electricity and electronics, with elementary explanations of many terms in these fields. Part II is a glossary of scientific and engineering terms, along with abbreviations, prefixes, suffixes, alphabets (Greek, Hebrew, Russian), surnames, the elements, and index.

G M H

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"VERGIFTUNGEN: ERKENNUNG, VERHÜTUNG UND BEHANDLUNG" Editors: R. Frey, M. Halmágyi, K. Lang, and P. Oettel. Anaesthesiology and Resuscitation No. 45: XX + 173 pp., 43 figs.; 1970. Springer-Verlag, 1 Berlin 33, Germany (Heidelberg; New York). \$5.50/DM 19,80.

This brochure (with limp cloth cover) reports on the Symposium held at Mainz, Germany, on 11-12 October, 1968, which as the title states was concerned with poisoning and its recognition, prevention, and treatment. Complete presentations are given of some of the

speeches, only a summary or abstract is presented in other instances. A list of 72 persons is given, representing those giving reports and also those who took part in the discussion following. The program was international in scope, with Europeans, east and west, and Americans participating in the consideration of this very important topic. All of the presentations are in German except for two in English. There are 3 chief divisions in the text: (1) Chemical and toxicological bases; (2) Clinical experiences with adults and children, also with alcoholics; and (3) Organization of poison centers (in German "detoxifying centers").

G M H

"PHARMAKOKINETIK: EINE EINFUEHRUNG" . Gladtké, E. and Hattinberg, H.M. von. Springer-Verlag Berlin, Heidelberg, New York. XII + 148 pp., 69 figs., 13 tabs.; 1973. Flexible cloth: DM 19,80; US \$7.00.

Dr. Gladtké of the University of Cologne's Childrens' Clinic and Dr. von Hattinberg of the Childrens' Clinic of the Justus Liebig University of Giessen have joined with Drs. W. von Kuebler and W. H. Wagner in the preparation of this little book (Buechlein) forming an introduction to the field of pharmacokinetics. It is not a textbook or a reference work or an exhaustive treatise; rather it is a simplified treatment for the starting student. The text is based on an introductory course at the University of Munich Childrens' Clinic conducted ca 1970. The formation and perfectioning of the field of pharmacokinetics requires a precise knowledge of higher mathematics; however, for an understanding and practical application of pharmacokinetic procedures, such knowledge is not a necessity. Hence, in this book the authors have been able to describe the essential bases of this new branch of science as clearly as necessary with the elimination of most of the difficult mathematical content. Professor Kuebler wrote up the chapter on the kinetics of intestinal resorption, while Professor Wagner discussed the use of digital computation. Developments of recent years have shown how important the pharmacokinetic framework is to medicine, biology, and pharmacy, as had been foreseen by the pioneer in this field, Dr. Friedrich H. Dost. This presentation is intended as a starter to stimulate the thought of practitioners in this new and very important area of pharmacy/medicine. Among the ten chapters are some on distribution volumes, elimination, steady states, and programmed procedures for pharmacokinetics. This work should do its bit in making the use of medicine more effective and safer for the patient.

G M H

"LIVING FORESTS." Gohl, Heinrich (photos) and Krebs, E. (text). Kaye & Ward (England) and Oxford University Press, 200 Madison Ave., New York 10016. 208 pp., 82 pls. (20 black and white; 62 colored); 1975. \$25.00.

This truly splendid volume of striking and beautiful pictures balanced with an excellent textual commentary must be considered one of the finest books about trees ever published. The illustrations were printed in Switzerland, a country reputed to have the best color printing facilities, and the text was printed in England. The printing itself is worthy of praise: highly legible and of large size, it will appeal not only to those with poor sight but also to those who may have to read in a dim light. While the volume is neither a textbook nor a reference work, it must surely be classified as an inspirational or pleasure-giving book with educational overtones; reading and viewing the fine illustrations must give any person a feeling of admiration, awe, wonder, yes even surprise at the majesty and beauty of Nature. In this way, it will serve well those who wish us to be more considerate of the environment ("ecology") and who would wish to preserve the natural wild areas of the world for the benefit of the humans that will follow us. This theme is followed by the text writer, who speaks with reverence of the forest and of its history, and he endeavours to show what happens when it is destroyed. One third of the land's surface is covered by forests with 10,000 species in the wet tropics alone. The importance of the forest in retaining moisture and thus indirectly reducing the hazard of that great enemy fire, in preventing soil erosion, in reducing the onslaught of noise, in serving as a refuge for wild life of all kinds, in providing a refuge for all of us at times, these and other important values are brought out. Dr. Krebs writes from a long background of activity in the forests since he was formerly head forester of Zuerich Canton in Switzerland. Mr. Gohl is internationally famous in his photographic skills. Unfortunately there is no index and the table of contents in front is general and without detail. Such might well have been provided for greater facility in using the book.

G M H

"HIGH BLOOD PRESSURE, A CURRENT SITUATION INVENTORY ("HOHER BLUTDRUCK. EINE AKTUELLE BESTANDSAUFNAHME."), Edited by R. Gotzen and F.W. Lohmann. V + 138 pp., 65 figs., 40 tabs. Springer-Verlag Berlin, Heidelberg, New York. 1979. DM 28,--; US \$15.40.

This book presents a current overview of the disease (or disorder) of high blood pressure (hypertension), one of the most important risk factors of cardiovascular disease (CVD). The epidemiology, pathogenesis, diagnosis, clinical study, and therapy of arterial

hypertony (hypertension) are reviewed in the two main sections of the text (12 chapters). The various papers on clinical practice are based on our current scientific knowledge. Given are both a critical evaluation of methods of measuring hypertension and a technical description of a rational high blood pressure diagnosis. In line with its significance, the medical treatment of hypertension is given a considerable amount of space. The newer possibilities of drug therapy are described, thus, for instance, the current popular use of B-receptor blockers (B-1 the most valuable, B-2 undesirable or even negative). One of the most used of these agents is propranolol. With about 20% of the population of the advanced countries having hypertension, it must be obvious to anyone how serious and important the problem becomes. - All of the text of the volume is in German and there is not the commonly seen summary in English. The text is reproduced from papers presented at an International Symposium held in Berlin in 1978. The 19 authors include the two editors, who are teachers and physicians in Berlin.

G M H

"ABREGE DE BOTANIQUE A L'USAGE DES ETUDIANTS EN PHARMACIE".

3rd Edition. Guignard, J.L., Masson S.A., 120 Blvd. St. Germain, Paris. xiii + 1-258, 149 figs; 1977.

This outline of botany represents actually an introduction to materia medica (pharmacognosy) and deals almost entirely with the classification of plants. The principal families of the vegetable kingdom have been considered with a strong emphasis on establishing their relationships and order of development, thus furnishing a kind of network upon which the less important families can be fitted into their place. To avoid confusion, the principal characters of the plants are shown and the less important disregarded. The course of evolution is made more emphatic in the use of the term and concept "embranchement" (branch) and "sous-embranchement" (sub-branching). Wherever possible, generalizations are presented. However, at the same time, practical matters are brought in with special reference to constituents and uses of medical/pharmaceutical importance. The illustrations (many of them original) are of various types: some are schemes, others diagrams, still others illustrative of the growth habit of the plant, these latter permitting the student to visualize the various groups studied. The book study should be combined with studies of herbarium specimens of the plant as well as study of plants in field and laboratory. Floral diagrams and diagrammed life cycles have been freely used and these while a bit old fashioned are still of much value in rousing the student's interest at the same time as being an important aid to memory. The Englerian order is used. A single short chapter gives general ideas on plant distribution. Although this summary text is designed for students of pharmacy, it will no doubt also be

of more general interest, even to the layman.

G M H

"HAGERS HANDBUCH DER PHARMAZEUTISCHEN PRAXIS," edited by P.H. List and L. Hoerhammer. 4th edition (completely revised). Vol. VI. *Chemikalien und Drogen*, Teil C: T - Z. XII + 582 pp., 18 figs., 19 tabs. Bound: 1979. DM 160,--; US \$88.00 (subject to change).

This volume completes the text portion of Hagers Handbook of Pharmaceutical Practice. Volume I contained the general portion of the text and active groups part I. Volume II was made up of Active groups II and the first part of the systematic text on chemicals and drugs, with monographs arranged in alphabetic order, A to AL. Volume II covered monographs beginning with the letters AM to CH, Vol. IV CI to G, Volume V with items from H to M. Volume VI included drugs and chemicals through the balance of the alphabet: Part A for the letters N to Q, B for R and S, and C from T to Z. Volume VII (published in 1971 and 1977) is devoted to medicinal dispensing forms and adjuvants, with two volumes A and B. All that now remains is volume VIII, which will be a general index to all the volumes of the Handbuch** Volume VI-C follows the pattern of the earlier volumes of the series. In it will be found important intermingled with the less important drugs and chemicals. Some of the outstanding drugs monographed in this volume are: Tamarindus, Taraxacum, Terminalia, Teucrium, Theobroma, Theophyllinum, Thevetia, Thymus, Throglobulin, Toxicodendrum (not Toxicodendron, poison ivy, etc.), Trifolium, Trigonella (with T. foenum-graecum: note hyphenization of specific name), Tussilago, Urginea, Urtica, Vaccinium, Valeriana, Vanilla, Veratrum, Verbascum, Vinca, Vinum (wine), Viola, Vitex, Xanthium, Yucca, Zanthoxylum, Zincum (with many salts), and Zingiber. The text as in other volumes is clear, concise, accurate, timely, and well provided with references. Entries with cross references are largely avoided, no doubt to be better taken care of with a comprehensive general index. (Thus, there is no entry for Tapioca). ** With the index to cover all of the contents of the many monographs, this Handbook will provide most of the answers to literature searches on thousands of drugs and chemicals.

G M H

"BOTANISTS OF THE EUCALYPTS: SHORT BIOGRAPHIES OF PEOPLE WHO HAVE NAMED EUCALYPTS, WHOSE NAMES HAVE BEEN GIVEN TO SPECIES, OR WHO HAVE COLLECTED TYPE MATERIAL". Hall, N. Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia. v + 160 pp., 8 potraits. 1978. \$7.50 (Austral).

Several hundred botanists and plant collectors are included in this

biographic directory, most living in Australia. The vital data (birth and death dates), career high points, and botanical activities are outlined, as well as the taxa of Eucalyptus which have some association with the person (as indicated in the title). The notes are arranged alphabetically by person's name in two series: (1) where species was validly published or person credited with collection of type material, and (2) where species were not validly published or where doubts exist as to the plant material which they collected. The names are listed in Appendix 1. Appendix 2 is a very useful one, since it gives a list of Eucalyptus species with authors, dates of publication, and reference to persons in the biographical section.

G M H

"CHEROKEE PLANTS AND THEIR USES-A 400 YEAR HISTORY". Hamel, Paul B. and Chiltoskey, Mary U.-Herald Publishing Co. Sylvania, North Carolina. pp. 1-74, 14 figs.; 1976.

Much information is included on plant usage among the Cherokee Indians from the 16th Century up to the present (introductory section first 20 pages). Most of the pamphlet is taken up by a listing , in alphabetic order, of their English common names telling of the specific uses of the plant in treating diseases, as food, etc. About 400 plants are included. Bibliography and index. The information conveyed in this book was obtained directly from the Indian natives who have lived for centuries in this area and have had the medical and other lore passed on to them from generation to generation.

G M H

"BIOLOGY: ITS PRINCIPLES AND IMPLICATIONS," by Garrett Hardin and Carl Bajema. Third edition. x + 790 pp., 404 figs. (342 in color), many tabs. and "boxes". W.H. Freeman & Company, San Francisco, Cal. 94104. 1978. \$18.95.

Most of the 45 chapters of this attractive cloth bound volume have at their end a series of questions and problems, readings, and Scientific American offprints. These study helps greatly increase the teaching value of the volume, which is intended as a beginning text in college biology courses. The general arrangement of the text may be outlined as follows: (1) The cell (2) The organism (3) Ecology (4) evolution and the diversity of species (in this part, most of the information on plants and animals is included) (5) Human anatomy and physiology (6) Heredity (7) Human evolution and the future. Nine appendices follow with information on various fixed constants, etc., much in tabular form. Relatively much emphasis

placed in the volume on the human being is a feature which should make the textbook more interesting to an average student. The authors have recognized the five kingdoms instead of the usual two or three: Animalia; Planta; Fungi; Protista; Monera (including the Cyanophyta and Schizomycophyta, generally placed among the Algae and Protista, respectively). The viruses are not included among any of the five kingdoms but are placed separately as "half-armed" living organisms since not possessing all of the attributes of life. This seems to be a return from the view of a few years ago that viruses were only large molecules with a nucleic acid-reproducing mechanism. On the whole, this volume appears to be a superior text for college and university level students.

G M H

"SITKA SPRUCE - A BIBLIOGRAPHY WITH ABSTRACTS". Harris, A.S. and Ruth, R.H. U.S. Dept. Agr. Forest Serv. Res. Pap. PNW-105: iii 251 pp.; 1970. (Gratis).

The world literature on Picea sitchensis (Bong.) Carr. is covered, with 1,741 references. While some of these are simply titles, many bear abstracts. The references are arranged in the alphabetic order of the authors; there is a subject index and also a list of botanical names matching the common English names used in some references. This bibliography covers all aspects of the plant, such as taxonomy, chemistry, genetics, silvics, insect and fungal pests, physiology, etc.

G M H

"COSMETICOLOGY. Being the 6th edition of "The Principles and practice of Modern Cosmetics." Volume I. by Harry, Ralph G. Chemical Publishing Company, Inc., 155 W. 19th St., New York City 10011. xxiv + 824 pp., 39 figs., 37 pls., 56 tabs. 1973. 1976 reprint. \$39.00.

The first edition of this work appeared in 1940, so that it has been in popular use for nearly 40 years, the original edition dating back before World War II (or US participation). This edition was revised by J. B. Wilkinson and colleagues. However, the title of Harry has been retained, with "Harry's Cosmetology" as short title. The coverage is very thorough including the physiology of the skin, nails, hair, teeth, etc., also the physical chemistry of emulsions, preservatives, surfactants, etc. Malfunctions of the body's parts, such as allergy, are also included in the treatment. It is truly a textbook and reference book of cosmetics and not simply a kind of formulary for cosmetic preparations as are the usual treatments of the subject. The hazards and dangers in use

of the various products are not sidestepped; an honest effort has been made so that the manufacturer can be warned and the health of the customer protected. The general order of topics proceeds from the skin and dermal preparations (creams, ointments, tonics, masks, powders, make-up preparations) to the nails (with manicure preparations), bath preparations, deodorants, antiperspirants, depilatories, foot preparations, insect repellants, sunscreen, suntan, and sunburn preparations. Then the hair is considered in detail, with chapters on shampoos, hair setting items, hair tonics, "colorants" ("rinses" in the idiom), permanent waving, etc. The teeth are studied in some detail and of course dentifrices and mouthwashes. Baby and teenager cosmetic problems come next. Shaving preparations, hair straighteners, humectants, antiseptics, preservatives, etc., with finally a chapter on manufacturing and mixing, packaging, etc. An appendix lists data on the many proprietary articles mentioned in the volume (composition; manufacturer). A rather adequate index complements the volume. This is truly a worthwhile book for manufacturer, pharmacist, and even some physicians.

G M H

"THE COLOR DICTIONARY OF FLOWERS AND PLANTS FOR HOME AND GARDEN," (Compact edition), by Roy Hay and Patrick M. Synge. 586 pp., 2048 col. pls. 1976. \$6.95.

In this very useful and colorful "dictionary", the colored photos, and A-Z descriptive text, and introductory pages are the same as were published in Great Britain under the title of "The dictionary of garden plants in colour, with house and greenhouse plants" (1969). The American title would seem an improvement over the English one. The excellent color plates are arranged six to the page and occupy a central position in the volume. They are arranged in the alphabetic order of the genera in eight sets according to habit as follows: alpine and rock garden plants, annuals and biennials, greenhouse and house plants, hardy bulbous plants, perennials, trees and shrubs (exclusive of the next two groups), climbers, and conifers. 32 pages of prefatory matter is followed by 344 pages of the figures with the dictionary portion occupying the final 208 pages. This last portion bears useful descriptions of all the plants illustrated arranged by the generic part of the scientific name, with cross entries of English common names. The entries also serve as an index to the illustrations. (The price is remarkably low considering that of the German version (translation) of 1971 which was DM 58,00 (approx. \$29.00)).

G M H

"DOBUTAMIN, EINE NEUE SYMPATHOMIMETISCHE SUBSTANZ - ANAESTHESIOLOGY AND INTENSIVE CARE MEDICINE - Vol. 118. XI + 81 pp., 56 figs. (partly in color), 8 tabs.; 1978. Springer-Verlag Berlin, Heidelberg, New York. Stitched, with flexible cloth cover. \$17.60, DM 32,--. (H. JUST, Editor)

Except for a chapter on its chemistry and pharmacology, this book is devoted entirely to the clinical experiences with the drug Dobutamine. Synthesized ca 1968 at the Lilly Research Laboratories in Indiana (USA), Dobutamin(e) represents a sympathomimetic catecholamine related of course to both isoproterenol (ISO) and dopamine (DOP), also norepinephrine (NE). It is used to increase the contractility of the heart in serious heart diseases where there is imminent death of the victim. All four compounds (DOB, DOP, ISO, NE) represent dihydroxy phenylethyl amines; DOB was engineered from the other compounds to give a compound more effective in treating cardiac pathologies. Cardiologists, internists, pharmacologists, surgeons, and anesthesiologists tested the drug under controlled conditions in the field of intensive care medicine and the drug appears to have fulfilled the established expectations. The drug is an inotropic agent, that is, it affects the force or energy of the contractions of the heart muscle, as distinct from the rate of contraction. A complete de-limitation from the other known sympathomimetic compounds in all areas of activity is till not possible, it is admitted. However, its high activity and in many instances its pronounced superiority over the other similar substances has been fully demonstrated. Only three papers are in English, the remaining six in German (the preface and introduction are also in German). There is a terminal summary in both English and German. Most of the authors are Germans with a few Englishmen and Americans participating. This book will be of interest to the same groups as participated in its writing.

G M H

"KONSTITUTION UND VORKOMMEN DER ORGANISCHEN PFLANZENSTOFFE (EXKLUSIVE ALKALOIDE). ERGAENZUNGSBAND I". W. Karrer, E. Cherbuliez, and C.H. Eugster. Birkhaeuser Verlag, Basel u. Stuttgart. 1-1038; 1977. sFr 328. (US \$133. ca).

This volume is supplemental to the main work (first edition published in 1958), the second edition of which appeared in 1976. The changes incorporated into this supplemental volume include those of the originator, Dr. Karrer (who died in 1961) plus those of the other co-authors. The first edition of the main volume covered the literature up to ca 1956, while the present supplement volume takes care of the literature up to the end of 1961. The reason for limiting the coverage to this five year period (1956-61)

was this: in order to retain and continue the historic character of the compilation (as in the main volume), it was not possible to include more of the literature if the volume were to be kept within its established size limitations (900-1000 pages). Also there has been a somewhat more comprehensive search of the literature than was possible to Dr. Karrer. The contents of the tome are made up of three chief parts: (1): additional data on the compounds covered in the main work, retaining the divisions and numeration of the same volume. (To facilitate the use of the supplementary volume, the synonyms which are given in the main work are retained even when they may be out of date.) This section bears data for many but not all compounds in the main work (#2-2669). (2): Newly discovered compounds, numbered from # 3001 to 4754. This means that in the main work and in the supplement there is a total of 4424 compounds. Actually there are more than this number since two or more isomers or analogs are sometimes placed under the same one number; thus, hexadecane is #6, while heptadecane is 6a and nonadecane 6b. (3): The important indexes: (a) plants and plant products (botanical scientific names; common names of plants and plant products); (b) chemical compounds. As in the main volume, the compounds are arranged in the same general order: (1) aliphatic, including hydrocarbons, alcohols, epoxides, carbonyl compounds, etc.; (2) compounds with aliphatically bound sulfur (but no amino acids), (3) polyols (sugar alcohols); (4) amino acids and peptides; (5) terpenes and terpenoids (but no gibberellins); (6) other alicyclic compounds (except quinones); (7) other aromatic compounds (8) quinones; (9) other heterocycles (except those of No. 10); (10) nucleosides and nucleotides (heterocyclic nuclear N glycosides with or without phosphoric acid ester groups in the sugar moiety). At the beginning of the systematic treatment appears a list of about 150 journals (with abbreviations), representing the chief source of the data of the volume. This work will provide very important information to a large variety of specialist scientists interested in the composition of plants, including botanists, chemists (especially phytochemists), biochemists, pharmacognosists, pharmacologists, and others. While the book is not cheap (Swiss francs 328), yet it has so much to offer and effectively supplants so many other books with fragmentary coverage, that it is very definitely worth the price.

G M H

"URIC ACID." VOL. 51 OF 'HANDBOOK OF EXPERIMENTAL PHARMACOLOGY' (Continuation of 'Handbuch der experimentellen Pharmakologie'). W.N. Kelley and I.M. Weiner (Editors). Springer-Verlag Berlin-Heidelberg-New York. XXII + 639 pp., 114 figs., 53 tabs.; 1978. DM 290,--; US \$156.00 (fluctuates)

This well-made volume, all in the English language, is a compilation

of 23 chapters written by 27 specialists, mostly of the United States but also including persons from France, Canada, Switzerland, Australia, and Japan. Most of the chapters are by a single author. The editors are both American; they did not author any of the chapters. The work deals with uric acid diathesis, a predisposition of the body to collect uric acid and urates in the body tissues, producing such undesirable states as gout, diabetes, etc. Chapters 1 to 7 describe the chemistry and synthesis of this waste product, the regulation of the biosynthesis, the diseases which result from abnormalities in the metabolic processing, and the effects of various intermediates and end products on other metabolic processes. Chapters 8 to 12 are concerned with mechanisms of elimination of uric acid from the body in both lower animals (non-mammalian vertebrates; non-human mammals) and in man; this involves detailed consideration of the biochemistry and physiology of the compound. (Considerable amounts of uric acid are excreted in the gastrointestinal tract (including the saliva), in the breath, etc.). Chapters 13-19 review the factors causative of diseases produced in the human body by uric acid, particularly in the joints (gouty arthritis) and kidneys (nephrolithiasis, urate nephropathy). Finally chapters 20 to 23 occupy themselves with therapeutic controls available in treating gout, with basic discussions of the chemistry and pharmacology involved. Included are the uricosuric drugs (as probenecid), inhibitors of urate synthesis (as allopurinol), enzymic uricolysis agents (urate oxidase), and miscellaneous agents (such as colchicine, indomethacin, fenoprofen, etc.). Bibliographies will be found at chapter's end. There are complete author and subject indexes. A considerable number of abbreviations appears throughout the text and this may occasionally cause confusion or interrupted understanding of one's reading. It might be well therefore to include a table of abbreviations inserted in a convenient place at front or back to aid in the effective use of such a volume. This book is undoubtedly important in achieving better knowledge and eventually control over this pervasive compound, uric acid, which has caused so much suffering at least discomfort in human beings.

G M H

"20 JAHRE FLUOTHANE"- ANAESTHESIOLOGIE UND INTENSIVMEDIZIN No. 109. E. Kirchner (Editor). Springer-Verlag Berlin (etc.) XVIII + 343 pp., 56 tabs., 151 figs.; 1978. Price DM 58,--; US \$29.00.

Fluothane, 2-brom-2chloro-1,1,1-trifluorethane (international generic name: Halothane) was first used as an anesthetic on a human being in 1956. This volume reports on a series of papers presented at a Symposium held at Hanover, BRD. (in 1976-7) what the current opinions and information on this agent are. A list

of 90 chairmen and reviewers is given in front. 42 papers detail the history, action, biotransformations, physiology, biochemistry, toxicology, clinical use in various branches of surgery, effects on various organs and systems and in different age groups, etc. The entire issue is in German except for 2 papers in English, (one of these by M. Johnstone (the first person to use Halothane clinically)). A long summary in English parallels one in the German language. Halothane (or Fluothane) in a short time after its introduction became the most popular general anesthetic in use, soon supplanting both chloroform and ether, which had been in use for over a century. It is generally considered the safest and most pleasant to the patient of all anesthetics available. There is a subject index.

G M H

"BACK TO EDEN, A HUMAN INTEREST STORY OF HEALTH AND RESTORATION TO BE FOUND IN HERB, ROOT, AND BARK," by Jethro Kloss. XIII + 684 pp., figs., portrait. Benedict Lust Publications, P.O. Box 404, New York 10016. 1977. \$2.95.

This book of popular medicine, originally published at \$7.95 (see review in *Phytologia* 29:433; 1975) has been reprinted again. It represents the holistic medical approach with emphasis on hygienic living and herbal medicine. In the first chapter, Kloss, a native of Wisconsin, claims to have recovered his health by following the principles which he expounds in this book. (See also pages 457 to 468).

G M H

"THE CHEMISTRY OF THE BIGUANIDES," by F. Kurzer and E.D. Pitchfork. Fortschritte der Chemischen Forschung (Topics in Current Chemistry) Vol. 10: No. 3: 375-472 (98 pp.); 1 fig., 13 tabs.; 1968. Springer-Verlag Berlin. DM 34,-- (US\$18.00).

This brochure concerns a series of compounds which have been synthesized over the years. This is more than an exercise in chemical syntheses, since these compounds have received usage in medical treatments in a variety of ways - antimalarial; oral hypoglycemic (antidiabetics); tumor inhibiting; antibacterial; tuberculostatic; antiviral; trypanosomicide; fungicide; etc. In addition, many industrial uses have been discovered, in the most diverse fields. This monograph is devoted to the synthesis of biguanide and its numerous substituted compounds, together with a full expose of its physical and chemical properties. 763 references are listed in the alphabetic order of authors.

G M H

"DIE PHARMAZEUTISCHE VORPRUEFUNG IN FRAGEN UND ANTWORTEN".
by Dr. Walter Lang; originated by Walther Zimmerman'. Ed. 6. -
264 pp. Deutscher Apotheker-Verlag, Postfach 40, Stuttgart 1,
Germany. Cloth bound. 8° (small) DM. 12.80.(ca 1970)

This collection of information on the fields of pharmacy is a catechism, with brief questions followed by quite informative answers. There are eight (8) sections to the series: Chemistry 8-18. - Inorganic Chemistry 19-70. - Organic Chemistry 71-114. - Botany 115-188. - Pharmacognosy 189-231. - Physics 232-243. - Jurisprudence 244-256. - Homeopathy 257-264. The last entry is the only one which would have little interest in the United States, since homeopathy has here for all purposes almost vanished as a practice of medicine. There is no table of contents and no index to the volume, a fact which frustrates the would-be student until he makes his own index in the way presented above. The questions are numbered, and come out evenly in each section. Thus the chapter on Chemistry has 50 questions, that on Inorganic chemistry 300, and so on. (One exception: Pharmacognosy with 294 Q. and A.). There is a total of 994 questions and answers, with botany leading with over half of these, vix., 500. The text is simple and direct. A sample may illustrate this: Ques. How do the annual rings (in a stem) arise? Ans. Annual rings are formed every year from the early wide (spring wood) and the later narrow (fall wood) vessels. This sort of "quiz compend" used to be popular in the USA, but it has been some time since this reviewer has seen one. Most students apparently would rather have a condensed textual review, apparently, without the somewhat mechanical dialogue of question-answer. However, it might really be useful to elementary students to have study books of this type, with the obvious benefit of emphasizing certain points more strongly than would be done otherwise.

G M H

"SHORT COURSE IN BIOCHEMISTRY". (John Hopkins Univ., Maryland)
by Albert L. Lehninger. Worth Publishers, Inc., 444 Park Ave.
S., New York 10016. XLIV + 421 pp., many figs. and tabs; 1973.
\$12.95.

The series of 23 chapters, representing the same number of lectures or discussion periods, is arranged in a logical sequence. Part 1 is descriptive of the chemical compounds concerned in biochemical processes (biomolecules) including water, amino acids, proteins, enzymes, carbohydrates, lipids, nucleic acid derivatives, vitamins, and coenzymes. Part 2 deals with features of catabolism and the generation of energy through the AT phosphate cycle. Part 3 is concerned with biosynthesis (anabolism) and the utilization of energy derived from phosphate bonds. (Includes a special chapter

on mam^{al}ian biochemistry (nutrition, metabolism)). Part 4 deals with the mechanics of transmission of genetic information, as this has been worked out chemically. At the end of each chapter are a summary, references, and series of problems (answers in back of book). Glossary and index terminate this attractive volume which endeavors to make the subject a dynamic and hence interesting one for the student.

G M H

"RANCHO SANTA ANA BOTANIC GARDEN-THE FIRST FIFTY YEARS, 1927-1977," by Lee W. Lenz. vii + 157 pp., 32 fig. Aliso Vol. 9 (No. 1): 1977. \$5.00.

This issue of Aliso in an ornamental dull gold cover is an historical account of the famous native plant garden of Claremont, near Los Angeles, California. It furnishes an intimate and interesting story of the beginnings of the Garden, as conceived in the mind of Mrs. Susanna Bixby Bryant. Originally located in Orange County, it was moved in 1950 to Los Angeles County, becoming associated with Claremont College. Much information is given on the personnel, library, herbarium, and other important resources of the Garden. Much of the history is given in the form of letters of various individuals which are quoted verbatim. Appended is a list of individuals graduating with the Ph.D. in Botany in whose program of studies the Garden participated. There is also a descriptive list of plants introduced 1953-77. A map to demonstrate the original and later position of the Garden would have been useful. The index is of value, but there is no entry for Dr. Munz, who served the Garden and before that Pomona College for 44 years, as Director of the Garden from 1946 to 1960 and active as Director Emeritus until his death in 1974.

G M H

"THERAPEUTICS," by J.G. Lewis. VI + 297 pp., 5 figs., 21 tabs. PSG Publishing Company, Inc., 545 Great Road, Littleton, Mass. 01460. Ed. 3. 1978. \$14.00.

This small but richly concentrated volume presents the essential facts on pharmacology and is useful as a learning aid to medical and nursing students, as well as those studying or practicing in the fields of pharmacy, dentistry, veterinary medicine, etc. It should be of particular value for those reviewing for state boards in the health sciences. The subject topics and order are: antimicrobials, drugs for the mycobacteria, chemotherapy otherwise, antiprotozoal drugs, anthelmintics, immune products, cytotoxic therapy, allergy and inflammation remedies, corticosteroids, diuretics, analgesics, drugs acting on the autonomic and central

nervous systems, drug overdose and poisoning, anticoagulants and coagulants, cardiovascular drugs, respiratory tract agents, alimentary canal agents, renal diseases, blood alterations, vitamins, diabetes, obesity, endocrine disorders, sex hormones, infusions and transfusions, antiarthritics, metabolic agents, and adverse drug reactions. Valuable information of miscellaneous type is appended, with several indexes. An excellent book of modern pharmacology!

G M H

"FLORA OF TAIWAN. V. ANGIOSPERMAE-MONOCOTYLEDONEAE." H.L. Li, T.S. Liu, T.C. Huang, T. Koyama, and C.E. DeVol (Eds.). Epoch Publishing Company, Taipei (Taiwan): XIII + 1166 pp., 389 figs.; 1978.

This, the last textual volume of the "Flora of Taiwan", represents the largest volume of the set, with 150 pages more than the third volume, originally planned to be the largest volume. There are 16 contributors, including the five editors, all being oriental with the exception of Dr. DeVol, who has lived in Taiwan for many years. Since DeVol is co-author of only the section on family Juncaceae (with only 9 pages), the authorship of the volume is predominantly oriental (Chinese with one Japanese, T. Koyama). Like any other flora, there are successive keys to the families, genera, and species (where more than one), with descriptions of intermediate length, synonymy, the Chinese common names (in Chinese characters, not transliterated), habitats and distribution both in Taiwan and outside it, with citation of herbarium specimens to better indicate distribution. There are frequent discussions, in which such matters as chromosome number, relationships to other spp., and uses are brought up. There is one illustration or more for each genus described i.e., found in Taiwan, and these are useful in elucidating the structure of the plant. There are 38 families taken up: the largest are the Gramineae with 412 pages, Orchidaceae (280 pp.), Cyperaceae (183 pp.), and Liliaceae (45 pp.). The Englerian order is generally followed, although the position of the Monocots is of course exceptional. There are many novelties, including two new species: Juncus ohwianus Kao (similar to J. canadensis) and Zingiber koshunensis Hayata ex Moo (compared with Z. kawagoi Hayata). There are two new varieties, 24 new combinations, and 28 taxa given a new status, thus for instance Smilax discotis subsp. concolor (Norton) T. Koyama (S.d. var. c.). The volume is an attractive addition to the library shelf and is moderately priced at US \$44.00. Volume VI yet to be published will supplement the other five volumes by supplying the bibliography, general index to the whole series, and a check list for the Flora. It will also contain additions and corrections to the preceding volumes.

G M H

"KOMPENDIUM DER ALLGEMEINEN BIOLOGIE". E. Libbert (Editor).
VEB Gustav Fischer Verlag, Jena, Germany. 1-474; 1977. [Ed. 2.]

This textbook of general biology fills a gap in the German language literature which seems rather deficient in books in this field. The five authors (including the editor) shared the task of writing the 12 chapters, which are devoted to general treatment (living systems, the cell, chemical bases of living matter, genetics, reproduction, irritability, motion, evolution, relations to the environment).

G M H

"CARCINOGENIC HORMONES," Edited by C.H. Lingeman. Recent Results in Cancer Research, Vol. 66: XI + 196 pp., 156 figs., 24 tabs. Springer-Verlag, Berlin, Heidelberg, New York, N.Y. 1979. DM 78,--; US \$42.90.

The nine authors of this volume, including the editor, are all Americans. Of these, five (including the editor) are with the U.S. Armed Forces Institute of Pathology. The authorship includes specialists in cancer, medicine, veterinary medicine, and agriculture. For many years now, it has been popular to administer male and female hormones to members of both sexes and for a variety of reasons. This usage has accelerated with the increasing supply of the synthetic compounds and a great reduction in prices. A history of adverse reactions has been accumulating in medical records. One of the most serious of these has been cancer and other neoplasias. In this volume the potentials of hormones and hormonomimetic compounds in the development of neoplasms is demonstrated, chiefly through the medium of microphotographs of malignant tissues. There are chapters on the pathologic effects of oral contraceptives: Neoplasia of the liver produced by contraceptives and anabolic steroids, mammary neoplasia in animals resulting from contraceptive steroids (H.W. Casey, R. C. Giles, and R.P. Kwapien) and cancer and other lesions in mice receiving estrogen. It is clear that estrogens, progestins, and androgens are suspect.

G M H

"ATLAS OF UNITED STATES TREES." E.L. Little, Jr.-Vol. 4 Minor Eastern Hardwoods. U.S. Dept. Agr., For. Serv. Misc. Publ. No. 1342: v, 1-17, 230 maps (s.p., total 257 pp; oversize). 1977. \$8.75.

This atlas shows the natural distribution (range) of native hardwood (=Angiosperm) tree spp. growing in the eastern USA. Each of the 166 spp. is assigned a large county map of the USA, with the

ranges shown in a rich reddish brown color. The area covered extends from Maine to Florida and from North Dakota to Texas and all the area between, covering 37 states. When the range of the plant extends westwards beyond the range noted, a map of North America is used to show the area covered. Tree spp. are not shown which are primarily native to western states and extend only into the 6 marginal states from No. Dakota to Texas. The ranges of these trees are shown in volume 3 of this series. Because of the well known difficulty of classification of the hawthorns (Crataegus spp.) this group of plants has not been included. Also omitted are the tropical trees of southern Florida: these are the subject of the fifth and last volume of the Atlas. The tropical trees of Puerto Rico and Hawaii have been excluded from all numbers of the Atlas. Range extensions into Canada and Mexico have been indicated. 23 species with local distribution are of special interest. One of these, Franklinia alatamaha is now extinct and known only in cultivation. Another, Betula uber, may be extinct and the trees known by this name actually hybrids. Of the remaining, nine are classed as threatened, three as endangered, and the other nine as rare and local. Since there are 89 species of important hardwoods of the East shown in volume I of the Atlas and some 30 species of western hardwoods extending into the east and taken up in volume 3, this gives a total of eastern trees featured in the Atlas as about 285--however with the exclusions noted earlier. The ranges of the various species have been very carefully plotted and are based on many different sources, including herbarium specimens, the literature, field studies, and discussions with botanists. (The range shown for Aralia spinosa falls short of southern New York state; however, the reviewer has observed this species in the Bronx Park, N.Y. Botanical Garden, growing wild). Making the Atlas easier to use is the arrangement of species by the alphabetic order of the generic names. The mode of use of the volume and much background information of utility is given in good detail at the front of the book. Some valuable suggestions for programs of tree mapping in the future are brought forward. Dr. Little, the author and compiler, who has just recently retired, is deserving of much respect and sincere gratitude for the splendid service he has rendered in this and his other works of similar nature. Through his industry and intelligence, he has done a great deal to bring light to our knowledge of the trees of the western hemisphere.

G M H

"THE NURSE'S DRUG HANDBOOK." Suzanne Loeb1 and others. John Wiley & Sons, NYC, London, Sydney, Toronto. xi + 803 pp., 33 tabs., 1 fig.; 1977. \$11.95.

This book consists of two parts, the introductory sections (ii + 30 pp., roughly 5% of the total), and the chief list of drugs,

773 pp., with over 95% of the book's content. In the first part, general important information for the nurse is given, including some details of modes of administration of drugs. In the second part, 13 chapters furnish information on the anti-infectives, antineoplastic agents, blood formation and coagulation agents, cardiovascular drugs, central and autonomic nervous system drugs, hormones and antagonists, diuretics, histamine and the anti-histamines, vitamins, treatment of common medical conditions (such as coughs, gastrointestinal complaints, ^{and} diarrhea, etc.) heavy metal antagonists, and miscellaneous drugs. The book is written in simple direct style, the typography and binding are excellent, and this represents a fine textbook for the student of nursing. It would also be useful for pharmacy and medical students.

G M H

"PHARMACEUTICAL CALCULATIONS". Werner Lowenthal. Robert E. Krieger Publishing Co., Inc., 645 New York Avenue, Huntington, NY 11743. 457 pp., 1978 (original edition 1969). \$10.50.

This book is a self-instructional text for undergraduate pharmacy students who must master the fundamentals of pharmacy mathematics. The book is presented in small units or frames. Each frame is sequentially numbered to a total of 373. Branching is used throughout the text so the advanced student does not waste time on routine problems. Humor is employed to help overcome the boredom inherent with self-instructional texts. In addition to the routine pharmacy math problems a number of various types of compounding problems involving mathematical procedures are presented. A collection of ten sets of review questions are scattered throughout the text to test the reader. One useful addition to the text would be a thorough review section dealing with sodium chloride equivalents. In addition a table of contents and chapters or divisions within the text would have been useful. This book is recommended as a textbook for the beginning undergraduate pharmacy student in pharmacy math and for the pharmacy student reviewing math for the State Board Examination. It is not recommended for libraries as a major advantage of the book is writing on the text pages.

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"HAZARDS OF MEDICATION: A MANUAL ON DRUG INTERACTIONS, INCOMPATIBILITIES, CONTRAINDICATIONS, AND ADVERSE EFFECTS." Eric W. Martin. J.B. Lippincott Co., Philadelphia, PA., and Toronto, Ontario, Canada. xvi + 895 pp., 56 tabs., 1971. \$27.50.

There are many pitfalls in medication, in which there may occur under-as well as over-dosage: the contraindications, precautions, possibility of adverse reactions, etc., must be accompanied by appropriate warnings. Sex, age, condition, etc., all play important roles. In providing the medications, many parts of the manufacturing process are of importance—packaging, storage, labeling, preservation, appropriate promotion, and distribution. Many of these matters are discussed in detail in this work. There are two long important tables—one published on blue paper for ready location—presents inferences which might occur in clinical analysis of blood, urine, liver function, spinal fluid, and feces. For instance, aloin used as a medicament would cause a coloration of the urine (differing for acid and alkaline urines). Towards the end of the volume, a thick section (416 pp.) tabulates drug interactions, telling for instance that anticoagulants interact with many classes of compounds (for instance adrenocorticoids) as well as specific substances (such as ascorbic acid), modifying the action of the medication. All items are cross-indexed so that one might search under either the medicinal agent or under a suspected interactant. Many references and an index complete the volume, which is of interest to physician, pharmacist, dentist, nurse, and others in the health sciences.

G M H

"MARTINDALE: THE EXTRA PHARMACOPOEIA, INCORPORATING SQUIRE'S COMPANION," Ed. 27. edited by Ainley Wade. xxii + 2077 pp., The Pharmaceutical Press, 1 Lambeth High St., London SE1. 1977. £30 (post free). (US \$60.00).

In three years, Martindale will be a century old. The format has changed considerably over the years. Only a few years ago, it was a small pocket-sized book (although too thick to be comfortably placed in the pocket), now it is a volume of large size (about 7 x 10 inches) and very thick. The subtitle used on the dust jacket succinctly states its nature: "A comprehensive source of information on drugs and medicines in current use throughout the world." The coverage is really very wide—it includes every single drug proprietary in the United Kingdom (primarily), Australia, Canada, the USA, France, Germany, Sweden, and South Africa. However, this fine reference book also includes many proprietaries sold in other European countries, Japan and Argentina. The chief contents are these: (I) monographs on ca 3130 substances, grouped together to show pharmacological or therapeutic similarities (example: the chapter on Astringents, one of 112 chapters, includes alum, agaric acid, many aluminum (aluminium) compounds, catechu, bael, Cr compounds, tannins, Zn compounds, etc.). (II) brief descriptive sections on 1040 drugs, minor, obsolescent, or new (ex: arrowroot, Arsphenamine,

Bicyclomycin). (III) many (more than 1450) proprietary medicines commonly sold without prescriptions and relatively innocuous (ex: Calamine preparations, C-plus). (IV) directory of manufacturers with addresses (world-wide). (v) index of clinical uses (ex: alveolitis, bee sting) with preparation(s) recommended for treatment (or cross-indexing to other indications). (VI) general index with 171 pages with 4 columns on each page (ex. Caranda wax, minor synonym for Carnauba wax). Parts II to VI are each in alphabetic order, but Part I, which composes nearly 83% of the text pages is alphabetized only as far as the 112 chapter headings go, hence the use of the index is mandatory in almost any search, unless of course one is aware that the item sought is a over-counter proprietary, manufacturer's name, and so forth. Although cross-indexing is quite thorough, it is always best to search under generic headings, thus for instance, some of the specific names under "Oils" do not appear in the regular alphabetic sequence (ex: girofle, Graminis Citrati, Oleum). It would hardly be expected to find toxic plants and animals that have no medicinal use listed (for instance, loco weed) nor plants used so far experimentally for their medicinal values (as Leptotaenia (Ferula) species used for presumed antibiotic values), nor materials with primarily food or beverage usage (thus, Kombucha, Kefir) nor plant materials used in medical folk medicine (such as Jussieuia reptans; Iridaea edulis; fustic; motherwort) nor in cases where the name may be one used in some remote area (ex: Gelsony oil) or in commerce (e.g. pontico gentile applied to some form of wormwood). Black catechu (Catechu of the pharmacopeias; cutch) is mentioned only briefly; the monograph on Catechu is for Gambir (or pale catechu). Apparently the purpose of the volume publishers is to furnish information (and not an excessive amount) for items or information which would come up in the course of a day's work in the modern pharmacy, physician's office, hospital dispensary, or manufacturer's plant. For such purposes, the volume seems to provide good solid dependable information in condensed form. The work belongs certainly in any active pharmaceutical establishment in Britain but also would be a valuable reference work in any other English speaking country--the USA and the Commonwealth--and in countries such as the Scandinavian where English is so well know as to make it almost equal in importance to the national tongue.

G M H

"CHEMICALS AND LIFE," by Kenneth E. Maxwell. x + 1-372, several figs. and tabs. Dickenson Publishing Company, Inc., Belmont, California. 1970. Price not indicated.

This volume consists of 34 carefully selected articles from the scientific literature, with editorial comments and explanations. A brief run-down of the subject matters will give a better idea of the potential val

ue to the reader of this book. Eleven sections with the individual chapters indicated in parentheses are shown: 1. Living molecules (amino acids, DNA). 2. Birth control (world population; steroidal contraceptives; "the pill"). 3. Pollution ("The spoilers") (Lake Erie; CO₂ increase; smog; climatic changes). 4. Drug abuse (LSD; cannabis; strychnine in aiding problem solving). 5. Chemical mutagenics (caffeine; LSD). 6. Cancer (the problem a challenge; smoking; drugs). 7. Environmental (mostly food) medicinals and poisons (poisons in foods; juvenile hormone; cycasin aglycone, a carcinogen). 8. Life savers (drug residue levels; detoxication; chloroquine). 9. Pesticides (pro and con). 10. Chemical and biological warfare (CBW). 11. Nuclear hazards. - Following these literary excerpts are a glossary and the index. A reading of this volume will bring the interested person abreast of many modern conditions, advances, and problems.

GMH

"McGRAW-HILL DICTIONARY OF THE LIFE SCIENCES," with Daniel N. Lepedes, Editor-in-chief. xiv + 907 pp. + 38 pp., ca 800 figs. McGraw-Hill Book Company, 1221 Avenue of the Americas, New York City. 10020. 1976. \$19.95.

This 959-page dictionary of the biological sciences actually covers 55 major fields, thus, for instance, anatomy, cytology, plant pathology, and evolution, in other words everything from agriculture and archeology to zoology. It contains some 20,000 terms. It resembles in format the prestigious "American Heritage Dictionary" with somewhat similar typography and illustrations appearing on the sides of the page (including many photographs). The terms have been selected from the "McGraw-Hill Dictionary of Scientific and Technical Terms" (1974). Each term has been identified as to the field from which taken; thus, chalones (BIO-CHEM). Alternative names often appear at the end of the definition ("also known as ...") and these names are of course inserted with their definition at the appropriate alphabetic position. This Dictionary will be of interest and assistance to scientists, teachers, students, researchers, librarians, and those of the lay public who are interested in scientific matters, this latter now a very large group. From a cursory examination, it would appear that there are more zoological names than botanical. While the illustrations are very useful, they consume about 40% of the page surface and since often pages have no figures, this constitutes a wastage of space which might well be used for additional definitions. An advantage however is that the space can be used for annotations and insertion of new definitions, likely in any advancing field. (Some definitions not included: tiller (bot), zoochromes, cocoa, cytomixis, Phanerozoic (times), onychites, provender).

GMH

"EDIBLE NUTS OF THE WORLD," by Edwin A. Menninger, D. Sc. viii + 175 pp. ca 300 figs. Horticultural Books, Inc., POB 107, Stuart, Fla. 33494. 1977. \$14.95.

This large attractive book (quarto size) was written by the distinguished author of several books devoted to telling the story of the colorful plants which surround us ("Flowering Trees of the World", "Fantastic Trees", etc.) Almost every page bears one to several photographs of the plants and nuts described. Descriptions and uses are important information of the descriptive text. Where the nut is known to have toxic properties, a warning appears in the form of a marginal black skull and crossbones. Something like 700 seeds are described in the book. Part I is devoted to the dicotyledonous nuts (such as cashew, Brazil nut, pecan, sunflower, etc.). Part II represents monocotyledonous nuts (as coconuts and other palm products, Pandanus, and so on), Part III covers nuts from the Gymnosperms (ex. pine nuts, cycads, ginkgo), and Part IV is titled "Not Nuts", covering seeds and non-seed plant parts, which are commonly called "nuts" but which are properly not so and often even not edible. Included here are areca nut (betel nut), prayer bean, ivory nuts, chufa "nuts" (actually a tuber), litchi nut (in actuality a fruit). Bibliography, index. This book will be of much interest and value to almost every person - it is of universal appeal and a job well done !

GMH

This is the tenth collection of book reviews by G. M. Hocking to be published in PHYTOLOGIA. 27(3): 180-208; 1973. - 29(5): 395-445; 1975. - 34 (1): 95-144; 1976. - 37(2): 98-176; 1977. - 40(3): 264-304; 1978. - 44(1): 33-64; 1979. - 46(4): 246-280; 1980. The first seven contributions were supported entirely by a Faculty Grant-in-Aid (No. 73-57) of Misc. Grants Fund 2775-17-5240 (Auburn University, Auburn, AL.) for which the reviewer is grateful, as also for the approx. 20% support of the eighth issue (Misc. Grant Fund 6-40020; Auburn University).

GMH

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